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ORIGINAL COMMUNICATIONS.

"A body of men engaged in the same pursuit form a joint stock of their information and experience, and thereby put every individual in possession of the sum total acquired by them all."—REV. DR. WILLIAM CAREY.

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Note on Eucalyptus globulus, the genuine Blue Gum Tree. By Baron Ferdinand Von Mueller, C. M. G., M. & Ph. D., F. R. S.

This important and now widely-celebrated tree was discovered in 1792, by the naturalist La Billardière, during Admiral d'Entrecasteaux's expedition, sent out in search of the ships *Astrolabe* and *Boussole*, lost under the command of Count La Pérouse. La Billardière found the tree on the Bay, at which, subsequently, the city of Hobarton arose, while the survey of this great inlet, commenced by Tasman, was continued by d'Entrecasteaux. The genus Eucalyptus having been established on the ordinary stringy bark tree (E. obliqua) by l'Heritier (plantæ rariores, quae in hortis juxta Londinum excoluntur) in 1788, from specimens gathered by Nelson in 1773, at Adventure Bay, of Tasmania, during Cook's third voyage. La Billardière, in placing his tree in that genus, gave the somewhat curious specific name "globulus" to this new Eucalyptus, and furnished in 1799, a short descriptive note of it, accompanied by a drawing, in his "Relation du Voyage à la recherche de La Pérouse," of which work two English editions were subsequently issued. A brief diagnosis

of the tree, also, by La Billardière, occurred in the second volume of his "Novae Hollandiae Plantarum Specimen" in 1866; short descriptive notes were published by Sprengel in 1825, (Systema Vegetabilium, Vol. II.;) by De Candolle in 1828, "Prodromus Systematis Naturalis Regni Vegetabilis," Vol. III., and by G. Don, in 1832, History of Dichlamydeous Plants, Vol. II.; but a fuller description of the tree occurred about 1860, in the first volume of J. Hooker's "Flora Tasmanica," and a still more extended phytographic account appeared in the second volume of my "Fragmenta Phytographiæ Australiæ" also in 1860, while about the same time, a lithogram, with ample analytic details of this species, was issued in my "Plants of Victoria." In 1866, a full English description was inserted into the 3rd volume of the Flora Australiensis, issued by Mr. G. Bentham and myself.

The geographic limits of Eucalyptus globulus extend from the ranges about Cape Otway to East Gippsland and the bases of the Australian Alps, and northward into New South Wales as far as the Hume River district. It occurs also in various parts of Tasmania, particularly in the southern and south-eastern portions of that island, and it is furthermore found on various isles of Bass's Straits. Although generally occupying forest valleys, sometimes gregariously, sometimes sparsely, it may be noticed also occasionally in open places, for instance at the You Yangs and on the islands of Western Port. Trees grown in deep forest glens attain not rarely 300 feet in height, and sometimes rise even to a still greater height; in less favorable localities, its size is proportionately less; and on the storm-beaten declivities of Wilson's Promontory I have seen this species profusely flowering, though dwarfed to the size of a shrub.

It belongs to the technical section Leiophloiae of the genus, embracing the smooth barked species, as defined by me in the 3rd volume of the Proceedings of the Linnæan Society of London, in 1859.

The marvellous rapidity of growth of this tree among evergreen and hard-wooded kinds (equalling, or even excelling, the rate of growth of a poplar or willow) combined with the enormous size of the tree, could not fail to attract early attention, as well in Tasmania, as in Victoria, to which two colonies the Eucalyptus globulus is naturally almost confined. Among the first who planted it extensively in Victoria was the late General Sir Edward Macarthur; this was fully 20 years ago, and some plantations in Tasmania were formed still earlier. Having had myself an opportunity, as far back as 1852 and 1853, to watch our Blue Gum trees in the forests of Monsieur Macedon Dandenong, Monsieur Buller, the Buffalo Ranges, and in many parts of Gippsland, and having also seen with what facility they could be raised by sowings of seeds, obtained then for the Melbourne Botanic Garden, and having also noticed the resistance of the tree to drought, with others I recognized the importance of this valuable gift to us by nature for transferring it in masses to woodless tracts here, and to countries in warm temperate climes.

My friend Monsieur Prosper Ramel, on returning in 1859 from here to France, and becoming acquainted with this tree in our Botanic Garden, most enthusiastically and perseveringly advocated the introduction of Eucalyptus globulus into his country and the Algerian colony, and for a series of years I had by every means in my power seconded his efforts to give this timber and fuel to many almost woodless districts on the Mediterranean Sea, while I endeavoured to find appreciation for the Eucalyptus globulus in India, South Africa, the La Plata States, Chili, California, Virginia, China, Japan, and some bare plateaux of Brazil. A gradually increasing demand for seeds arose, and it is no exaggeration when I affirm that seed-merchants and seed-collectors have exported hitherto to the value of £10,000 of seeds of our Blue Gum trees, not to speak of the seeds of other Eucalyptus, and the rate of export is still increasing, a large quantity having been

demanded for New Zealand, for a series of years. The current price of sifted seeds of Eucalyptus globulus is now about 15 *s.* per lb.

The seed is raised with great care in nursery beds, the seedlings are transplanted after a few months, either at once to permanent positions, or moved for a few months more into new nurseries. The final transplanting should take place at the commencement of the cool season. The use of Heyer's bore-spade is advantageous in this operation.

Among nearly 150 species of Eucalyptus, known to exist in Australia, the E. globulus is chiefly recognized by the quadrangular stem and the clasping broad, apposite, and ashy-blue leaves of the young plants, by the sessile and mostly solitary flowers, covered with a crown-shaped, somewhat chalky lid, and by the peculiar shape and comparatively large size of its fruit capsules. All further characteristics are fully set forth in the works already quoted. The vernacular appellation Blue Gum tree is an ambiguous one, inasmuch as in New South Wales and South Queensland, several other species occur under the name of Blue Gum trees (E. eugenioides, E. haemastoma, E. botryoides, E. tereticornis) while in some parts of our own colony, a very different tree, namely E. goniocalyx, passes under the same popular appellation, and while in West Australia the E. diversicolor and E. megacarpa are called Blue Gum trees.

The natural growth of the Eucalyptus is often very close in the forests—sometimes from 20 to 40 trees occur on an acre—but in proportion to their closeness they are also more slender. This shows, however, how large a yield of timber might thus be obtained from forest areas, either natural or artificial, if carefully worked. In our own western basaltic plains and undulations, which are extensively destitute of timber, enlightened settlers in forming areas of trees have predominantly and very successfully chosen the E. globulus for this purpose. In reference to the celerity of growth of this tree

under very favorable circumstances, we are made aware of some astounding data. So I was informed by Mr. Brace, that in the Neilgherries, of the Madras Presidency, his young trees had attained a height of from 20 to 25 feet in eighteen months from the time when I despatched the seeds, and I have similar records from the Argentine Republic; even in the comparatively cool climate of Hyères (France) the height attained in 8 years was 55 feet. In rich deep soil the same results may here be obtained. The E. globulus is not absolutely bound to any geologic formation, but it has a predilection in culture for friable soils of fair quality, and dislikes much stagnant water in the soil, also avoids pure sand and saline ground. Young plants, while yet succulent, are apt to be attacked by a species of coccus, also by caterpillars of various kinds—both require removal. In Senegambia, while the locusts destroyed the bark of nearly all other trees they left the Eucalyptus untouched.

Turning briefly to some of the products obtainable from Eucalyptus globulus, the volatile oil directly obtainable by distillation from the foliage may first be mentioned. The yield is from two-thirds to one per cent., hence this Eucalyptus is thus far outrivalled by several species, for instance E. amygdalina, E. oleoga, and some others. The oil of Eucalyptus was brought by me before the first Paris Exhibition in 1855, with the view of its adoption in medicine, its resemblance to the Indian oil of Cajaput having then become to me very obvious. Mr. Jos. Bosisto prepared the oil on that occasion for me, and the same gentleman and Mr. Johnson of St. Kilda furnished a whole series of oils from materials supplied by myself on the occasion of the Melbourne Exhibition of 1862, and the London Exhibition of 1862. Again, in 1866, for the Intercolonial Exhibition, and in 1867, for the second Paris Exhibition, the Eucalyptus oil was produced in a laboratory then recently established in my department, and its qualities carefully investigated on sug-

gestions of myself by Mr. J. Osborne, the discoverer of photography. Mr. Jos. Bosisto also carried on the extensive tests of the qualities of the oil, and he has the credit of having pushed it into mercantile trade and extensive technologic application, after the value of the oil as an admixture to precious cosmetics, in the manufacture of scented soap, and its great utility as a solvent of select resins for superior varnishes, had been recognized, partly by himself, partly by other investigators. The remarkable fact was demonstrated of this oil readily dissolving subterranean kauri and amber; 100 parts of the oil of E. globulus are saturated with 14 parts of camphor, 12 parts of mastic, 7 parts of sandarac, 8 parts of kauri resin, 6 parts of asphalt. It mixes in all proportions with oil of turpentine, all fat and drying oils, benzole, naphta, ether, and pure alcohol. Its specific weight is 0·917 It boils at from 338° to 347° Fahrenheit, excelling Eucalyptol first prepared by Dr. Cloëz of Paris, who found for this the chemical formula C^{24} H^{20} O^{2}. The remaining volatile oil boils between 370 and 374° Fahrenheit. Mr. Cloëz obtained from Eucalyptol, by application of phosphoric acid, the new Eucalyptene and Eucalyptolene. Eucalyptus oil can be used for giving light, quite like kerosene, the best of which it surpasses by its more pleasant odour. In burning, it leaves no smoke, and does not give rise to explosion. The export of Eucalyptus oil, hitherto exported from Victoria solely, as a new resource of the colony, represents by this time several or perhaps many thousand pounds sterling, and the demand in the European and American markets will likely increase. It is most cheaply drawn off from the leaves by steam vapour.

But this is not the only oil obtainable from the Blue Gum tree. In my laboratory I caused tar to be prepared from Blue Gum wood by Mr. Rummel, and this tar subjected to analysis, to trace its component parts. The pitch obtained was excellent, and can be dissolved for varnishes and be used in other ways technically. The tar itself, which can be pro-

duced by thousands of tons from waste wood now lost, will doubtless ere long become an article for export, when the supply of wood tar from North Europe and North America fails. The process of its production presents no difficulty, involves no large outlay, and requires no trained knowledge of any extent. Dyes of various kinds would likely be obtained from the Eucalyptus tar, but my intended investigations in this and other directions could, with the withdrawal of the necessary working notes and the laboratory, not be carried out.

The bark of Eucalyptus globulus contains about 4 per cent. of tannic acid, and although this is several times less than the yield of Wattle bark (from Acacia decurrens and Acacia pycnantha) the copiousness of the supply of Eucalyptus bark will cause it to be utilized even for this purpose. Samples of packing and printing paper were made by my order from the bark, also paste-boards.

The yield of tannin from the leaves is sufficiently great to induce Count de Marafy to recommend them as a substitute for Sumach.

The saw-dust at mills from the wood can be converted into a paste for admixture to the material of the coarser kinds of paper. By simple chemical processes it can also be made to yield alcohol, and by other means oxalic acid, and several other substances.

The gum-resin exuding in a fluid state from the stems of E. globulus, or lodged in a solid state in fissures and cavities of the wood, is rich in tannic acid, and can be used in medicine like kino. Indeed it has long since been drawn thus far into use, particularly in chronic diarrhœa.

The yield of potash from E. globulus is also not unimportant. The fresh foliage, branches, and bark taken together at a weight of one ton, give about 8½ lbs. of pure potash, so far as my experiments hitherto have shown. The yield from the wood, as is usual with other trees, proves less. According to

soil, age, and other circumstances, the percentage fluctuates. The method of obtaining potash from the wood ashes by maceration and inspissation is of the simplest kind, and fully explained in my lecture on Forest Culture.

The Eucalyptus globulus seems destined to sustain itself in many various climes, because it is not destructively affected by mild frosts, as long as these are not of lengthened duration, though the plant is more susceptible to frost in a young state than when the stem has become hardened. A vigorous tree will stand a temperature occasionally as low as 18° Fahrenheit, particularly if the position is not exposed. Since some years past, E. globulus has attracted great attention in respect to hygienic action, not only for the sake of its therapeutic principles, but also as affording the means of meliorating the clime of fever regions. When planted in masses on malarian swamps, very beneficial effects from Eucalyptus seem to have arisen, which may be attributed to a three-fold action: namely the drying of the swampy ground through the enormous power of absorption and respiration possessed by Eucalyptus in a much higher degree than most other trees (as explained in my lecture on Forest Conservation and Wood Industries, printed nearly three years ago); *secondly*, to the diffusion of the antimiasmatic vapour of the volatile Eucalyptus oil through the air; *thirdly*, to the antiseptic action of the dropping Eucalyptus leaves on other vegetable and also animal substances decaying on the ground, or contained in water near it.

First, Dr. Tristany in Madrid; then Mons. Malingre in Sevilla; Dr. Ahumade, Mons. Rahard, Professor Guebler in Paris; Dr. Marés in Algiers; Dr. Carlotti, of Agaccio; Dr. Tedeschi in Corte; Dr. Gimbert, of Cannes; Dr. Miergues, of Bouffari; Dr. Brunel, of Monte Video; Dr. Casson, of Paris, have brought leadingly the therapeutic value of the Eucalyptus leaves as febrifuges into practical medical notice. The aqueous or vinous infusion retaining the volatile oil, seems the best

form of administration, the leaves contain no alkaloids, and therefore the medicinal properties must rest on the bitter extractive principle, some resin, the essential oil, and perhaps the tannic acid. The leaves can also be administered in the form of powder. In many cases simply the Eucalyptol has been used for various medicinal purposes. It is particularly used in intermittent fevers, in which the Eucalyptus medicines have been administered, and particularly in such cases in which the unsuccessful use of Quinine indicated the trial of some of the various other known febrifugal remedies, and among these now, according to the testimony of several physicians, in various parts of the globe, Eucalyptus takes a high rank. The treatment with Eucalyptus has overcome in many cases long standing febrile affections. Special physiologic and therapeutic experiments made by Dr. Claude Bernard, Professor Robin, and Dr. Vulpian have shown that the Eucalyptol diminishes the spinal reflex action, lessens organic combustion and also respiration, facilitates the elimination of urea, stimulates the sympathetic nerves and the capillary circulation, and is eliminated again by the lungs and bladder.

Dr. Gimbert recommends the use of Eucalyptol in asthma (against which disease also Mons. Ramel's patented cigarrettes of Eucalyptus leaves have much come into use), further to assuage the cough in various pulmonary affections, and convulsions and spasms generally. Thus also a new efficient remedy was found against hooping cough, chorea, vesical catarrhs, dræmia, fevers of all types, dyspepsia, chronic rheumatism and gout, and even against entozoa. In cholera, the inclination to vomiting is diminished by this remedy, and the infusoria are destroyed. Against inflammation of the mucous membranes, generally, it has proved most useful. He finds as an antiseptic the Eucalyptol most advantageously applicable as an external remedy in putrid suppurations. Injected into the veins of animals, it retards the decomposition of the cadaver for a long time, differing in this respect from oil

of turpentine, which exercises only a passing preservative effect. The coagulated blood of rabbits was preserved for three months after an injection of Eucalyptol without perceptible alteration, the tissues dried up and exhaled the odour of Eucalypts. We possess thus in the Eucalyptol an antiseptic as powerful in its effect, though perhaps to be applied in larger quantity, as carbolic acid. In this colony many of the observations of the Spanish and French physicians have been verified, and I may add, that the distilled oil of Eucalyptus leaves has proved here the most quickly acting remedy for healing the sores of horses.

Dr. Brunel, in Monte Video, had patients coming from Brazil and West Africa to obtain relief from fever by the Eucalyptus treatment, and has published a treatise on his Clinical Observations respecting the use of this plant.

The industrial value of the timber of Eucalyptus globulus is multifarious; in the wood-work of buildings, for planks, for railway sleepers (lasting a dozen years and more when cut in the right season and well dried), for shafts, spokes, &c. Ships' keels of lengths of as much as 120 feet have been obtained from it. Blue Gum tree wood has been shown in some instances to carry 14 lbs. more weight than the wood of English oak, and 17 lbs. more than Indian teak wood on the square inch. For many other observations on the uses of the Blue Gum tree timber, reference may be had to the successive exhibition volumes issued here since 1854, as a detailed explanation of all its uses would be beyond the scope of this brief document.

From researches instituted by Mr. Hoffmann under my order, the wood of the Blue Gum tree, when heated with exclusion of air, is converted into 29 per cent. of charcoal, 46 per cent. of crude wood vinegar with wood spirit, 6 per cent. of tar, and 19 per cent. of gases. These proportions are however not absolute; as they depend on the nature of the particular quality and age of the woody and the degree of heat

adopted, for it was ascertained in the progress of these enquiries by Mr. Rummel, that with at once increased heat, a larger volume of light-gas is evolved at the expense of the other products—a discovery which promises to lead to extensive application of wood instead of coal in any gasworks. Samples of the tar-vinegar, pure acetic acid, alcohol, coal, the volatile oils, pitch, paper of various kinds, potash, as well as various products obtained by utilizing, for instance the acetic acid for dye-materials, the alcohol and oils for varnishes, &c., were shown in former exhibitions, and a large series of products of these kinds is rendered accessible by me for inspection at the Industrial Museum in Melbourne. The last work in my laboratory has been to separate the constituent parts of the Eucalyptus tar, and give several distinct oils, each of a particular boiling point and specific gravity, and all readily available as distinct solvents for various technologic uses. Circumstances explained already have rendered the continuation of these researches through myself an impossibility.

Important Memoirs on the Eucalyptus globulus and other species of that almost exclusively Australian genus have appeared in the journals of various nations, but no where the value of these trees has been more carefully observed and tested than in France; and among those who have recorded the observations most extensively, stand foremost Monsieur Prosper Ramel, Mons. Raveret Wattel, and Mons. Ernest Lambert.

15*th March*, 1874. FERD. VON MUELLER.

Uses of the Bamboo in China. BY M. C. D'EDUARD MÈNE.

(Translated from the Journal of the Acclimatation Society of Paris.)

That useful plant, the Bamboo, is in general use in China, where it is considered quite a Providence for the poor and working classes. The fruitful imagination of the Chinese,

excited moreover by sheer necessity, has utilized the bamboo to serve a variety of purposes.

In truth, in a country subject to frequent scarcity, and of which the population is considerable, it is necessary that household furniture and other objects of daily use should be made at an extremely low price, to place them within the means of the lower classes. And this advantage can only be attained by the use of the bamboo.

The varieties of this plant employed in China are numerous, all differing in color and size.

One called the white bamboo, of which the stem is green when it is immature, acquires a yellowish white tint on arriving at maturity, or after being cut and dried. It is the most common variety, the most used, and the most useful; the stem being extremely high, straight, and of much greater diameter than the black bamboo.

This last has a black stem, the colour existing in all conditions of the stem, immature, mature, or cut and dried. Its height is by no means considerable, not exceeding 15 feet; its diameter does not exceed 4 or 5 centimetres, and ordinarily 2 to 3 centimetres; its habit is more herbaceous; the stems being generally inclined, contrary to the white bamboo, which affects the appearance of a tree.

Bamboos grow generally in low and alluvial soil: they grow rapidly and multiply infinitely. They are found in all parts of China, in the south as well as in the north, under 50 degrees (centigrade) of heat, and on the borders of frozen rivers, particularly on the coasts, advancing towards the north. On these coasts the thickest and tallest varieties exist, forming groves extending from 12 to 15 leagues into the interior, sometimes on level ground, embedded in vegetable soil to the depth of 12 to 15 feet, sometimes on hill slopes or the side of mountains, supported in not more than 2 or 3 inches of vegetable mould.

The white bamboo, when allowed to attain its full deve-

lopment, reaches 50 and 60 feet in height, with a diameter of 20 centimetres. It is generally cut when its diameter is from 10 to 12 centimetres; it is then most convenient for ordinary purposes.

In every village there exist one or more depôts of bamboos, assorted according to length and thickness.

In every farm, large or small, we see behind the homestead an area of about a hundred square metres, enclosed by a wide ditch filled with water, set apart for the cultivation of the bamboos required for daily use; sometimes grouped alone, at other times, mingled with other trees, they form masses of a picturesque aspect, affording shelter to numbers of turtle doves.

In their large gardens, the Chinese often group with their artificial rocks bouquets of bamboos, the effect being magnificent. For this purpose they employ, more especially, the black bamboo.

The stems, taken of sufficient thickness to give them the required resistance, are cut and scraped so as to remove all the natural roughness about the knots and other little natural defects; they are then cut according to the desired length, heated before a fire, to render them susceptible of being twisted or trained as required; each piece being attached to the next by means of pegs also of bamboo.

When the bamboo is to be worked, the Chinese almost always cut it when still green, because, in skilful hands, it may then be split down its full length without breaking, and it furnishes ribbons or blades of various degrees of thickness or fineness, of great strength, and capable of being plaited and worked up in a thousand ways.

The bamboo, by its flexible and resisting nature, bending, but never breaking, is available for all possible uses. It has the advantage of being free from the attacks of worms, and it may almost be said that it cannot rot: covered with a sort of natural varnish, it resists the ravages of time.

Bridges.—Bridges made with bamboo are thrown across streams and small rivers. Five or six bamboos, from 10 to 12 centimetres in diameter, and from 20 to 30 feet long, are tied together, a wooden bolt being attached transversely at regular distances from end to end. The platform thus constructed is supported at each extremity on a trestle placed on either bank; the trestle being also made of several bamboos. On this swaying construction, pedestrians and even horsemen entrust themselves, the ponies of this country being very sure-footed.

Conduits for Water.—In mountainous countries, the bamboo affords its aid to agriculture, for the irrigation of localities where water is scarce and difficult of distribution. It comes to the help of the enterprising cultivator who requires from the earth, even in steep places, all that it is capable of producing.

As it would be impossible to irrigate these small patches of soil, existing as they do at great heights, the Chinese have invented a very simple means for keeping reservoirs constantly fed. They select a point in a stream easily accessible and always more elevated than the spot where the reservoir is to be formed. Here a small dam is constructed of bamboos, closely placed one against the other, the object being to maintain a constant depth of two feet of water all round. This depth gives a sufficient height of water over and above the deposit of silt at the bottom. To this dam are fixed, end to end, long and thick bamboos, the knots of which have been pierced with a hot iron. These bamboos thus form perfectly staunch water-pipes, solid and durable, by no means suffering from the heat of the sun. These pipes are maintained at intervals on supports of wood or stone, and each abuts on a small trough forming a reservoir, whence the next bamboo is carried on as before. Each of the bamboos is at least 15 to 20 centimetres thick, and 30 to 40 feet long. The slope is gradual, and the arrangement of pipes and reservoirs is such

that the distribution and flow of the water is effected easily and regularly. The result is seen in the splendid cultivation which adorn the sides of the mountains, watered on this simple and inexpensive system.

Huts for Fishermen.—Fishermen establish on the banks of large rivers, an enclosure formed of strong and tall bamboos, generally four or five in number; they sometimes place several others cross-wise to give the structure greater solidity. On the upper part, a kind of platform is constructed by means of other bamboos fastened with strips of the same material, which serves as a flooring for a little hut; this is the fisherman's dwelling. The walls of this little cabin are composed of strips of bamboo, or of young stems of the same tree. The roof is made of thatch, reeds, or of bamboo mats. In front of the cabin, two bamboos of the same height are fixed cross-ways, and at the point of junction is placed a third bamboo which forms a lever, and to which are fixed a line and a net all made of bamboo. The net is let down into the water and taken out of it, the fisherman all the while remaining inside his cabin: all he has to do is merely to pull a cord fastened to the other extremity of the lever. The height and the number of these huts on the banks of Chinese rivers excite surprise when seen for the first time, and the manœuvres of an unseen person are perceived.

Villages.—These huts are not the only ones so made. Entire villages are built in the same way; the supports are formed of thick bamboos, smaller ones are placed in the intervals; mats made of strips of bamboo furnish the walls, which are plastered over with a composition of earth, lime, and bamboo shavings.

Enclosures.—One of the most important uses to which this plant is put is for fences for dwellings as well as for land. In the latter case it is used in various ways; according to the relative thickness desired, when the enclosure is low. Bamboos are fixed in the earth at certain distances, sufficiently

strong to serve as upright posts, then slips of split bamboo are arranged in the manner of European trellis-work; other small pieces form cross-pieces, on which they fix the ends of the slips, and these are fastened by means of a slip of fresh bark.

In other cases instead of forming a trellis, the slips are all placed vertically, closely joined together. Another set of slips being placed horizontally; sometimes these fences are as much as 15 to 20 feet high, and their thickness is so great that they resist the most violent blows, even with a hatchet, in consequence of the flexibility of the bamboo.

Paper.—The bamboo is the principal, it may be said almost the only, material used in paper-making in China. Cut when quite green, it is scraped and cleaned; the thicker shavings are used to stuff mattrasses, cushions, and pillows.

The finer shavings are separated, macerated in water, and are reduced to paste by a special process. This paste is mixed with a certain proportion of isinglass, and sheets of various qualities of paper are manufactured.

The common unbleached paper is slightly yellowish, but of a fine uniform color, smooth, soft, and of great strength.

The shavings of inferior quality are also macerated, converted into paste, then made into sheets and dried. It is mixed with slaked lime to form a substance with which walls are plastered.

Tinder.—Bamboo paper, besides its ordinary applications, is also made use of to produce a kind of tinder, very much in request among the lower classes, especially watermen.

This tinder is very combustible, but burns very slowly. The Chinese take one or more sheets of paper which they roll up in the palm of the hand; one of the ends is slightly pressed down so as to prevent the unrolling of the paper, and the other end is lighted; as soon as the ignition is complete, the paper is thrust into a small tube of bamboo which is immediately closed. The fire is extinguished at once, but the

paper is charred; when fire is wanted, the burnt end of the paper is placed on a flint, and this being struck with a piece of iron, the smallest spark is sufficient to produce a light, the paper burning like ordinary tinder. Blowing on this sharply, once or twice, is sufficient to raise a flame, a result that cannot be obtained with any other kind of tinder.

Nails.—Bamboos in many cases are employed instead of nails, these being relatively dearer. These bamboo nails are pegs cut out according to the length and thickness desired.

Brushes.—Chinese masons cover the rough mouldings of wood, in the interior of houses, with white-wash. They employ for this purpose brushes made of filaments of bamboo fastened together and secured in a handle also of bamboo.

The small brushes which are used for coloring pictures are also made of fine bamboo shavings introduced into a small holder of bamboo.

Chisels.—Modellers make use of small chisels cut from the hardest part of the bamboo. They are very expert in using these in the manufacture of ornaments in plaster, of which the body has been formed of lime mixed with fine shavings of bamboo.

Coverings for Boats.—Boatmen shelter their boats under arched roofs which secure passengers against the heat of the sun and against rain. These coverings serve at the same time as a dwelling for the boatmen at night.

These arches are formed by halves of bamboo split lengthways, the ends being morticed and joined; the whole covered with mats of plaited bamboo.

Handles for Boat-hooks, Oars.—The handles of boat-hooks are made of a single bamboo; and so is occasionally the "yolo" (a kind of single oar) which the Chinese use in managing their boats.

Masts.—To the uses which boatmen make of bamboo, we must add one which is very important, namely masts. They fix on their little boats, called sampans, a pole attached to

the bottom of the boat, and tied a little higher up against a piece of wood by means of a collar of iron. To the top of this mast is hoisted a small square sail, which is kept open by means of another bamboo placed crossways.

In the junks there are generally four masts of wood arranged like a fan from prow to stern. On each of these masts are fixed large sails, generally made of yellow or red cloth, but often also of bamboo-mats.

These sails or mats are kept open by a certain number, from 15 to 20, of small bamboos, fixed crossways. These serve as yards and ropes and facilitate working when reefing. In fact, by working on a clew-line placed at the head of the mast, sail may be taken in from below at will, according to the force of the winds.

Clothes.—The Chinese make by hand a kind of netting, the rectangular meshes of which are one centimetre square. Into these meshes are introduced small tubes of bamboo, just the length of one side of the mesh. With this netting mixed with bamboo, they make a sort of sleeveless paletot which is worn on the naked body, during the great heat of summer. Placed next the skin, to the exclusion of all other clothing, it imparts, they say, great coolness.

Hats.—The hats are conical in shape, but they are very low and wide. They are generally of two sizes; the hats of the coolies (street porters) do not exceed 35 to 40 centimetres in diameter, whilst those of chair porters often attain 60 to 80 centimetres in diameter. Their construction is very simple; they are made of little strips of split bamboo plaited together, after the manner of a cane chair, and bound with a somewhat stronger strip; the middle terminates in a low conical summit. These hats are covered with a kind of cloth waxed and oiled cloth, black in color: a string passes behind the ears, and is fastened under the chin.

The shalaco, or head-dress which Europeans wear at Saigon (Cochin China) is likewise made from bamboo. When the

Chinese are engaged in work which leaves their hands free, they do not wear hats to protect themselves from sun or rain. They make use of an umbrella of which the handle is made of bamboo as thick as a man's thumb, and all the ribs and joints of which are made of the same material. Umbrellas covered with oiled paper, painted green, are very light, strong, and inexpensive.

Beds.—The greater portion of a Chinese bed is entirely made of bamboos of different sizes, joined together by means of little bamboo pegs. Mattrasses, cushions, and pillows, are, as has been said above, stuffed with bamboo shavings.

Chairs, easy chairs, and couches are made of a frame-work of bamboos, neatly cut and arranged, supporting a tissue made from reeds.

Amongst the poorer classes, tables, cup-boards, and chests are also made of this plant.

Ladders.—These are formed of two long and strong bamboos, hollowed out at the level of each ladder step, which is nothing more than a thinner bamboo.

Broom handles, the poles for scavengers, handles of all kinds, and of all sizes, supports of every sort are made from the bamboo.

Canes.—Canes are made, sometimes of white, sometimes of black bamboos. Into these, curious designs are carved from top to bottom, representing people and landscapes, the relief of the carvings being sometimes made prominent by the introduction of a white substance into the parts cut out. This plant also furnishes the implement of trade of the Chinese coolies and street porters. They all make use, like our water-carriers, of a bamboo, split up of its length; to each end of this half bamboo, cords are attached, from which are suspended two wooden plates. In these are carried food, vegetables, and other loads.

Poles for Sedan Chairs.—Sedan chairs are extensively used in the Celestial Empire. The poles of these chairs are made

of two long bamboos which pass under the chair and project beyond it before and behind. The ordinary sedan chairs are entirely constructed of pieces of bamboo fitted together.

Baskets.—Baskets for washing and keeping rice are made of strips of bamboo woven in compact meshes. Baskets for fruits and vegetables are also made in the same manner, and so are the large baskets which are used for storage and in conveyance of merchandize on board European ships and the junks employed in the Coasting Trade.

Boxes are almost always made of bamboo, woven like our cane chairs, the texture being closed or open as desired. Some of these boxes are covered with paper, white, red, or yellow inside, black outside. They are generally pretty, of varied forms and sizes, and extremely solid and durable.

Cordage.—Some kinds of the cordage in use are made with filaments of plaited bamboo, these cords are very strong, almost incapable of rotting, and very light. These filaments are also employed in the manufacturing of small circular knots or bosses which are attached to each other, chain-like, and are used as bracelets, necklets, and watch-chains.

Mandarins' batons.—A mandarin's badge of office consists not only of a button which embellishes the top of the hat and which varies according to the class of the official, but also of a baton or wand which, for certain classes, is of jade, for others of ironwood, or lacquered wood, for others, of carved bamboo.

Spear-handles.—In the army, some of the cavalry are provided with iron-pointed lances, the handle of which is made of a long bamboo. They also carry arrows formed of bamboo terminating in an iron point.

Nearly all the tools used in husbandry are made of bamboo; as are also the chop-sticks used in eating rice, which for the richer classes are of ivory, but for the poor classes, consist of two small bamboos enclosed in a case with the knives.

Articles of domestic use.—A large portion of articles of

domestic and daily use are made of bamboo. This material also furnishes lamp-stands and supports, and the frame-work of lanterns. This frame-work is formed of several bamboos and pieces of bamboo covered with colored paper. So with the fans, so commonly used in China. Costly fans are mounted in carved ivory, on sandal, or lacquered wood, but the common fans are made of slips of bamboo covered with paper, adorned with fantastic designs and vivid colors.

Hand screens are made of the same material, and, in the same way as fans, standing screens are made of a light frame-work of bamboos, fixed into each other, forming fantastic shapes, and supporting a piece of silk embroidered with designs of birds, flowers, and plants.

The Chinese have games of dominoes almost exactly like ours. They are formed of small pieces of cut bamboo, arranged, glued together; one of the pieces is painted, and shows the numbers in black and red, sometimes the piece of bamboo which bears numbers is replaced by a piece of bone or ivory. Among the lower classes of the people, the teeth of hair-combs are made of strips of bamboo fixed in lacquered or carved wood.

Tobacco-jars.—A large proportion of pots for tobacco are made of bamboos, the bottom being formed of one of the natural knots of the plant. They are very pretty, adorned with carvings and fantastic decorations.

The stems of pipes for the smoking, both of tobacco and opium, are often formed of a small bamboo stem, the internal divisions having been removed by hot iron. The stem is fitted into the bowl.

Musical Instruments.—Some of the instruments of Chinese music are likewise made of bamboo, two kinds of flutes for instance. One kind is closed at one extremity, either by a natural knot or by a stopper of bamboo shavings. Along this flute holes are spaced cut at regular distances, the first being the mouth-piece, and the others being opened and shut

by the fingers of the player.

Another flute resembles the foregoing, but the knot at one of its extremities is cut to a slope, and an opening effected as in the flageolet. There is also a kind of violin, with two strings fixed to a long handle of wood, terminating in a bamboo stem; closed at its extremities by a lightly-stretched snake's skin. A piece of split bamboo is used as a bow.

The Chinese drum is formed of a hollow cylinder of wood covered with a skin tightly stretched, and fastened with copper nails. There is no string with which to tighten or loosen the drum-head; this instrument is placed on a tripod made of small bamboos placed cross-ways. As to the tam-tam, it is suspended, sometimes to a piece of wood, sometimes to a framework of bamboo.

To these instruments of music may be added a kind of very curious whistle. The Chinese believe that evil spirits often haunt the abodes of men. To drive them away, or frighten them, they employ the following means: Several holes are pierced in a piece of bamboo, two of the natural knots being left, one of which offers an opening cut in a slope.

To each extremity are fastened two long strips of paper from 5 to 6 metres in length and 15 to 20 centimetres wide. A string is attached to a groove made in the bamboo, and when there is a little wind, this curious kite is sent aloft, remaining in the air as long as the wind is strong enough to keep it up. In this position a monotonous whistling is produced, resembling at times the noise of a jet of steam, sometimes the sighing of the wind in trees.

If this noisy kite does not drive away the spirits, at any rate, it scares birds of prey, especially magpies and crows, which are very abundant in these parts.

Kitchen furniture.—House-keepers frequently use the bamboo for pails for raising water. The little common drainers are often made of in the same manner.

Gridiron for cooking fish are made of slips of bamboo

pierced with holes a centimetre in diameter. These gridirons are placed above the iron pots which hold the rice, and the fish is cooked by the steam which escapes from the pots.

Food.—This plant is frequently used as an element of Chinese food in various forms.

Cut in March and April, the young shoots are from 15 to 18 centimetres long, and sometimes about as thick as one's finger. They are of a fine light yellow colour, are very tender, and but slightly stringy.

Sometimes they are boiled in water, a little salt being added. They then resemble asparagus, and are eaten sometimes with oil, sometimes with white sauce, the Chinese not being the only people who relish bamboo shoots. They are frequently served on the tables of foreigners and Europeans who live in Chinese towns, especially in Shanghai.

At times these shoots are eaten in salad, after having been cooked, and cut into small pieces, much like the filaments of the nasturtium.

"Poison gratiné au Bambou" is still more liked. The sauce, instead of being seasoned with mushroom, is garnished with slices of bamboo cut from the young shoots.

The Chinese cut the shoots in winter also, but they are harder then and less delicate; they use them for other culinary purposes, but those above-mentioned, are most esteemed.

When one considers all the uses to which a plant so widespread as the bamboo is put, one arrives, without difficulty, at the conclusion, that the bamboo can supply nearly all the wants of life.

The preceding details shew that the fertile imagination of the Chinese, excited by necessity, has neglected nothing to take all possible advantage of this plant. Providence has conferred it in profusion on these regions where the population is very numerous and very poor. Human intelligence has augmented that profusion, and when we examine the incalculable numbers of articles of all kinds manufactured from

the bamboo, one should zealously endeavour to acclimatise in France such a useful and serviceable plant.

Hand-Book for the Indian Vegetable Garden.

CHAPTER I.

The Indian Vegetable Garden.

This Hand-book gives names of vegetables in English, and, as far as practicable, in the vernacular, with full instructions as to the proper care of the seeds, at intervals, when not required for sowing; how to sow and when to sow the seeds in Bengal, and when in the North-West Provinces; proper treatment of seedlings; time for transplanting, manuring, watering, nature of soil, and other details and particulars, forming a useful and necessary accompaniment to the following form of Register for noting, whenever required, results of sowings of vegetable seeds, of all kinds in general use in India, by Europeans.

It will be noticed on reference to Chapter II., that the chief months for sowing vegetable seeds in Bengal are August, September, and October, and a few kinds early in the month of November.

When assortments of vegetable seeds are imported from foreign countries into Bengal early in the year, or for months before the proper season for sowing, and such assortments are in well and securely-closed up cases, care ought to be taken that such cases are not unnecessarily opened to satisfy idle curiosity, but delayed until the time for sowing has fully arrived, and then advantage ought to be taken of the first fine clear bright sunny day to do so, as every exposure of imported seeds to the damp, humid atmosphere of Bengal, in the months of August, September, and October, is fatal to all kinds of seeds, and more particularly to imported varieties.

It is, therefore, suggested, that when a fair opportunity of a fine dry day offers for opening the box of seeds, four or five

large wide-mouth stoppered bottles, or tin canisters, should be ready provided to receive the seeds at once in their original packets or papers, for each separate month's sowing put up in separate bottles or tins, having the stoppers or covers well securred, by using a little malleable wax to exclude effectually all damp.

The bottles or tins to contain the papers of seeds need not have the names of the vegetable seeds they are to contain labelled on them, but simply the months—August, September, October, and November. Thus bottle or tin No. 1 ought to be appropriated exclusively for the deposit of seeds of artichoke, asparagus, Brussels sprouts, cabbage of kinds, cauliflower, cellery, endive, knole kohl, lettuce, parsley, radish, tomato, turnip, &c., all of which have to be only partially sown in August, and quantities reserved for subsequent later sowings.

Bottle or tin No. 2, reserved for the deposit of beet and [illegible] seeds, required to be sown before the month of September, and then opened for sowing these seeds in September, bottle No. 1 may also be opened, and after a second sowing of the seeds already sown in August, the remaining seeds may be transferred to bottle No. 2, for third or subsequent later sowings, and the stopper of the bottle again securely closed with wax.

Bottle No. 3 ought to be appropriated exclusively for the seeds of basil, beans, marjoram, sage, savory, spinach, and thyme, which are not required to be sown before the month of October, and when opened in that month, bottle No. 2 may also be opened for further sowings of the kinds and varieties already sown in August and September, and the residue transferred into bottle No. 3, for further sowings in November.

A fourth bottle, No. 4, would be desirable for the deposit of seeds of borage, cress, leek, onions, parsnip, and peas, which in Bengal are not required for sowing before the

month of November, and when the time arrives for sowing these, the contents of bottle No. 3 may also be taken out, and final sowings of basil, beet, endive, lettuce, marjoram, sage, thyme, tomato, and turnip be completed.

It will be observed that by the adoption of this simple arrangement of keeping seeds separated, there is no unnecessary exposure of the kinds not immediately required for sowings;—a very necessary precaution.

If, therefore, the simple precautions here suggested for the protection of seeds from the injurious damp influences of a Bengal atmosphere be neglected, or other equally safe precautionary measures be not taken, and the seeds thereby get affected by damp, they will simply not germinate, or do so very partially. The majority of failures in raising vegetables are owing to the want of proper care of the seeds at intervals before sowing.

In illustration of the necessity, and the satisfactory results of protecting seeds from the influences of damp, a letter was read at a Meeting of the Agricultural Society held in September, 1873, from one of its members to the effect: "That he had recently sown nine varieties of American and French vegetable seeds which were imported in 1872, and that more than 50 per cent. had yielded healthy seedlings. The varieties sown were sugar-loaf, drumhead, early york, and red cabbages, cauliflower, broccoli, lettuce, cellery, and tomato. The seeds were put away in their original paper packets in a stoppered bottle, just before the rains set in."

By the above remarks and illustration, it must be clearly understood, that the proper care of the seeds is primarily essential to the success of the garden; once the seeds lose their vitality, all labour to get them to germinate will be in vain.

Science has suggested various artificial means for the restoration of seeds affected by damp, but practical experience

has proved that prevention is better and simpler than any remedy suggested by science—seeds once deteriorated can only be partially restored. The simplest remedy suggested for restoration is to put a little *quick-lime* into each packet, keeping the packet in a dry, airy room, until required for use. The *quick-lime* has a strong affinity for carbonic acid, which will at once act upon the seeds and remove the superabundant carbonic acid which they have absorbed in a moist atmosphere; but the most sceptical will admit, that putting away seeds carefully in the first instance, in bottles or tins, securely closed, is simpler than resorting to artificial remedies for their restoration when deteriorated either from want of care, or other causes.

The next essential is the selection of the proper months for sowing the seeds of different kinds of vegetables, Nature cannot be forced, and by sowing out of season, no material advantage is gained. The seedlings will be either weak, run into weed, or be misshapen, and the vegetable, consequently, will scarcely attain that healthy and crisp maturity so much desired, and which is successfully attained only when seeds are sown at the proper season, nature assisting the development and growth of the seedlings in due time into perfect maturity.

The foregoing remarks are intended as applicable to the garden, not to experimental sowings for purposes of forcing some kinds of vegetable into existence out of season. This of course can be done, but for all practical and useful purposes, the sowings of seeds should be restricted to the proper months, ascertained after long practical experience.

A third essential is of no less importance than the two already commented on. The raising of vegetables from seeds in private gardens with the aid of native malees in the interior of numerous stations in India is of much importance to many European families, particularly in localities or stations where markets for the sale of such commodity do not exist.

Too much care, attention, and personal supervision by those immediately interested cannot be given to the subject; it is therefore suggested for consideration, and if happily adopted, will eventually bring with it its good, *viz.*; the keeping annually of a simple register of the result of the sowings of the seeds. A form of such register is herein supplied. Although there are manifold reasons why such register ought to be kept with care, precision, and regularity, it will suffice to give one reason only, *viz.*, an effective check against Native gardeners selling or changing the seeds, or doing both, and then declaring them bad. It appears this is frequently done when seeds are freely entrusted for treatment to Native malees. There is always a ready demand for imported vegetable seeds, and there is also old deteriorated seeds to be had in exchange; but when the fresh seeds are carefully tested, their good quality ascertained, it will deter the malees from boldly giving away the remainder, in exchange for old seeds, that will not germinate.

In illustration of the truth of such deceptive practices, the following simple facts may be related. Two members of the Agricultural Society of India, near neighbours, drew their annual supplies of fresh imported seeds from the Society. The one handed over to the care of his malee the seeds he had just received, while the other carefully retained his share, and superintended or supervised their sowings. The seeds germinated most freely, and abundance of vegetable of American and French varieties was the satisfactory result; while the seeds entrusted to the care and treatment of the malee proved a total failure—the man pronounced them as old bad seeds. The member disgusted, throws up his membership, and for the following year imports seeds on his own account direct from the best seedsmen, and again hands over the package to his faithful malee, who promises great results; but emboldened by his master's ready credence of the declaration that all the

seeds were bad last year, he resorted to the like declaration for a second time—not a seed germinated, while his neighbour's garden was again abundantly supplied. Hence the necessity of keeping a register, if only to test the quality of the seeds, particularly those who cannot spare the time necessary to give to the garden itself.

Having commented fully on three principal essentials for securing the success of the garden, it is necessary to remark on one other essential of no less importance than those already alluded to, the careful observance of which it will be apparent is also absolutely necessary to success. I refer to the character or description of the soil selected for raising the seedlings. If the soil used for the purpose be of a description liable to cake and form a hard or stiff impenetrable surface, either below or over the seeds, the progress of the germination of seeds so treated will never be visible, owing to the difficulty, amounting almost to an impossibility, for the germs to force their way through the hard stiff clay, they must consequently perish, and that more frequently by rot, owing to the constant injudicious application of water, in ignorance, that it is not water that is needed, but the breaking up or removal of the stiff clay which is confining and killing the already half-germinated seeds. However much the truth of this may be well-known and understood, yet the simple precaution to guard against it is very frequently neglected, and good seeds are unjustly condemned as bad; therefore, in selecting soil for raising seeds, every care must be taken, that it in no way partakes of the character of clay, it must be a light, sandy soil, laid on thinly over the seeds, soil on which water will not lodge, but easily filter through, nor must the soil cake or become stiff.

To obviate this, the seed beds ought to be composed as much as possible of leaf or vegetable mould. If the surface could be entirely leaf or vegetable mould, say to the depth of 1½ to

2 inches, so much the better, and then there would be no necessity for watering the beds, the night dew in the cold weather is sufficiently heavy, and is readily absorbed by the mould and descends to the seeds. After the seeds have germinated, and the seedlings are well advanced, water can be given if needed, and then there is no danger of crusting.

All gardens should have a refuse hole or pit into which the weeds, leaves, &c., of the garden should be deposited daily, and allowed to rot. Collections may be made throughout the year, and during the rains it will readily rot, and be fit for use in the cold weather when most needed.

Gardens are much benefited by a regular drenching with water, not watering with watering-pots, but irrigating, the water to flow freely over the beds, seed beds, and all, when it will be found that seeds that have lain dormant will come up freely. Watering with the rose only wets the upper surface, the moisture soon evaporates, and the seeds eventually rot: they are parboiled, the upper crust forming as it were the top of a Dutch oven, whereas, by irrigation, the moisture goes deep into the soil, the earth remains damp for days, and the seeds have time to come up. Irrigation also destroys insects and their larva.

Reference is now requested to the following chapter, being a list of vegetables, in alphabetical order, shewing the months in which to sow, and how to sow the seeds, separately, in Bengal and in the North-West Provinces, compiled with care and precision from notes obtained from an European professional gardener of twelve years' continuous practical experience in Bengal, and from a practical gardener of the North-West Provinces.

No time can be fixed for the germination of seeds, and those fond of gardening, must exercise a large amount of patience. It frequently occurs that a bed of seeds is dug up under the impression that ample time has been given to the

seeds to germinate, this impression being formed from the first crop of the seeds put down immediately after the termination of the rains, putting in appearance in a very short time. As the weather becomes colder, seeds take longer to germinate. Seeds of Cauliflower (first sowings) that germinated in 24 hours, will take 8 days to germinate later in the season, and yet both germinations be equally good.

CHAPTER II.

NAMES OF VEGETABLES in English, alphabetically arranged, the months in which to sow seeds in Bengal, and in the North-West Provinces, separately shewn, and how to sow the seeds.

	Names of Vegetables.	Months in which to sow seeds in		How to sow the Seeds, whether in pots, beds, drills, trenches, broad-cast, or at certain distances.
		Bengal.	N. W. Provinces.	
1	Artichoke	August & September ...	July to September ..	In beds or boxes.
2	Asparagus	September... ...	August	In drills, seeds 10 inches apart; soil rich, mixed with sand.
3	Basil	October & November ...	November... ...	Thinly, broad-cast, on 3 feet wide beds, slightly sunk; soil good, not too rich.
4	Beans	October	October & November ...	In drills, 4 inches deep; for broad and other large kinds, 24 inches apart, and seeds 8 inches apart. French and other small varieties, drills, 15 inches apart, seeds 5 inches apart, and 3 inches deep.
5	Beet	September to November	August to January ...	In pots, boxes, beds, or ridges.
6	Borage	November... ...	November	In drills, good soil, 3 inches apart.
7	Brinjal	June and July ..	October to December ...	In drills, 3 feet apart, seeds 2 feet apart; a good rich soil.
8	Broccoli	August & September ..	August & September ...	On raised beds, with Jhamps.

9	Brussels' Sprouts	September & October	September... ...	On raised beds, with Jhamps.
10	Cabbage	August to October ...	August and September	Ditto ditto.
11	Carrot	September & October	August	Broad-cast, first sowings on raised beds or ridges; late or second sowings, on sunk beds. Let the beds be of good, but not too rich a soil, and 3 feet wide.
12	Cauliflower	August & September . .	August and September	On raised beds, with Jhamps.
13	Cellery	August to October ...	August	In pots or boxes.
14	Chilli	September... ..	June, transplant in July and August.	Ditto.
15	Cress, Curled	November	October	Sow thickly, broad-cast, on 3 feet wide beds, of rich soil.
16	Cress, Common	All the year ...	All the year ..	Sow thickly, in pots or boxes, filled up to the brim with finely pulverized soil.
17	Cucumber -	April & May ...	February and March ..	Three or 4 seeds in holes, 12 inches apart; soil rich and light, mixed with stable manure.
18	Endive	August to November ..	October	On a gravelly soil, or unfrequented gravel walk is the best soil to raise seeds.
19	Knole Kohl	August to October ...	September ...	On raised beds, with Jhamps.
20	Leek	November	October	In pots or boxes.
21	Lettuce	August to November .	September to January	On a gravel soil, same as Endive.

CHAPTER II.—*(Concluded.)*

***NAMES OF VEGETABLES** in English, alphabetically arranged, the months in which to sow seeds in Bengal, and in the North-West Provinces, separately shewn, and how to sow the seeds.*

	Names of Vegetables.	Months in which to sow seeds in		How to sow the seeds, whether in pots, beds, drills, trenches, broad-cast, or at certain distances.
		Bengal.	N. W. Provinces.	
22	Marjoram	October & November ...	October ...	In pots or boxes.
23	Mustard	All the year ...	September and October	Sow thickly, in pots or boxes, filled up to the brim with finely pulverized earth, well damped. Keep in a dark place.
24	Onions	November... ...	September & October ...	Thinly, broad-cast, on beds 3 feet wide, Soil must be good, but not too rich. Soak the seeds.
25	Parsley	August to October ...	October	Early or first sowings in pots, and kept until later sowings, and then transplant; second or later sowings, broad-cast, moderately thick on beds, 3 feet wide. Soak the seeds.
26	Parsnip	October & November ...	September & October ...	Broad-cast, on sunk beds 3 feet wide; thin out to 3 inches apart. As soon as the seedlings appear, thin out again to 6 inches apart.
27	Peas	Early in November, but if late heavy rains, postpone.	September to December.	Tall kinds in drills, 2 inches deep and 3 feet apart, in moderately good soil, mixed with sand. Dwarf kinds, such as the little Gem, the Eugenie, in drills, 1 and ½ inch deep, and 18 inches apart, in a better or richer soil than the tall kinds. Soak the seeds in warm water and allow to dry.

28	Potatos	September to October..	January and February in the Hills. July and August in the plains...	In trenches, 9 inches deep, and 14 inches apart, leaving a distance of 18 inches between the trenches. Soil up. Water sparingly, and only when necessary; ground light and loamy. Free drainage.
29	Potatos, Sweet	April, August, & Sept.	June and July ...	In trenches, the same as for Potatos, sowing the tubers 3 feet apart.
30	Pumpkin, (White & Red) ...	August and September..	February and March and in June ..	A single seed sown, so as to climb up the side of an out-house, or to trail on the ground, on a large open space.
31	Radish	August to December ...	October to February .	Broad-cast; first sowing on raised beds, or ridges, second or late sowing, on sunk beds, 3 feet wide. Soil moderately rich.
32	Rams' Horn	July to September ...	.....	Sow 2 feet apart, in a rich moist soil .
33	Rhubarb	October and November..	October and November..	In pots or boxes.
34	Sage	October and November..	October	Ditto ditto.
35	Savory	Ditto	Ditto	Ditto ditto.
36	Spinach	Ditto	September to November.	Broad-cast, on raised beds, 5 feet wide. Ordinary soil.
37	Squash	Ditto	January and February...	Sow at 6 feet apart, on a rich loam.
38	Thyme	October and November..	October	In pots or boxes.
39	Tomato	August to October ...	June to August ...	Ditto ditto.
40	Turnip	August to November ...	September to January...	Broad-cast; early sowings on raised beds, or ridges, late sowings on sunk beds, 3 feet wide, and the rows 3 feet apart. Soil good.

CHAPTER III.

Treatment of Seedlings after they have been raised.

The following instructions and remarks for advancing the growth of the seedlings, and bringing them to maturity, apply equally well to the North-West Provinces as they do to Bengal, the only difference being as to the proper time for sowing the seeds, and this is clearly shewn in the preceding pages.

1. ARTICHOKE; *Kungor, or Hattichoke.*—As soon as the seed leaves fall off, prick out of the gumlahs or boxes the young seedlings, and plant them in a sheltered bed 3 to 4 inches apart. Previous to sowing the seeds, select and prepare a bed for transplanting the seedlings from the sheltered bed. The best soil is a mixture of salt, leaf-mould, and rotted cow-manure, well dug in and mixed with the earth, and allowed to remain unused for four or five months, keeping it clear of weeds. The seedlings may be removed into this bed say three months after the sowing of the seeds, adding to the roots at the time of transplanting, to the depth of 6 or more inches, a preparation as above recommended, *viz.*, salt, leaf-mould, and old cow-manure. The distance between the plants ought to be from 2 to 2½ feet. Water daily and freely, until the appearance of new leaves, when moderate the supply of water. On blossoms appearing, earth up and water the roots freely; pinch off all young lateral heads in a young state to increase the strength of the principal stems. After fruiting, if the shoots and slips are cared for in some sheltered bed, they will supply plants for next season.

2. ASPARAGUS. *Marchooba, or Paragus.*—This is strictly a perennial, and with ordinary care of the seedlings once raised, seeds will not require to be sown again for some years. The instructions for raising seedlings and their after-treatment ought therefore to have particular and special attention. The seedlings must be well weeded, and, when sufficiently advanced, must be carefully pricked out into well-manured beds and cared for until fit for transplanting into beds, which should be

prepared as follows: Trench the bed to the depth of 2½ to 3 feet, place at the bottom of the trench a good layer of kunker, or small broken brick, placing over it sand, well mixed with cow-manure, over that manure only; filling up the trench to the surface with a rich light mould composed of cow-manure and litter, with as much sand as will render it light for the young shoots and root fibres to force their way through the soil with ease. A bed of 30 feet by 5 feet, planted at 8 to 9 inches apart, will suffice for a large supply of seedlings, the plants ought to be inserted about 6 inches deep into the bed, the earth ought to be carefully removed, and after placing the plant, or divided roots or suckers, the earth replaced well, and yet lightly, to cover the roots. For the first year or two, the plants must be allowed to run to stalks, eventually cut down, the earth loosened, and renewed with sand, cow-manure, and leaf mould, well watered; the siding of the bed ridged up to retain the water. From the second or third year, the bed will commence and continue to supply a good crop for 10 more years. In selecting ground for asparagus, it would be desirable to take the spot on which celery had grown the previous year.

3. Basil, *Toolsie.*—If the seeds be sown in pots or boxes, transplant them into beds 3 feet wide, slightly sunk, to retain water, in moderately rich soil. In transplanting, be careful to remove a good ball of earth with each seedling; and in the transplanting or thinning the bed, as the case may be, observe a distance of one foot from plant to plant. Water freely, in the dry season.

4. Beans, *Seem.*—The seeds should be steeped for a few hours in hot water, so hot as barely to admit of the hand being held in it—broad and other large beans for three hours, French and the like small varieties, for two hours, remove, and allow to dry for half a day before sowing. Soil good, without being too rich. Broad beans at 8 inches apart from seed to seed, and French at 5 inches apart, and 3 inches deep. On the plants coming to full blossom, or as the blossoms fade, pinch

off the tips to promote full pods.

5. Beet, *Chuckunda.*—As soon as the seeds have germinated, expose the seedlings, or they will become dwarf and weakly, and transplant as soon as fit, from gumlahs, early sowings into slightly raised beds or ridges, later sowings into sunk beds, 2 inches below the surface, and planted in rows, 8 inches apart, from plant to plant. The beds or ridges must be carefully prepared, free of all hard substances or clods of earth, and the soil well mixed with old cow-manure, salt, and sand, rich, and yet light, to admit free play for the root fibres and regular formation of the beet. The beds ought to be kept well cleared of weeds.

6. Borage.—Sow in good soil, 3 inches apart. When up, thin the drills to 1 foot apart. Water moderately.

7. Brinjall, *Bagoon.*—Sow in rich soil. Earth up as for cabbage; thin out to 2 feet apart. Water freely.

8. Broccoli, *Chota Phool Kobee.*—Repeated attempts have been made in Bengal, as well as in the North-West Provinces, to cultivate this vegetable, without attaining that success which would repay time, trouble, and expense. The most experienced and practical gardeners have invariably failed. Those, however, desirous of experimenting, are recommended to observe the same treatment as that for cauliflower, under which treatment it has been known to succeed in the northern slopes of the Himalayas and the like climates and latitudes.

9. Brussels' Sprouts, *Goomogoon Kobee.*—Immediately on the second leaf appearing, and about maturing, transplant to another bed of moderately richer soil. One month after, re-transplant into drills, small kinds, 24 inches apart; large kinds, 30 inches apart. As they advance in size, keep earthing up, and when growing, water freely every 10 days; keep the earth loose and free of weeds. When well advanced and large, swamp with water; the soil cannot be too rich. When swamping, mix fresh cow-manure with the water.

10. Cabbage, *Kobee.*—The same treatment as that re-

commended for Brussels' sprouts, very rich soil, and plenty of liquid manure. The transplanting should be delayed until five or six leaves are well developed, and rich old manure, mixed with the earth, should be put in with the roots of the young seedlings, and watered freely.

11. CARROT, LONG, *Lumba Jagur.* } First or early sowings on raised beds or ridges, 3 feet wide. Late or second sowings on sunken beds of the same width. Immediately the seedlings appear, thin out the beds to 3 inches apart, from plant to plant, keeping the beds clear of weeds. A further thinning may be resorted to as the seedlings advance and become larger and adapted for some culinary purposes, to about 6 to 8 inches apart, to attain their full growth. Water freely; allow a little more space for the long variety than for the horn kinds.

12. CAULIFLOWER, *Phool Kobee.*—The treatment the same as that recommended for Brussels' sprouts and cabbages. The young seedlings must be carefully transplanted twice during its growth, first soon after germination, when sufficiently advanced for removal, and again, about a month after, into the final drill beds, where they are to remain and mature. The soil cannot be too rich. Earthing up and thorough swamping, with fresh cow-manure mixed with water, are essential and beneficial.

13. CELERY, *Ujooden or Shalaree.*—Immediately the seedlings are sufficiently large, transplant at 2 inches apart into other gumlahs or boxes filled with almost pure old manure, placing the gumlah or box in an open airy, but shady part on the North of any building. Water freely and often. When 5 or 6 inches high, and firm and stiff, plant out at 9 inches apart, in trenches 3 to 4 feet long, a foot wide, and 18 inches deep, which fill with 4 inches of manure before planting the seedlings. Water freely, keep the soil stirred up. As the plant advances in size and strength, and are fully 10 inches high, earth up gradually, say not more than about 2 inches at a

time. Water freely, mixing fresh manure with the water. Keep earthing up a little at a time as required, and in watering, take care that the water is applied to the roots only and not to the leaves. The stalk and leaves ought to be kept scrupulously clean.

14. Chilli, *Lungka or Merich.*—When 4 inches high, plant out in good rich light garden soil. Water freely when 6 inches high; keep them clear of weeds. When requiring to remove the fruit, care should be taken not to hurt the branches.

15. Cress, Curled, *Belatee Hallim.*—Sow seeds thickly, on 3 feet wide beds, in a rich soil, and water freely. Allow, if desired, a head or two to run to seed, but pinch off the bloom spikes of all the rest of the bed as they appear; and when required for salads or garnish, gather the leaves only, by the removal of the bloom spikes; and gathering of the leaves carefully; the plants will continue longer in season.

16. Cress, Common, *Dasee Hallim.*—Sow thickly, in gumlahs or boxes, filled up with finely pulverized soil to the brim. Water the soil before sowing. No covering of earth required over the seeds, but a wooden covering may be placed over the gumlah or box with advantage.

17. Cucumber, *Shusaw or Khira.*—A rich light soil, well mixed with stable manure. On the fourth or fifth leaf appearing, thin out the plants to 2 in a spot; pinching off the leading shoots, and as they spread, they should be carefully trained to keep clear of each other, raising them on a trellis-work platform, or as the natives call it a *machan*, made of split bamboo.

18. Endive, *Kashiha, or Kasee, or Kuroo.*—The same treatment exactly as for lettuce. When large enough, transplant the early sowings on raised beds; second or late sowings in drills, the former in rows 10 inches apart, and 10 inches apart from plant to plant, and the latter or second sowings, 15 inches apart. Water freely, with care. The soil cannot be too rich, and swamp the roots with liquid manure as for cabbage. The endive,

when full grown, should be tied up rather tightly, and this should only be done between 2 and 3 o'clock in the afternoon, to ensure the leaves being perfectly dry. Any damp or moisture will rot the fine tender leaves inside. Endive, like salad, if well grown, form heart without tying up, yet careful tying up will improve them. The second sowings of endive, like lettuce, may be planted in drills between cabbages, and the tying up and blanching with pots over the plants ought to be operated on, from time to time, on a few plants only, as long confinement and want of air, will soon rot the plants, therefore the blanching should be regulated in regular succession, according to daily requirements of the plant for consumption.

19. KNOLE-KOHL, *Ole Kole.*—No better or clearer instructions for the treatment of this cabbage tribe can be given, than that already fully explained in the cultivation of Brussels' sprouts, cabbage, and cauliflower. Each plant requires a distance of 14 to 15 inches, and the beds or ridges 20 inches apart; the root stems must remain uncovered and kept quite clear of weeds. Rich heavy soil is essential to the proper production of this much-esteemed esculent. The transplanting should be when the plants have attained three or four leaves.

20. LEEK, *Gunduna.*—As soon as large and strong enough, transplant from the gumlahs, in rows, to a slightly sunken bed, 6 inches apart from plant to plant. Water freely, as they advance in growth. A rich soil is necessary and careful earthing up, the treatment being different to that for onions.

21. LETTUCE, *Kahoo, or Kuma, or Cor. Saladh.*—When large enough, remove the plant into rows, 10 inches apart, and 10 inches from plant to plant. Early or first sowings, on raised beds; late or second sowings, in drills 15 inches apart, so as to admit of irrigation. The richest soil is necessary. Free watering and swamping the same as for cabbage. Allow a space of 12 inches for the cabbage lettuce, and 10 inches for the cos; the cos, like the endive, should be tightly tied up for a few days before cutting. Frequent watering is necessary,

but the application of water, mixed with manure, should be limited to once in 8 or 10 days.

22. MARJORAM, *Murooa, or Murzunjoosh.*—When 4 inches high, plant out at 6 inches apart, on sunk beds 3 feet wide, and water occasionally. A good soil and shady situation are requisite.

23. MUSTARD, *Sursoo, or Raee.*—Like the common cress, it needs no transplanting, the seeds being thickly sown in gumlahs filled up with earth to the brim which is well damped before sowing the seeds. A dark place is preferable to the growth of this herb. Cover the gumlah with a plank.

24. ONIONS, *Peeaz.*—Soak the seeds for an hour or two in warm water. After drawing away the water, allow the seeds to dry for a few hours before sowing. The beds ought to be of good soil, and 3 feet wide. Water moderately.

25. PARSLEY, *Ajmood, Pitasilli.*—The same treatment as for onions. Seeds germinate quick, and with more certainty when soaked like onion seeds. When 3 or 4 inches high, thin out the bed to 8 inches apart. An occasional mixture of manure with water applied to the roots is beneficial.

26. PARSNIP, *Juzur, Istufeen.*—The soil should be light and sandy, well mixed with old manure. Frequent watering of the young plants is necessary. The bed should be thinned to 9 inches, from plant to plant, and treat in all respects as for carrots.

27. PEAS, *Multur.*—Tall kinds, in rows, in drills on poor soil, 3 feet apart; dwarf kinds, such as Eugenie, Little Gem, &c., on rich soil, 18 inches apart, soaking the seeds moderately in warm water, and allowing them to dry for some hours before sowing. Water slightly to damp the surface of the bed just as the seedlings appear, and slightly again, when forming pods except the weather is dry and hot, and plants seem drooping and poor, when the watering may be moderately increased, and the plants sheltered from the hot sun. Nipping the leading shoots when the second or third set of blossoms appear

will hasten the setting and filling of the pods. Sticks for the support of the plants should be ready immediately as they throw out tendrils, inclining or bending the sticks to the sunny sides for the action of the sun to draw them that way.

28. Potatos, *Aloo.*—A difficult tuber to cultivate successfully. Soil should be composed of *very* old stable manure, reduced, as it were, to dust, mixed with lime, sand, and bone-dust, well mixed with ordinary garden soil. A spot selected where water cannot lodge, and is readily let off, as free drainage being most essential to the success of the growth of this most useful tuber. Most cultivators cut up potatos, and sow slices or pieces having two or more eyes to each piece; but it is maintained, that the best produce is that grown from young potatos, about the size of pigeon's eggs sown entire: they should be sown in trenches, 14 inches apart, covering over the trenches with earth. On the seedlings appearing, use the pronged hoe pretty deeply, and when the seedlings reach to the height of 4 or 5 inches, earth up to strengthen their growth. The potato has many enemies in the shape of the red worm, the grub, the cricket, and the cockroach; in frequent instances the larvæ of these pests are introduced with the manure, which at once suggests the necessity of using *old, very old* manure that has crumbled to dust, for mixing with the earth. Fresh animal manure, or manure in half a rotted state, will simply destroy the entire crop.

29. Potatos, Sweet, *Shakerkund.*—A tuber cultivated under the same treatment and soil as the ordinary potato, and requiring the same care, precaution, and attention. They must never be watered. If they do not grow well without water, the soil is not suited for them. Water will produce abundant foliage, but the tubers will be thin and of little use.

30. Pumpkin, White, *Kuddoo*, Pumpkin, Red, *Kumrah.*—Most easy of cultivation,—a rich light soil, well mixed with stable manure. Dig a hole a foot deep, and 18 inches in diameter, one seed in a hole,

31. Radish, *Mooloo, Moolee.*—A moderately rich soil. Water freely as the seedling attains strength. Sowing a small quantity of seeds at a time is preferable to sowing largely at once, as the former keeps up a long succession of nice tender roots, while the other method is subject to waste and loss, owing to the roots being large, tough, and uneatable.

32. Rams' Horn, *Dharus, Bhindee.*—A rich soil, plant 2 feet apart, requiring little attention after the seedlings are once up than keeping the ground moist.

33. Rhubarb.—The climate of Bengal is little suited to it—the seeds will germinate, and, probably, with care and attention, its growth may be improved. Plant out the seedlings in very richly manured soil, in rows 4 feet apart, and 3 feet apart from plant to plant.

34. Sage, *Seesturs.*—Moderately rich soil, beds 2 to 3 feet wide. Plant out at 6 inches apart and keep the beds clear of weeds. When required for use, cut away any long and straggling branches to help to keep the plant with a good bushy head. The seedlings had better be planted out about the middle of December.

35. Savory.—No better treatment, soil, care, and attention, than that recommended for marjoram and sage.

36. Spinach, *Isfanaj.*—Thin out the beds to 3 inches from plant to plant, swamp or flood the beds away 10 days, and nip off the bloom spikes as they appear.

37. Squash, *Sufura Koomru.*—Left to grow in a rich loam, at 6 feet apart, and trained either up on straight sticks, or on small trellis.

38. Thyme.—Transplant, say in December, at 6 inches apart. The soil ought to be a rich, and yet light soil, a most difficult and delicate plant to rear, requiring much care to preserve; keeping it too dry, or giving it too much moisture are equally obnoxious.

39. Tomato, *Goolbagon, or Timotee.*—As soon as up, transplant into another pot, or box, at 2 inches apart. When the

seedlings are stiff and attain the height of 5 to 6 inches, plant out in rows, 3 feet apart, and 13 inches from plant to plant; when a foot high, the plants should have a support built under them about 8 inches above the ground. The plants are top-heavy, and if not supported by machans they are apt to be blown down, and if left trailing on the ground, fruit will soil, be damp, and will neither grow well, nor ripen satisfactorily. A rich soil is necessary. Water sparingly, and the plant will fruit abundantly.

40. TURNIP, *Shulgram.*—The soil must be good and free of clods of earth, &c. Thin out the beds or ridges to 3 inches apart, from plant to plant. Water freely by swamping, say once a week. The seeds ought to be reserved for a succession of sowings, say every 3 weeks. If this be not done, and consumption not equal to the quantity raised, they will become overgrown and uneatable. Weeding is very necessary to the proper and satisfactory growth not only of turnips, but of all kinds of vegetables.

CHAPTER IV.

Gathering of seeds.

All who indulge in vegetable and flower gardens, can, if disposed, gather seeds year by year with much advantage.

No one having gardens in India should be above gathering seeds to meet delays and other contingencies inseparable from importing seeds from Europe.

The provision of seeds so gathered, would enable early sowings to be effected with advantage; without reference to the receipt of imported seeds, particularly, of such varieties, the sowings of which, should not be delayed to any period late in the season. The seeds raised from imported varieties do not deteriorate at once to that extent as to make it objectionable or undesirable, to save some, provided such gatherings be effected in each year from newly-imported stock, and not from crops raised from acclimated seeds.

If collections of seeds are to be made, care must be taken

to gather seeds that are really ripe ; having satisfactorily ascertained that, expose them, when collected, for several days to the sun all day long. Have well cleaned bottles with good new corks ; expose both bottles and corks to the sun, and after 4 or 5 days exposure of the seeds in the sun, bottle them off in the middle of the day, while the seeds, bottles, and corks are thoroughly dry. Cork tightly and put away in some dry place.

History of the introduction of the Medicinal Ipecacuanha Plant into Bengal. By G. King, M. B. F. L. S.

In March, 1866, Dr. Hooker, of Kew, entrusted to me a single plant of *Cephælis Ipecacuanha,* which in the following month I made over in good health to Dr. Anderson, late Superintendent of the Botanical Garden, Calcutta. This plant was retained in the Botanical Garden, and every effort was made to propagate it by artificial means since it showed no tendency to yield seed. By 1868, this plant had been increased to nine ; but as the climate of Calcutta did not appear to suit *Ipecacuanha,* three of these nine plants were sent to the Cinchona Plantation in Sikkim, in the hope that in one of the low hot valleys there, a more suitable locality might be found. From the date of their arrival in Sikkim, the history of these three plants and their offspring becomes the history of the experiment, as the cultivation in Calcutta was then practically abandoned, although resuscitated for a short time in 1872, when Dr. Henderson acted as Superintendent. Propagation by stem-cuttings proved a very slow process indeed ; moreover, about half of the young plants so raised having perished by an accident, the total stock on 31st March, 1871, amounted to only five plants. These plants had excellent roots, and the success of root propagation having been discovered both in the Edinburgh Botanical Garden and at Rungbee, as many cuttings as possible were taken from

the roots of these five plants, so that by the end of August, in the same year, the stock at Rungbee amounted to three hundred plants.

2. In September, 1871, eleven plants were received from the Royal Botanical Garden, Edinburgh, great attention having been there given to the cultivation of this valuable plant at the request of His Grace the Duke of Argyll, then Secretary of State for India. During 1872, further supplies of plants (amounting in all to 369) were received from the same source and from Messrs. Lawson, the eminent Scotch nurserymen. In December, 1872, Dr. Henderson brought out from Kew and Edinburgh, a further consignment of 128 plants, part of which were retained in Calcutta. In the meantime propagation had been steadily carried on in Sikkim, and at 31st March, 1873, the total numbers amounted to 6,719 at Rungbee and about 500 in Calcutta. At 31st March of the present year, the stock stood as follows:

Planted outside, experimentally	29
Rooted plants, potted off and planted in frames	13,000
Cuttings, rooted and unrooted	50,000
Total ...	63,292

3. The recent success in propagating has been entirely due to the discovery that this plant, unlike most others, can be propagated freely by root-cuttings, while from the slowness of the plant's growth, materials for stem-cuttings are yielded very sparingly. Propagation has all along been carried on in glass-covered frames and at an elevation of about 3,000 feet above the sea. Our efforts have naturally been confined hitherto to increasing the number of plants, so as to get a sufficiently large stock for experiment with the view of determining the conditions under which *Ipecacuanha* can be grown, as a crop. The work has been carried on by the Cinchona Establishment, and very little, if any, special expenditure has been incurred on its account.

4. When this experiment in acclimatization was first begun, very little was known regarding the plant and the conditions required for its growth. We have now learnt from experience that it is a humble creeping under-shrub of peculiarly slow growth, that it apparently requires a thoroughly tropical climate, by which I mean a pretty equal day and night temperature, the absence of a decided cold season and an atmosphere pretty steadily and thoroughly saturated with moisture. We have proved that it cannot stand exposure to a hot sun, and that it is apparently impatient of stagnant moisture at its roots. We do not as yet know what sort of soil best promotes the development of the root (the medicinal part) but experiments are now going on with the view of settling this point.

5. As already stated, what remains to be done is to find out how to grow Ipecacuanha profitably as a crop. As a first step towards this, patches of plants have been put out at different elevations and under different conditions as to soil, moisture, and shade. We have not even now a sufficiency of large enough plants to do this on a large scale, for it must be remembered that the great majority of the plants above returned are still tiny things, under two inches high, and which, with their slow rate of growth, will not be much more than double that height a year hence.

6. In conclusion I would remark that no part of Sikkim has a tropical climate, that of the bottom of the lowest valleys being no more than sub-tropical. It may therefore be found necessary to afford the plants, during the cold season at any rate, some cheap and rough kind of shelter.

August, 1874.

Memorandum on Cephælis Ipecacuanha. *By* Mr. A. T. Jaffrey. *Government Cinchona Plantation, British Sikkim.*

Ipecacuanha has for many years been known in European cultivation as a plant to be found only in botanical collections,

and from its slow growth and backwardness in producing fruit has been looked upon as a plant difficult to increase from seed. This matter is easily explained by the fact that the genus is "dimorphic," that is to say some of the plants produce flowers with long styles and short stamens : other flowers with short styles and long stamens. Plants treated under artificial culture, are of course in a great measure removed from the influence exerted by insects in causing impregnation. It is necessary here to observe that the *dimorphous* nature of the flowers is distinctly confined to different forms of the plant, and in no case have I observed the same form producing long styles and short styles. Whether these forms are merely varieties, or distinct species, it would be premature to conclude at present, or until such time as the whole subject has been fairly investigated by competent authority. There is no difficulty in procuring seed from either form by artificial impregnation with its own pollen. and from what has been observed in individuals planted out, they appear to seed freely enough without any artificial aid. Increase by seeds is slow, as they take a long time to germinate. The seeds are not unlike small coffee beans, and of the same texture.

Plant Cuttings.—These, when taken from the parent plant while in vigorous growth, root freely in leaf mould and sand, with or without artificial heat, if protected from the air with glass. From the slow growth of the plant, very few cuttings are procurable, and if these are taken from the plant in a hardened condition, they will be found of little or no use, as they are very difficult to root in that condition and often do not root at all.

Propagation by Leaf Cuttings.—This process is a very interesting one, though at the same time attendant with a deal of trouble in such a moist climate as that of British Sikkim. It produces, when successful, very strong plants. It is well to know there is such a mode of perpetuating the species, but as a means of rapid increase it has not much to recommend

it, as the great care and attention required and the heavy percentage of failures from damp, &c., render it more a matter of experiment than one of practical value. It will be observed from the specimens forwarded that the leaves have the root-producing power pretty freely distributed: if a leaf be cut across transversely, the upper and lower halves root freely: if cut down the midrib, the lateral halves root equally well. In fact I believe that the leaves would root if cut up into several fragments and so treated as to bring the fibrous portions of each section into contact with the soil—but this would be much more a subject of scientific amusement than business.

Root cuttings.—As a means of increasing Ipecacuanha, propagation by root cuttings is at once the safest and quickest mode of procedure, but it must be borne in mind that the possession of plants is not the only requisite necessary towards increase. To ensure success, these must also be strong and vigorous, for no one can produce a healthy progeny without a healthy stock to draw from, so that unless those who possess plants can grow them healthy, the chances of success are against them. This holds good with every plant as well as Ipecacuanha. Any one who has taken an interest in Ipecacuanha will observe that in all the drawings of the plant the roots are represented as spreading. This is a decided mistake which may have arisen from the sketches having been taken from specimens of the plant grown in pots. After close attention to the habit of the roots, I find they do not spread but descend straight down into the soil, and I must admit to having been professionally puzzled for some time to account for the slow success of the plants, until I found I had been astray by the figures I had seen, and so been led to arrange the roots of my plants in a spreading, instead of in a descending manner. In propagating by root-cuttings, it is not necessary to work with large pieces. If a root be cut into very small portions and the pieces be planted with the precau-

tion of always keeping the top of the pieces upwards and quite uncovered by the soil—the lower extremities alone being in contact therewith—they will in a month or six weeks throw out young shoots and form fresh fibrous roots. The formation of roots does not always take place with the appearance of the shoots, and indeed the latter may not be thrown out for some time afterwards. I may observe here that Ipecacuanha cuttings in the climate of British Sikkim are subject to be attacked during the rains by a minute thread-like fungus—the same pest which attacks Cinchona seedlings. In fact when once under way, it makes a clean sweep, and no artificial remedy has proved of any avail. Atmospheric changes alone have influence in staying the disease, but these are not under man's control.

October, 1874.

Notes on Fungi from the interior of a white Ant-hill. *Communicated* BY W. F. GIBBON, ESQ., *Senior; with remarks thereon* BY DR. D. D. CUNNINGHAM.

In an extract from the *Gardener's Chronicle*, on Mushrooms in India, in the Society's Journal, Vol. II., Part I., page 36, the writer says:

'I cannot conceive white-ant earth being of any use in gardening. The only growth I have ever observed on it, or in the nests, was that of a very small fungus, less in size than an ordinary pinhead, and often mistaken for the egg of the termites, in shape resembling a button mushroom, of a white colour.'

I now send you a bottle containing mushrooms I extracted a few days ago from the centre of a white-ant hillock. When I collected them, they were in appearance like asparagus, over 14 inches in length, and the people about here consider them particularly good-eating, partaking of them both raw and cooked, and call them bhuephor.

When I read the above article in your Society's Journal, somewhat over a year ago, I was then aware that mushrooms

existed in the interior of ant-hills, for I had often seen them, but I did not know their season of sprouting, and whenever I searched, was unsuccessful till the other day. I have now ascertained the season they sprout is the end of August, or the beginning of September, and I believe all ant-hills produce them then.

These mushrooms appear to me to proceed from a peculiar substance always found in ant-hills in this country, (whether white or black,) generally called ants' food, a bluish gritty substance, like coarse wheat flour, turned mouldy and adhesive. In dry weather, brittle, and in damp weather, like soft leather. It is this substance under the combined influence of heat, damp, and darkness, from which the mushrooms grow.

As my experience is at variance with the writer in the *Gardener's Chronicle*, you may care to record it perhaps.

The liquor in the bottle with the mushrooms is white wine vinegar, which I thought would best preserve them; and to ascertain their true shape and length, I would advise your breaking the bottle, for I do not think you can possibly extract them entire otherwise.

I would like these mushrooms, if possible, referred to some mycologist, and their names ascertained, and I would like also to know if the bluish substance, the ants' food, was collected and treated artificially, could similar mushrooms be raised.

I know of several other fungi which are eaten by the people here, and considered good food, which on procuring, I will forward to you, to be recognized. One in particular I am desirous of knowing more about, to all appearances like a small potato, and considered the best of all. It is procured from under the ground, and its presence is indicated by the earth cracking generally near the stumps of saul trees.

Remarks by Dr. Cunningham.

I herewith return the letter sent to me more than a month

ago, along with specimens of fungi said to have been procured from the interior of a white ant-hill.

The specimens apparently belong to some species of *Lepiota*, and are chiefly remarkable for the extreme length and coarse fibrous contents of the stem.

The occurrence of fungi in connection with ant-hills is well known, but in so far as I am aware, those hitherto described as occurring on the hills of the white-ant belong to species of the Gasteromycetous order, Podaxinei, so that the occurrence of a species of one of the sub-genera of Agaricus in such localities is a new and interesting fact.

With regard to the material from which they arise, and which must apparently be of the same nature as the so-called spawn of the cultivated mushroom, consisting of vegetable debris permeated by the mycelium of the fungus, it may be noted that a similar substance is described by Belt as occurring in the nests of the leaf-culling ants of Nicaragua, and is supposed by him to serve as food—the ants culling and storing the leaves for the sake of the fungi which are subsequently developed in the debris.*

Were this spawn artificially exposed to conditions similar to those which it naturally encounters in the interior of the hillocks,—heat, darkness, and moisture,—I believe that the pilei might very probably be raised at will, and if they really are good-eating, the experiment would be well worth trying.

* "The Naturalist in Nicaragua," p. 80.

Correspondence and Selections.

Notes on the Vanilla.

THE Vanilla is remarkable for its climbing habit, which is not common among Orchids. There are several species, most of which are natives of the hot and damp regions of South and Central America; the genus is also represented in tropical Asia and Africa. The stems climb to the height of 20 or 30 feet, twining round the trunks of trees, and throwing out a profusion of aërial roots, some of which eventually reach the ground, as is the case with the Banyan, while others float in the air. The leaves are thick and fleshy, as also are the greenish-white flowers. The important part of the plant, however, is the pod, which, in some of the species, is an article of commerce, and yields the delicious flavouring which is so well known. Some little uncertainty exists as to which of the species produces the most valuable fruit. It appears, however that V. planifolia and V. aromatica are the most important, although V. guianensis, V. palmarum and V. pompona also yield some of the Vanilla of commerce. The pods as imported are narrow and flattened, from 5 to 10 inches long, and of a dark brown colour: they are pulpy within, and contain a great number of very small dark seeds.

A great part of the Vanilla of commerce is brought from Mexico and Venezuela, and principally from Vera Cruz, whence, according to Humboldt, the value of the annual export in his time was 10,000 dols. The cultivation is mainly carried on at Misantla, twenty-four leagues north-west of Vera Cruz, the inhabitants of which are the only people in Venezuela who cultivate the plant. The growth is, indeed, extremely easy, as the ground requires no tilling: slips of the Vanilla plant are set at the foot of a tree on the approach of the rainy season, and soon begin to spread up the trunk. The plantations are cleared once a year from weeds and under-growth, and in the third year the plants bear fruit.

Five varieties are recognised by the growers. One, the Vanille de Cochon, is so-called from emitting an offensive smell whilst drying. The harvest begins about December, when the fruit becomes yellowish-green. There are two ways of preparing it for the market. In one method the fruit is allowed to dry until the pod loses its green colour. Straw mats covered with woollen blankets are spread on the ground, and when these are warmed through, the fruits are spread on them and exposed to the sun. After a time they are wrapped in blankets, and placed in boxes

covered with cloths, after which they are again exposed. In about twelve hours the fruits should become of a coffee colour, but if they do not, the process is repeated. After about two months' daily exposure, they are tied up in bundles of fifty, and packed in tin boxes. Five qualities of Vanilla pods are known: the best is the *primiera*, the pods of which are 24 centimetres long, and proportionately thick. The second quality is called *chica prima*, the pods of which are shorter, and two count as one; the third, *sacate*, and the fourth, *vesucate*, are still smaller, four of the latter being reckoned for one; they are gathered before they are ripe. The fifth and poorest quality is called *basura*; the fruit is very small, spotted, and much cut or broken about.

The following is another method of preparing Vanilla for the market: About 12,000 of the pods are strung together by their lower end, as near as possible to the footstalk; "the whole are plunged for an instant into boiling-water to blanch them; they are then hung up in the open air and exposed to the sun for a few hours. By some they are wrapped in woollen cloths to sweat. Next day they are lightly smeared with oil by means of a feather or the fingers, and are surrounded with oiled cotton to prevent the valves from opening. As they become dry, on inverting their upper end they discharge a viscid liquor from it, and they are pressed several times with oiled fingers to promote its flow. The dried pods, like the berries of pepper, change colour under the drying operation, grow brown, wrinkled, soft, and shrink to one-fourth of their original size. In this state they are touched a second time with oil, but very sparingly, because with too much oil they would lose some of their delicious perfume."

It appears somewhat remarkable that the cultivation of Vanilla in the West Indies has not been largely undertaken, as it would be attended with but little difficulty, and would be a source of much profit to the inhabitants. But even in Caraccas and Guiana, where the plant grows profusely in a wild state, it is almost entirely neglected. In the Isle of Bourbon, however, it has been cultivated with considerable success, and 17½ tons were exported from Réunion in 1871. At Liège it is grown on a small scale to the value of 600 francs per annum; and a plant cultivated at Paris in 1840 attained the height of 3 yards, and yielded 117 pods, which ripened in 12 months. In England it has been in cultivation since 1759; fine examples may be seen in the tropical and economic houses at Kew. Mr. Ewing and Mr. E. Bennett grew the Vanilla with considerable success at Osberton; the latter gathered no less than 300 ripe pods off a single plant in one season. He considers a temperature of from 50° to 70° to be most suitable for it. He found it necessary to effect fertilisation by artificial means; the stigma being prevented from receiving the pollen of its own flower by the interposition of an

organ called the retinaculum.

As the English grown pods are very highly flavoured it is possible that it might be practicable to grow it for economic purposes. The annual import of Vanilla amounts to about 5 or 6 cwt., its price varies very greatly, being sometimes as high as 125*s.* per pound, and at other times as low as 26*s.*

The chief use of the Vanilla is in flavouring perfumery and confectionary, and especially chocolate. One pod is sufficient to flavour $1\frac{1}{2}$ lb. of chocolate, being ground with sugar for that purpose. The fragrance is said to act upon the system as an aromatic stimulant, exhilarating the mind, and increasing the energy of the animal system. It is occasionally employed on the Continent in cases of hysteria; and is used by the Spanish physicians in America as an antidote to poison and to the bite of venomous animals, as well as in other cases. A liquid used in Peru, where it is known as *Baume de Vanille*, exudes from the open pods at perfect maturity. The fruits in time become covered with an efflorescence of fine needle-like crystals, which possess properties similar to those of benzoic acid; when viewed through a microscope with polarised light they are very beautiful objects.

De Menonville, who travelled to Guaxaca in 1777, thus describes his discovery of Vanilla in that district. After various hindrances and disappointments, he says:—"At length an Indian, with a hoe in his hand, made his appearance. 'Brother,' said I, holding out a dollar, 'show me some Vanilla and this is yours.' He coolly bade me follow him, and advancing a few steps through the underwood into a thicket, in which were a number of trees. He immediately climbed up one, threw down to me two pods of Vanilla perfectly ripe, and pointed out to me a branch on which several others were hanging yet green, together with two faded flowers. The form of the leaves, the fruit, the peculiar smell of the plant—everything convinced me it was the real Vanilla in everything corresponding with such as I had seen at Vera Cruz. All the trees of this little copse were covered with it. I saw a quantity of green fruit, but collected no more than six specimens of these, and four large pods which were ripe. I caused the Indian afterwards to part from the root some of the scions which had sprung up. These I tied well together, wrapping up the whole in the leaves of an Arum, which at their base are 3 feet wide. After thus packing a faggot, which weighed upwards of 30 lb., I placed it in my large sack, which I fastened on my horse. I was so well satisfied with my Indian, that besides what I promised him, I gave him two reals in addition. For his part, unwilling to be out-done in generosity, he ran to his hut, and brought me three other pods of Vanilla."

The Chica Vanilla of Panama is yielded by another Orchid, a species of Sobralia. The expressed juice of *V. clavicnlata*, a native of mountainous woods in the West Indies, is applied to recent wounds, and is hence called by the French in S. Domingo

Liane à blessures. There is a species known as *zizpic* in Yucatan, which is a great ornament of the *cenotes* or subterranean water caverns of the country. These singular caverns are sometimes entirely subterranean, and are then of course without vegetation; frequently however, they are more or less open at the top, when they are often of surpassing beauty on account of the luxuriant development of vegetable life which they contain. To these *cenotes* the few Ferns of Yucatan are almost confined, and it is here that this Vanilla attains perfection. The pods are occasionally taken to market at Valladolid, where they may be bought at an almost nominal price. —*Gardeners' Chronicle, May*, 1874.

Action of Camphor on Plant life.

In the year 1798 Benjamin Smith Barton described two experiments as to the stimulant action of Camphor on Plants. One was made on a Tulip, which, placed in a solution of Camphor showed vigorous growth, and was longer in withering than other Tulip slips, of the same kind, placed in ordinary water. The other experiments was made on a withering yellow Iris; through treatment with camphor it seemed, for some hours, endowed with new life. Barton came to the conclusion that camphor has a greater action on plants than any other known substance; and he compared its action to that of spirituous liquors or of opium, on the human body, when taken in certain quantity.

These almost forgotten experiments of Barton's have been repeated, in new forms, by M. Vogel of Munich; and they have a considerable theoretic interest. This author, who has recently communicated his results to the Munich Academy, obtained a homogeneous solution by rubbing camphor with water, and shaking camphor powder in a flask with distilled water. Two branches (alike in size and similarly conditioned) of a flowering Syringa were then introduced, one into ordinary water, the other into the camphor-water. Considerable differences soon appeared: in twelve hours the branch standing in pure water drooped and was near withering; the other branch in camphor-water stood upright, and without any sign of watering—some of its buds were even developed; it was not till three days after, that this branch began to wither.

In another experiment, a flowering branch of Syringa, which was nearly dead, was placed in the camphor-water, and a marked renewal and recovery was ere long observed, which lasted some time. Frequent repetition of the experiment with branches of Syringa showed the same result in varying degree. The camphor-water seemed to have less effect on Vine shoots, and almost none on Sambucus nigra.

The action of camphor on cut branches of living and fully

developed plants having thus been established, at least for some species, the idea naturally occurred that camphor must also have an influence on the process of germination of seeds. With this view, several seeds of Lepidium sativum and various other plants were taken for treatment, and they were mostly old, as the germinative force in such appears to be weaker than in fresh seeds. The seeds were spread out on some moistened blotting-paper covering a porcelain plate, and a second moist paper was put over them. In all cases the seeds thus treated with ordinary water and with camphor-water were exactly in similar conditions as regards temperature and access of air.

For the first experiments seeds of Lepidium sativum of the years 1869 and 1871 were taken. The entire duration of the germinative force of Lepidium sativum is known to be three years. The seeds of both the years mentioned, treated with ordinary water, showed a very imperfect, retarded germination, while the seeds moistened with camphor-water germinated very soon—those of the year 1869 in twenty-four hours, those of 1871 in seven hours. A similar acceleration of the germinative process has previously been observed in treatment of seeds with chlorine and salts.

A further experiment was made with different kinds of Raphanus sativus major, the seeds being of the year 1866. As the duration of germinative force of this seed is three years, or four at the most, the sowing of these specimens in a garden would, of course, have been thought useless. Treated with camphor-water, however, the seeds germinated in four days, and thus some days earlier than fresh seeds under favourable circumstances.

Seeds of Pisum sativum of the season 1865 showed in forty hours, under treatment with camphor-water, all the phenomena of the germinative process. Apart from the fact that Pisum sativum, even under the most favourable conditions, first begins to germinate after four or five days, the duration of germination of the seed is two, or at the most three, years; so that seeds of the year 1865 could no longer be sown with advantage.

With like rapidity germinated seeds of Cucumis sativus under action of camphor-water. In ordinary cultivation of this species of seed in garden ground, not a single grain, out of a large number sown, showed the slightest germinative movement after a long time. The example is thus a striking evidence of the peculiar action of camphor in revival of germinative force of some species of seeds.

The following flower seeds were examined in their relation to camphor-water: Schizanthus pinnatus, of the year 1869; Maurandia Barclayana, Coreopsis, Ipomopsis, Sanvitalia elegans, of the year 1860; Silene pendula, Silene amœna, of 1867; Basilicum, Myosotis alpestris, of 1866; Aster species, of 1868; Celosia cristata, of 1867. In all of them a remarkable influence of cam-

phor on the germinative force was perceived. The after development of some of the seeds that were treated with camphor was observed by Dr. Raob, the seeds having been put into the ground. It is interesting to know that the traces of the camphor treatment were here also visible, the young plants showing greater vigor and freshness.

From all these facts, M. Vogel draws the inference that we have in camphor a kind of stimulant for vegetation, capable both of strengthening the force and accelerating the time of vegetation.

There are cases, however, it appears, in which the favourable action of camphor is not observed. Thus M. Vogel found that Clover seeds, which in garden soil germinated in twenty-four hours, showed no signs of germination after a longer time, when earth had previously been mixed with camphor powder.

As oil of turpentine acts like camphor on the animal organism, M. Vogel made some experiments as to the action of water containing oil of turpentine on plants. The general result was, that this solution also accelerated the germinative process. But there was here, as evidently, an injurious action on the after development of the plants. Even in a few days the progress of the quickly developed seed ceased, and the plant deteriorated.

M. Vogel remarks, in conclusion, that the process of germination, receiving of oxygen, and giving up of carbolic acid, is identical with animal respiration. From the agreement of the vegetable process in the early period of germination with the animal processes, the thought arises that, precisely in reference to this, stimulants are possible whose action resembles the known stimulants of animal life.—*Ibid.*

On Grasses and Fodder Plants.

In the household of Nature there is not a more important tribe of plants than that of the grasses, as upon the seeds of the cereal division more than two-thirds of the population of the globe subsist. The same remark is also applicable in regard to the animal world. To the graminivorous animals, which are the most numerous among the mammalia, the value of grasses as fodder is hardly second to that of corn for human food, and a considerable portion of the feathered tribe live almost upon the seeds of grasses. Without wheat, rye, barley, oats, maize, Guinea corn, rice, what would become of us? It is said that rice alone forms the food of three-fourths of the human race; in other words, of between six and seven hundred millions of the population of the world. As nothing can be uninteresting which is connected with the habits of a tribe of such vast importance to man and beast, I will, before proceeding to the real object

of this paper, mention a few more illustrative facts. Professor Lindley says in his work, "The Vegetable Kingdom," the use of this most important tribe of plants for food, fodder, clothing, &c., requires little illustration. The abundance of wholesome fæcula contained in their seeds renders them peculiarly well adapted for the sustenance of man; and if the cereal grasses only, such as wheat, barley, rye, oats, maize, Guinea corn, rice, are the kinds commonly employed, it is because of the large size of their grain compared with that of other grasses, for none are unwholesome in their natural state only one kind being known amongst the whole tribe, namely darnel (*Lolium temulentum* — Lin.), the effects of which are undoubtedly deleterious. Sugar is a general product of grasses. For economical purposes grasses are often of much importance. I will only mention the bamboo, which in some parts of the world, especially in Asia, is employed as timber and cordage. Plants of a grass, called in South America "Taquarussa," are living fountains. They grow from thirty to forty feet high, with a diameter of six inches, form thorny, impenetrable thickets, and are exceedingly grateful to travellers and hunters; for, on cutting such a reed below a joint, the skin of the younger shoots is found to be full of a cool liquid, which quenches the most burning thirst. To this I can testify, as, during our travels in South America, we hailed with delight such a copse of reeds to quench our thirst. Besides these properties of the grasses, I may also mention their use for paper, cordage, straw plaiting, &c. In fact, the value of this order to mankind is boundless, and I should trespass too much on your patience if I ventured to tell you all of the economical purposes to which the products of the different grasses are applied. Besides these properties of the graminaceæ, their inorganic properties are also remarkable. The cuticle contains a large proportion of silex, as is proved, according to Professor Lindley, by its hardness and by masses of vitrified matter being found whenever a haystack or heap of corn is accidently consumed by fire. With the exception of the genus *Bambusa* (bamboo). Nature has not lavished on the representatives of this most important and interesting order of the vegetable world much outward beauty, nor has the enthusiasm of ancient and modern bards been excited by them, as is the case so frequently in praise of other plants, which have been endowed by Nature with every beauty to please the eye, but without the slightest use to mankind. I think we all, indeed, are apt to look on the grasses with too much indifference, considering that they constitute in a great degree the staff of our life. Professor Lindley says further:—"The great mass of herbage known by the name of sedges and grasses constitutes, perhaps a twelfth part of the described species of flowering plants, and at least nine-tenths of the number of individuals composing the vegetation of the world; for it is the chief source of that verdure which covers the earth, especially of northern countries, with a

gay carpet during the year." I extract the following account of the geographical distribution of grasses by Professor Shaw: "The family is very numerous. In the system of Roemer and Schubles there are 1,800; and since this work, were it brought to a conclusion, would probably contain 10,000 in all, it may be assumed that the grasses form a twenty-second part. It is more than probable, however, that in future the grasses will increase in a large ratio than the other phanerogamic plants, and that perhaps the just proportion will be as one to twenty, or one to sixteen." Greater still will be their proportion to vegetation in general when the number of individuals is taken into account, for in this respect most, if not all of the classes are inferior. With regard to locality in such a large family very little can be advanced. There are, however, both land and water grasses, but no marine plants. They occur in every soil, in society with others and alone; the last to such a degree as entirely to occupy considerable districts. Sand appears to be less favourable to this class; but even this has species nearly peculiar to itself. Grasses exist under the equator, on the mountains of the south of Europe, where they ascend almost to the snow line and on the Andes. The greatest difference between tropical and extra-tropical grasses appears to be the following: The tropical grasses acquire a much greater height, and occasionally assume the appearance of trees. Some species of *Bambusa* are from fifty to sixty feet high. The leaves of the tropical grasses are broader, and approach more in form those of other families of plants. Separate sexes are more frequent in the tropical grasses: the flowers are softer, more downy, and elegant. The extra-tropical grasses, on the contrary, far surpass the tropical in respect of the number of individuals. That compact, grassy turf, which, especially in the colder parts of the temperate zones, in spring and summer composes the green meadows and pastures, is almost entirely wanting in the torrid zone. The grasses there do not grow crowded together, but like other plants, more dispersed. The contribution of the cultivated grasses is determined not merely by climate, but depends on the cultivation, industry, and traffic of the people, and often on historical events. Within the northern polar circle, agriculture is found only in a few places. In Siberia, grain reaches at the utmost only to 60°, in the eastern parts scarcely above 55°, and in Kamschatka there is no agriculture even in the most southern parts (51°). The polar limit of agriculture, on the north-west coast of America appears to be somewhat higher, for in the more southern Russian possessions (57° to 52°), barley and rye come to maturity. On the east coast of America, it is scarcely above 50° to 52°. Only in Europe, namely, in Lapland, does the polar limit reach an unusually high latitude—70°. Beyond this dried fish, and here and there potatos, supply the place of grain. The grains which extend furthest to the north in Europe are barley and oats.

These, which in the milder climates are not used for bread, afford to the inhabitants of the northern parts of Norway and Sweden, of a part of Siberia and Scotland, their chief vegetable nourishment. Rye is the next, which is substituted for the inferior kinds of grain. This is the prevailing grain in a great part of the northern temperate zone, namely, in the south of Sweden and Norway, Denmark, and in all the lands bordering on the Baltic, the north of Germany, and part of Siberia. It is a very remarkable circumstance that the native country of wheat, oats, barley, and rye should be entirely unknown; for although oats and barley were found by Colonel Chesney apparently wild on the banks of the Euphrates, it is doubtful whether they were not the remains of cultivation. This has led to an opinion on the part of some persons that all our cereal grasses are artificial productions, obtained accidentally, but retaining their habits, which have become fixed in the course of ages. No doubt you will agree with me that there are few circumstances to which the agriculturists and squatters of this colony (South Australia) have been so inattentive as to the nature and produce of their pasture lands—namely, the grass and fodder plants. It is also true that the cultivation of artificial grasses and fodder plants never can be so general here as at home on account of the large extent of pasture land in the possession of the squatter, and on account of the insuperable difficulty arising from climate and the droughts to which some parts of the colony are often subjected, which is against the cultivation of most of the artificial grasses; and there are not many European and foreign grasses which would live throughout the year and will renew themselves annually. I will say first a few words regarding our native grasses, of which I am sorry to say so many species have already died out from cultivation and depasturing, since possession has been taken by Europeans. It is an historical fact that whenever man settles in a new country, he exercises a potent influence over the indigenous vegetation and animals, especially if the intruders are of an agricultural and pastoral pursuit. The plough, the axe, the herds, are enemies to vegetation, and as cultivation advances, one representative after the other succumbs to the foreign influence. The herbage suffers first, the native animals second, and even man succumbs, of which many countries, especially America, have given us examples. But the plough, the axe, and the herds are not the sole destroyers of the native herbage. No; with cultivation are introduced noxious weeds of other countries, which if they have taken root, spread with alarming rapidity and become possessors of the ground, growing often more luxuriantly in their new abode. As an example, I will call your attention only to seven of such noxious intruders in South Australia, *viz*:— The so called dandelion (*Cryptostemma calendulacea*, R. Br.), the cockspur (*Centaurea melitensis*, Lin.), the Scotch thistles (*Car-*

dinus marianus, Lin., and *Onopordon acanthium*, Lin.), the Bathurst burr (*Xanthium spinosum*, Lin., the French catchfly (*Silene gallica*, Lin.,) and the stinkaster (*Anthemis cotula*, Lin.), natives of the Cape and Europe, which already cover large tracts of pasture land, and will extend further and further to the destruction of the native herbage. You will agree with me, especially the squatter, of the seeming failure of the native grasses, and that the feeding properties of our native pastures have seriously declined of late years. Many close observers will have missed already several kinds of herbage, especially annuals or summer grasses, in our neighbourhood, and the representatives of other kinds are becoming less every year. But this is not alone the case with the annual, but also with the perennial herbage. I will only call your attention to the well-known and so useful kangaroo grass (*Anthistiria ciliata*, Lin., fil.), which in the early days of the colony we found everywhere, and formed a great part of the pasture grass. It has now disappeared even from localities which it formerly almost monopolised. It has been relished so much by the stock that it has been fairly eaten out of the ground, and I fear will soon disappear entirely; and a good many other grasses will follow. But not alone in South Australia, but also in South Africa, vegetation changes are going on through the introduction of sheep. In a paper by Mr. J. Shaw, of South Africa, read the other day by Professor Th. Dyer before the Royal Botanical Society, Mr. Shaw remarks:—"Civilisation and sheep have introduced the Bathurst burr. In the Orange State wool has become so filled with these burrs that its value has been deteriorated nearly 50 per cent., and the Government have legislated for its compulsory destruction. The sheep, in connection with the overstocking of farms, are doing very serious injury directly to the vegetation by eating down the better and more agreeable plants, giving range to poisonous and bitter ones. Since sheep have been introduced the grasses have very fast disappeared; the ground, by the hurried march of the sheep for food amongst a scattered bush, has become beaten and hardened, and the seasonable rains, which do come occasionally during the summer, are accordingly allowed to run off the surface without soaking in the ground to the extent formerly the case. The grasses and herbage disappear, the country is drying up, and becoming a semi-desert." The author further refers to the great increase of poisonous and bitter herbage, so that it was dangerous to have stock on many farms which formerly were free from injurious herbs. We see from the above that the South African squatters have the same cause of complaint regarding the introduction of noxious and poisonous, and the extirpating of the indigenous nutritious plants, as the South Australian squatters have. You will ask "What is the cause of this? Nothing is more easily answered—the constant pasturing on the runs throughout the year. The grasses and other herbs are

prevented ensuring their reproduction from seed, and as the sheep crop very closely, the plants soon succumb, having no chance whatever of being reproduced from seed. From this fact and from those relating to the disappearance of choice grasses, it is known that the sheep especially devote their attention to kinds of grasses which they most like and leave the inferior grasses untouched. Most of our better kinds of native grasses have no tendency to form a close turf, and growing mostly tussacky, are more easily eaten by the sheep out of the ground and destroyed. The perennial grasses suffer also from the constant trampling upon them by the stock.

As I have mentioned before, I fear very few artificial grasses can be grown with profit and advantage on the runs, and so the squatters must be dependent upon the native grasses. The only resource will be to encourage the growth of these. No doubt, if properly cultivated, native grasses would be the most suitable for pasturage on the runs. Their seeds should be collected, and care taken to procure those sorts of which sheep and cattle are fondest, and on which they thrive best. Of such grasses several acres should be sown in well-prepared soil, and fenced in for the sake of procuring annually a quantity of seed, which should be sown on such spots which are deficient of herbage. These spots ought to be ploughed and the seed properly sown and harrowed in. No doubt these seeds, sown before the rains set in, will grow afterwards without any further trouble. Or the runs should be divided into subdivisions. Annually one of these divisions should not be grazed, for the purpose of replacing the pasturage. The grasses should grow unmolested, flower, ripen, and scatter their seeds, so as to ensure their reproduction. Undoubtedly such a system of rotation would be very beneficial, and improve the growth of the pasture materially. I think we all know, and especially the farmer, that to farm profitably, grazing should go hand-in-hand with corn-growing, and that the farmer, as well as the squatter, will find it advantageous to have a paddock of artificial grasses near his homestead, in some suitable and confined spot, for the purpose of keeping stock which require to be kept in good condition during the summer months; but to keep such a paddock during this time in a growing condition, I fear some difficulty will be found in South Australia. Even with irrigation, we could not expect to produce such a fine turf as that with which we were so familiar at home; and every farmer will agree with me that it is not only raised by manuring and irrigation, but by the humid climate and the mild summer showers that fall at home. But with our dry climate, the thermometer ranging frequently from 80° to 100° at this season of summer, I think it improbable that we ever will realise that fine turf which a humid climate will produce. I have found that there are not many kinds of foreign grasses which will stand our arid droughts. My seven years' experience and experiments

with the acclimatisation of grasses from all parts of the globe have, I am sorry to say, not resulted in such favorable success as I should have wished. I have sown every year sixty or eighty kinds of grasses, which during the winter months have mostly grown luxuriantly, but as soon as the dry weather sets in, begin to suffer and perish. I will give you now the results of my experiments, not alone with grasses, but also other fodder plants, and will call to your attention those kinds which for years have stood the test of our arid climate, and I am confident that they are permanent in their duration, and well worthy a trial, if only a little care and attention are paid to their culture; but it is generally thought that any treatment will do for grasses. With the exception of lucerne, I think very little trouble has yet been bestowed on the culture of artificial grasses by the farmer and the squatter, because, as the phrase goes, "they will not pay for the trouble;" but, instead of moralising on this theme, I will bring facts before you. I shall only dwell at any length on those grasses and fodder plants which from my own practical experience I have found suited to our climate, and most of them I have cultivated for the last seven years, in the experimental ground in the Botanic Garden. I must remark at the same time, that I have bestowed on them not the slightest care in regard to watering during the summer, only that they have been kept clear from weeds, and the soil has been yearly dug once. I will first name the famous bunch grass of British Columbia (*Elymus condensatus*, Presl.) of which His Excellency the Governor speaks so highly from his own experience.

The second grass on my list is the famous Guinea grass—(*Panicum maximum*, Jacq.)—a native of tropical Africa, from whence it has been introduced to South America and the West Indies. His Excellency the Governor on several occasions has spoken highly of this valuable grass, in regard to its nutritious qualities, having become acquainted with it during his stay in the West Indies. My personal observations of a few years' residence in South America confirm his Excellency's experience in every respect. I can assure you in Demerara I have seen it attain a height of six to eight feet. One acre of Guinea grass will keep two cows or a horse throughout the year, as it will give under cultivation at least four or five crops a year. I have seen people cutting from one acre every day so much as they wanted for their horse or cows, and when they came to the end of the acre, the first portion cut had grown sufficient to cut again, and could be repeated four or five times throughout the year. It is not to be expected that we could do the same thing here, as the growth in South Australia can never be compared with that of South America. If it is cut there four or five times a year, we can scarcely expect that it can be done more than twice here. I believe the Guinea grass will be a useful paying grass with us, especially in favourable localities; it requires

a deep moist soil. According to my five years' observation on the plants in the Garden, it is capable of enduring during the summer, when it grows most rapidly, a degree of heat and drought which has proved destructive to almost any other kind of grass growing in the experimental ground. But I must remind all who intend to plant, and will secure a luxuriant growth of Guinea grass, that it must not be thought, as it is generally the case, that any treatment will do for grasses. It must be planted on prepared ground, the plants eighteen or twenty inches apart, and the land kept clear from weeds. I will also mention that it will not bear being fed down, nor trampled upon by cattle or sheep, but must be cut. The next grass is the well-known prairie grass (*Bromus unioloides*, Humboldt), a native of Central America, which I think has been so early as 1858 introduced into the Colony. Notwithstanding that it has turned out one of the best and nutritious fodder grasses, which is little affected by our dry seasons, it has not received that attention from the farmers which it deserves. I consider the prairie grass one of our best acquisitions of the foreign grasses, and it deserves to take the lead as one of the most permanent and paying. I find there is no grass better suited for green fodder, and none is superior to any grass for haymaking than the prairie grass. It thrives just as well on the plains as in the hills. It surpasses any grass in regard to seed-bearing qualities. Mr. T. Goode, Goolwa, who is an extensive grower of the prairie grass, and who commenced growing it from a few seeds which he received from the Garden, has assured me that he has raised as much as twenty bushels of seed per acre, and he finds it also superior to any grass for haymaking. There is not the slightest doubt, if early sown, say April, about fifty to sixty pounds of seed to the acre, it will give two or three crops. It is one of the most productive grasses during the winter. The result of often mowing is that the plants spread out more and grow thicker than if allowed to go to seeding. But there is one fault to be mentioned—it will not bear feeding off. Cattle and sheep are so fond of the grass that they will eat the roots out of the ground, which is facilitated by their peculiar growth. Thus a good many plants are destroyed by the cattle. Notwithstanding, I would recommend every farmer to give this valuable grass a fair trial.

For the introduction of the following splendid summer grass we have to thank Mr H. W. Phillips, North Adelaide. No doubt it is a rival of the prairie grass, and stands our summer better than any other kind. It is also a panic grass (*Panicum spectabile*, Nees ?). Mr. Phillips has kindly given me the following notes regarding this most valuable grass:—

"This grass came up in my garden near the aviary, and no doubt came with the canary seed which I bought from Messrs. Hackett. It is very prolific, seeding abundantly; it can also be

propagated from the large couch roots, which run a great distance under ground; any joint of which will grow. The seed should be gathered as it ripened, for it sheds easily. It will grow in the driest places; one plant came up between the wood and cement at the end of the verandah, which is so covered with passion flowers that it never got any water; still it grows notwithstanding all the traffic. The growth is very luxuriant, shooting vigorously about October, and continues to do so until the cold, wet weather sets in; it grows three or four feet high, with tall spikes of seeds, which are very pretty, and the roots are often a yard long, and as large as a little finger. Instead of feeling the late extremely hot weather, I noticed it had grown much during the week. It is very sweet and succulent, and cattle eat it greedily; but it must not be sown in arable land, as it would be difficult to eradicate it. It would be useful on runs, not only for feed, but also for stopping bush fires. If a plough was run across and across the run, and either seed or roots planted, it would form a belt of green no fire would pass; or if eaten down, which it most likely would be, there would be a bare space to stop the fire. A single line would soon spread a yard wide. A seedling will cover a square foot the first year, and the roots can be taken up and planted without any fear of clearing the ground. It will come up again quite thickly, every rootlet growing. The roots also mat together, so that it is useful to plant to prevent water-courses washing away the soil, for which purpose I have given a large quantity of roots to Mr. Mais for the water-works. In stony places, if a stone is raised and a joint or root placed under it, it will shoot up all round, and never wants re-sowing. You will be able to give the best information about time and mode of sowing: if too early, the slugs eat it off, and I think it should be pretty deep, or the ants and birds eat it; it will sometimes lay two or three years in the ground.

"I have circulated the seed far and wide. I have distributed more than 1,000 packets; through Mr. Todd it has been sent to every telegraph station between Port Augusta and Port Darwin; a friend going home overland, took nearly 100 packets for distribution on the route; another friend who travelled through Western Australia distributed and planted it wherever he went, and I am now sending a parcel to the Cape. I gave half the original plant, when about four years old, to a sheep-farmer. It filled a corn-sack, and the man had to make two trips to carry it away. It does not thrive so well in the hills; for, although it will grow, it is never so luxuriant as on the warmer plains"

The Catstail grass (*Phleum prätense*, Lin.), a native of Europe. Probably bearing this name from the seed panicle, which has some resemblance to a cat's tail. This is a first-class grass, and one of the best and most valuable of all perennial fodder grasses. It stands our climate well, and seems not particular regarding

the soil, as it thrives well in sandy or heavy soils. It is worthy of recommendation, especially for pasture Oat grass (*Avena elatior*, Lin.), also of European origin. This is an excellent grass. It is nutritious, and seems to grow and produce well on every kind of soil. This valuable grass suffers little from the droughts, and can be recommended as a superior grass for hay. Great recommendation deserve the two Falling Awn grasses (*Piptatherum Thomasii*, Knth., and *Piptatherum multiflorum*, Beauv.). The first is a native of Corsica, the second from the southern parts of Europe. Both are first-class grasses, and these kinds are some of my first importations, and have stood their ground well. They bear our climate uncommonly well, and will pay the cultivation, as they are throughout the year in a growing state; and I can recommend them as some of the best of the collection. Cattle are very fond of both. The next grass, called the Millet grass (*Milium multiflorum*, Cav.), a native of Europe. This grass is also worth cultivation for summer and winter fodder. It stands our droughts well, and could be also used for hay. The produce of the millet grass is superior to many kinds of grasses. It flourishes, I may say, in every soil if not too poor, and the cattle like it very much.

I introduce now to notice three other kinds of panic grasses, namely—*Panicum tomentosum*, Roxb.; *Panicum Teneriffæ*, R. Br., a native of the Canary Islands; and *Panicum crus galli*, Lin. Nearly all the panicum species, of which nearly 300 kinds are known, are nutritious and fattening grasses, and worth the cultivation. They are chiefly tropical and sub-tropical, and endure the influence of our scorching heat and droughts well. All three are worth the recommendation. *Panicum Teneriffæ* is only an annual or summer grass, but well worth the cultivation, as it thrives well in sandy and poor soil. The following grass is the Pennisetum grass (*Pennisetum villosum*, R. Br.), a native of Abyssinia. It is not a tall-growing grass, but a capital grass pasture. I bring now to your notice the Fescue grass (*Festuca duriuscula*, Lin.), of European origin, and well adapted for permanent pasture. It thrives even well on sandy soil, and resists the drought. Cattle are very fond of it. There are some other kinds of fescue grasses, namely—*Festuca elatior* and *F. ovina*, which are all worth recommendation for rural purposes. The next grass is called the Cocksfoot (*Dactylis glomerata*, Lin.), a native of Europe. This is also a valuable grass, adapted as well to dry as to moist soils. Its yield of fodder is abundant, so also its nutritious qualities. It endures our droughts well. The Buffalo grass (*Stenotaphrum glabrum*, Trin.), a native of the warmer countries of America, which I cannot sufficiently recommend. It is a perennial, and every farmer and squatter should not be without some of this valuable grass. It is a creeping grass like the couch or dub grass, and is capable of standing any drought. Its fattening qualities I think are not so great as the

before-mentioned grasses; but the cattle and sheep like it very much. It thrives well on sandy soil, and is easily propagated from cuttings, as every little piece will grow, and after taking root it spreads very rapidly. It is also well adapted for binding river banks or sandy spots. It can advantageously be used for permanent pasture. The buffalo grass is entitled to a general introduction to our pasture. It is also very suitable for garden lawns. Everyone who has visited Sydney no doubt has been struck with the fine lawns, especially those of the Botanic Gardens. Since the last two years I have used it also for this purpose instead of the couch grass. The buffalo grass keeps its verdant freshness winter and summer—a great contrast regarding the dulness of the colour which the couch grass has during the winter. Notwithstanding, as already mentioned, that in appearance the buffalo grass seems to be coarse, cattle readily feed on it. The couch grass (*Cynodon dactylon*, Pers.) which has been introduced, it is said, from India to Sydney, deserves also mentioning. It possesses all the qualities of the buffalo grass, and I am told that the sheep are very fond of it. I know that the cattle, if they can get on other grass, will not touch it; but if the green food becomes scarce, they relish it also. The squatters would do well to introduce this grass on their runs, as it spreads as rapidly as the buffalo grass. Another grass which I can also recommend highly is a kind of Canary grass (*Phalaris Americana*, Elliot). I received the seed from America, with the recommendation of its being a very useful fodder grass. I have had it only two years, but it seems to stand our climate, and promises to be a great acquisition. The Love grass (*Eragrostis cylindrica*, Steud.), a native of China, seems to be also a good grass for pasture. The next grass is called the Bent grass (*Agrostis capillaris*, Lin.); also this is a grass well worth a trial for pasture. The following two kinds of Job's tears (*Coix lacryma*, Lin., and *Coix exaltata*, Jacq.), are worth a trial, especially the last. They stand the summer pretty well, and produce abundance of nutritious food. Not to tax your patience too much, I will only mention the names of the following grasses—the Hair grass (*Aira caespitosara*, Lin.) and the Blue Kentucky grass, which I consider both good for pasture. The Rye grasses (*Lolium perenne*, Lin., and *Lolium Italicum*, A. Br.), although very good grasses for their nutritious powers, seem to maintain their ground with us only one or two years; after the plants die off, consequently they are not well suited for this country, where we require a more permanent pasture. It is also said, when the plants begin seeding, the cattle will not relish the grass, and neglect it. It appears that both kinds of rye grass do not thrive so well with us as is the case in the neighbouring colonies, especially in Victoria, where they are spoken of most highly as good fodder and grazing grasses. All the seeds of the above-mentioned grasses should be sown in May or June, in well-prepared ground. I will

now go over to the fodder plants, of which I have not many on my list, and begin with the sheepbush of the Cape of Good Hope (*Pentzia virgata*, Less.), of which His Excellency has given us also such a good account. I received a small parcel of seed of this valuable shrub in 1869 from Dr. Hooker, Kew Gardens, of which he remarks that the plant is the most valuable sheep fodder for dry climates, and that the sheep at the Cape during the summer depend mostly upon this shrub. What the saltbush is to the South Australian squatter so the sheepbush is to the Cape squatter. I raised about twenty plants, which have done remarkably well, and prove that our climate is well adapted for their growth. It is, as you see, a much-branched, rigid little bush one or two feet high. The leaves and branches contain an aromatic bitterness, which I understand is liked very much by sheep, which gives the mutton a very fine peculiar flavour. The plant is easily propagated from cuttings, of which every one will grow if planted when the first rains begin to fall. The next two fodder plants are known under the names of Rib grass or Plantain (*Plantago major*, Lin., and *Plantago lanceolata*, Lin.), both natives of Europe. No doubt both excellent fodder plants; cattle and sheep are very fond of them. The plants thrive well on every soil, all the year through, if the season is not too severe. It seems the rib grass is not generally known, or it would have been more extensively grown. I recommend it as a great acquisition on pasture ground, especially for squatters, on the low lands of their runs, where it would supply a plentiful pasture. If once established it spreads rapidly, which I find in the experimental ground, where the seedling plants spring up everywhere. Another plant for sheep fodder to be recommended is the small Burnett (*Poterium sanguisorba*, Lin.), a perennial plant, which will grow in every soil, stands our drought, and is readily eaten by the sheep. As it is easily propagated from seeds and suckers, the squatter should introduce it on his run. Not much attention, I think, has been paid yet to the different kinds of Clovers, of which I find several do well in the Garden. *Melilotus alba*, Desz.; *M. officinalis*, Lin.; and *M lupulina*, Lam., do well. The clovers are known as nutritious herbs. It is true many kinds of clovers die away in the second year, but the above-mentioned kinds seem to stand longer. I will also mention, that clovers thrive best in damp soil, or on clay subsoils, which retain the moisture, where they will spread very rapidly. Lucerne has been extensively cultivated, and therefore I find it not necessary to mention it more particularly here. I could mention several other fodder plants which flourish during the winter months, but as during this time the food is abundant, I think it not necessary to speak further of them. These are the results of a seven years' trial regarding the capabilities of several foreign grasses and fodder plants in this Colony. I preferred not coming earlier before the public with my experi-

ence until I had tested their durability. Thinking this period sufficient for such a test, the more so as the plants withstood the severest droughts we have had, I can recommend these grasses with confidence. It depends now on the farmer and squatter to give them a fair trial, and call at the same time to their mind the old saying, and a very true one it is, "that the man who makes two blades of grass grow where one grew before is a public benefactor."—*R. Schomburgk, Ph. Dr., Adelaide.*

The Ceylon Coffee Fungus.

Owing to the misapprehension which still largely exists as to the real nature of the Coffee-leaf disease (Hemileia vastatrix), and the erroneous views and wild conjectures propagated respecting it, I feel that it is desirable I should again offer some observations on the subject. The disease consists in the parasitic growth within the Coffee-tree of a well-defined species of fungus, originated and reproduced by means of spores, easily identified by employment of the microscope, and thus readily distinguishable from every other known fungus. There can be no question that this fungus is communicated from Coffee plant to Coffee plant through dissemination of the spores, and that this may be conveyed by the wind, or by streams of water, or by animals of any kind moving from place to place. The fungus has only yet been detected, in a definitely organised form, in the cellular tissue of the Coffee leaf, lying immediately under the diseased spots, in the spores themselves, and in the filaments produced by the germinating spores. The fungus would appear, however, to be present in the growing tissues generally of the Coffee plant in a diffused form, altering the character of the cell-contents, and thus producing the stains observable on the bark of the young branches, and the pale somewhat translucent spots to be seen in the leaves previously to the outbreak of the orange-coloured spores.

Investigations with the microscope with reference to the germination of the fungus spores have been made by my friend, the Rev. R. Abbay, and by myself. The process has been observed by both of us. Mature spores removed from a diseased Coffee leaf and laid upon charcoal kept constantly moist, commence to germinate in a few days. The germination consists in the spore becoming somewhat enlarged, and its contents converted into one or more globular translucent masses. From each of the latter a filament is developed, which grows very rapidly, and becomes more or less branched. At the termination of some of these branches secondary spores are produced in the form of radiating necklace-shaped strings of little spherical bodies of uniform size, and this form closely resembles the fructification of

an Aspergillus. Mr. Abbay has also observed another form of secondary spores arranged in single rows of spherical bodies, a good deal larger than those radiately arranged, but still exceedingly minute. These inconceivably numerous secondary spores may be easily carried by the wind into surrounding districts, and thus convey infection to distant plantations. In what way the Coffee tree receives the infection remains to be ascertained, and from the subtlety of the operation, this will have to be inferred, rather than discovered by direct observation of the process. It would seem most probable that the infecting matter contained in the spore is absorbed by the tender rootlets of the Coffee tree, though it is possible to conceive it might also be introduced into the tree through the very young foliage.

The effect of the fungus upon the Coffee tree would seem to be the gradual loss of vital energy. The tree, after the first attack of the disease, which is often apparently the most severe, throws out fresh healthy looking leaves and exhibits for a certain period the appearance of having perfectly recovered. These fresh leaves, however, after the expiration of a few months, exhibit the characteristic spotting, and, as on the previous attack, fall prematurely. These repeated attacks occurring periodically, at length seriously affect the health of the tree, which if old and ill-cultivated, becomes of little or no value as a crop-producer.

There is great reason to believe, however, from what has been observed, that high cultivation, with judicious manuring, enables the tree to better sustain the attacks of the fungus, and to retain strength and vigour enough to produce a fair yield of berry. It is indeed ardently to be hoped that this beneficial effect will be permanent.

Whether each outburst of the disease implies a fresh introduction of the parasite into the Coffee plant, or merely a periodical spore production of a permanent parasitism, remains to be discovered.

Upon a careful inspection of the spots of orange-coloured spores it may be observed that on most of them a minute red maggot is feeding on the spores. Sometimes these little maggots are very numerous, and it could be wished they were still more so, and that thus the fungus spores might be altogether consumed, and the propagation of this terrible pest arrested.

Some persons would seem to be under the impression that in course of time the leaf disease will wear itself out and entirely disappear, but it is difficult to see how this can happen whilst Coffee trees remain for it to subsist upon. It is just possible to imagine some subtle destructive agency operating, in addition to the more obvious action of the little maggot, to arrest the development of the fungus, but there is nothing to support such a view at present. *From Dr. Thwaites' Annual Report on Royal Botanic Garden, Péradeniya, dated March 27, 1874.*

However opposite the parts which animals and vegetables play in the economy of the world, as the two opposed kingdoms of organic nature, it is becoming more and more obvious that they are not only two contiguous kingdoms, but are parts of one whole—antithetical and complementary to each other, indeed, but such "thin partitions do the bonds divide" that no definitions yet framed hold good without exception. This is a world of transition in more senses than is commonly thought; and one of the lessons which the philosophical naturalist learns, or has to learn, is, that differences, the most wide and real in the main, and the most essential, may nevertheless be here and there connected or bridged over by gradations. There is a limbo filled with organisms which never rise high enough in the scale to be manifestly either animal or plant, unless it may be said of some of them that they are each in turn and neither long. There are undoubted animals which produce the essential material of vegetable fabric, or build up a part of their structure of it, or elaborate the characteristic leaf-green which, under solar light, assimilates inorganic into organic matter, the most distinguishing function of vegetation. On the other hand there are plants—microscopic, indeed, but unquestionable—which move spontaneously and freely around and among animals that are fixed and rooted. And, to come without further parley to the matter in hand, while the majority of animals feed directly upon plants "for 'tis their nature to," there are plants which turn the tables and feed upon them. Some, being parasitic upon living animals, feed insidiously and furtively; these, although really cases in point, are not so extraordinary, and, as they belong to the lower orders, they are not much regarded, except for the harm they do. There are others, and those of the highest orders, which lure or entrap animals in ways which may well excite our special wonder—all the more so since we are now led to conclude that they not only capture but consume their prey. As respects the two or three most notable instances, the conclusions which have been reached are among the very recent acquisitions of physiological science. Curiously enough, however, now that they are made out, it appears that they were in good part long ago attained, recorded, and mainly forgotten. The earlier observations and surmises shared the common fate of discoveries made before the time, or by those who were not sagacious enough to bring out their full meaning or importance. Vegetable morphology, dimly apprehended by Linnæus, initiated by Caspar Frederic Wolff, and, again, independently in successive generations by Goethe and by De Candolle, offers a parallel instance. The botanist of Goethe's day could not see any sense or practical application to be made

of the proposition that the parts of a blossom answer to leaves; and so the study of homologies had long to wait.

Fly-catchers.—Until very lately it appeared to be of no consequence whatever (except, perhaps, to the insects) whether *Drosera* and *Sarracenia* caught flies or not; and even *Dionæa* excited only unreflecting wonder as a vegetable anomaly. As if there were real anomalies in Nature, and some one plant possessed extraordinary powers denied to all others and (as was supposed) of no importance to itself. That most expert of fly-catchers, *Dionæa*, of which so much has been written and so little known until lately, came very nearly revealing its secret to Solander and Ellis a hundred years ago, and, doubtless, to John Bartram, its probable discoverer, who sent it to Europe. Ellis, in his published letter to Linnæus, with which the history begins, described the structure and action of the living trap correctly; noticed that the irritability which called forth the quick movement closing the trap entirely resided in the few small bristles of its upper face: that this whole surface was studded with glands, which probably secreted a liquid; and that the trap did not open again when an insect was captured, even upon the death of the captive, although it opened very soon when nothing was caught, or when the irritation was caused by a bit of straw or any such substance. It was Linnæus who originated the contrary and erroneous statement, which has long prevailed in the books, that the trap reopened when the fatigued captive became quiet, and let it go; as if the plant caught flies in mere play and pastime! Linnæus also omitted all allusion to secreted liquid—which was justifiable, as Ellis does not state that he had actually seen any, and if he did see it, quite mistook its use, supposing it to be, like the nectar of flowers, a lure for insects, a bait for the trap. Whereas, in fact, the lure, if there be any, must be an odour (although nothing is perceptible to the human olfactories); for the liquid secreted by the glands never appears until the trap has closed upon some insect and held it at least for some hours a prisoner. Within twenty-four or forty-eight hours this glairy liquid is abundant, macerating the body of the perished insect. Its analogue is not nectar but the gastric juice. The observations which compel such an inference are recent, and the substance of them may be briefly stated. The late Rev. Dr. M. A. Curtis, forty years and more ago, resided at Wilmington, North Carolina, in the midst of the only district to which the *Dionæa* is native; and he published, in 1834, in the first volume of the 'Journal of the Boston Society of Natural History,' by far the best account of this singular plant which had then appeared. He remarks, that "the little prisoner is not crushed and suddenly destroyed, as is sometimes supposed," for he had often liberated "captive flies and spiders, which sped away as fast as fear or joy could hasten them." But he neglected to state, although he must have noticed the fact, that the two sides of the trap, at first concave to

the contained insect, at length flatten and close down firmly upon the prey, exerting no inconsiderable pressure, and ensuring the death of any soft-bodied insect, if it had not already succumbed to the confinement and salivation. This last Dr. Curtis noticed, and first discerned its import, although he hesitated to pronounce upon its universality. That the captured insects were in some way "made subservient to the nourishment of the plant," had been conjectured from the first. Dr. Curtis "at times found them enveloped in a fluid of mucilaginous consistence, which seems to act as a solvent, the insects being more or less consumed in it." This was verified, and the digestive character of the liquid well-nigh demonstrated, six or seven years ago, by Mr. Canby of Wilmington, Delaware, who, upon a visit to the sister-town of North Carolina, and afterwards at his home, followed up Dr. Curtis's suggestions with some capital observations and experiments. These were published at Philadelphia, in the tenth volume of Mehan's *Gardeners' Monthly*, August, 1868, but they do not appear to have attracted the attention which they merited. The points which Mr. Canby made out are, that this fluid is always poured out around the captured insect in due time, "if the leaf is in good condition and the prey suitable;" that it comes from the leaf itself, and not from the decomposing insect (for when the trap caught a plum-curculio, the fluid was poured out while he was still alive, though very weak, and endeavouring, ineffectually, to eat his way out); that bits of raw beef, although sometimes rejected after awhile, were generally acted upon in the same manner—*i. e.*, closed down upon tightly, slavered with the liquid, dissolved mainly, and absorbed; so that, in fine, the fluid may well be said to be analogous to the gastric juice of animals, dissolving the prey and rendering it fit for absorption by the leaf. Many leaves remain inactive or slowly die away after one meal; others reopen for a second and perhaps even a third capture, and are at least capable of digesting a second meal. Before Mr. Canby's experiments had been made, a similar series had been made in England by Mr. Darwin, with the same results, and with a small but highly curious additional one—namely, that the fluid secreted in the trap of *Dionæa*, like the gastric juice, has an acid reaction. Having begun to mention unpublished results (too long allowed to remain so), it may be well, under the circumstances, to refer to a still more remarkable experiment by the same most sagacious investigator. By a prick with a sharp lancet at a certain point, he has been able to paralyse one-half of the leaf-trap, so that it remained motionless under the stimulus to which the other half responded. Such high and sensitive organization entails corresponding ailments. Mr. Canby tells us that he gave to one of his *Dionæa*-subjects a fatal dyspepsia by feeding it with cheese; and under Mr. Darwin's hands another suffers from paraplegia. Finally, Dr. Burton-Sanderson's experiments, detailed at the last meeting of the British Association for the

advancement of Science, show that the same electrical currents are devolved upon the closing of the *Dionœa* trap, as in the contraction of a muscle. If the Venus's fly-trap stood alone it would be doubly marvellous—first, on account of its carnivorous propensities, and then as constituting a real anomaly in organic nature, to which nothing leads up. Before acquiescing in such a conclusion, the modern naturalist would scrutinize its relatives. Now the nearest relatives of our vegetable wonder are the

Sundews.—While *Dionœa* is local, the *Droseras*, or Sundews, are widely diffused. The two whose captivating habits have attracted attention, abound in bogs all round the northern hemisphere. That flies are caught by them is a matter of common observation; but this was thought to be purely accidental. They spread out from the root a circle of small leaves, the upper face of which especially is beset, and the margin fringed, with stout bristles (or what seem to be such, although the structure is more complex), tipped by a secreting gland, which produces, while in a vigorous state, a globule of clear liquid like a drop of dew—whence the name, both Greek and English. One expects these seeming dewdrops to be dissipated by the morning sun; but they remain unaffected. A touch shows that the glistening drops are glutinous and extremely tenacious, as flies learn to their cost on alighting, perhaps to sip the tempting liquid, which acts first as a decoy and then like bird-lime. A small fly is held so fast, and in its struggles comes into contact with so many of these glutinous globules, that it seldom escapes. The result is much the same to the insect, whether captured in the trap of *Dionœa* or stuck fast to the limed bristles of *Drosera*. As there are various plants upon whose glandular hairs or glutinous surfaces small insects are habitually caught and perish, it might be pure coincidence that the most effectual arrangement of the kind happens to occur in the nearest relatives of *Dionœa*. Roth, a keen German botanist of the eighteenth century, was first to detect, or at least to record, some evidence of intention in *Drosera*, and to compare its action with that of *Dionœa*, which, through Ellis's account, had shortly before been made known in Europe. He noticed the telling fact that not only the bristles which the unfortunate insect had come in contact with, but also the surrounding rows, before widely spreading, curved inwards one by one, although they had not been touched, so as within a few hours to press their glutinous tips likewise against the body of the captive insect—thus doubling or quadrupling the bonds of the victim, and (as we may now suspect) the surfaces through which some part of the animal substance may be imbibed. For Roth surmised that both these plants were, in their way, predaceous. He even observed that the disk of the *Drosera* leaf itself often became concave and enveloped the prey. These facts, although mentioned now and then in some succeeding works, were generally forgotten, except that of the adhesion of small in-

sects to the leaves of Sundews, which must have been observed in every generation. Up to and even within a few years past, if any reference was made to these asserted movements (as by such eminent physiologists as Meyen and Treviranus) it was to discredit them. Not because they are difficult to verify, but because, being naturally thought improbable, it was easier to deny or ignore them. So completely had the knowledge of almost a century ago died out in later years that, when the subject was taken up anew, in our days, by Mr. Darwin, he had, as we remember, to advertise for it, by sending a "note and query" to the magazines, asking where any account of the fly-catching of the leaves of Sundew was recorded. When Mr. Darwin takes a matter of this sort in hand, he is not likely to leave it where he found it. He not only confirmed all Roth's observations as to the incurving of the bristles towards and upon an insect entangled on any part of the disk of the leaf, but also found that they responded similarly to a bit of muscle or other animal substance, while to any particles of inorganic matter they were nearly indifferent. To minute fragments of carbonate of ammonia, however, they were more responsive. As these remarkable results, attained half a dozen years ago, remained unpublished (being portions of an investigation not yet completed), it would have been hardly proper to mention them, were it not that independent observers were beginning to bring out the same, or similar facts. Mrs. Treat, of New Jersey, noticed the habitual enfolding of the leaf in the longer-leaved species of Sundew (*American Journal of Science* for November, 1871), as was then thought for the first time—Roth's and Withering's observations not having been looked up. In recording this, the next year, in a very little book, entitled "How Plants Behave," the opportunity was taken to mention, in the briefest way, the capital discovery of Mr. Darwin, that the leaves of *Drosera* act differently when different objects are placed upon them, the bristles closing upon a particle of raw meat as upon a living insect, while to a particle of chalk or wood they are nearly inactive.

The same facts were independently brought out by Mr. A. W. Benentt at last year's meeting of the British Association for the Advancement of Science, and have been mentioned in the journals. If to these statements, which we may certify, were added some far more extraordinary ones, communicated to the French Academy of Science, in May last, by M. Zeigler, a stranger story of discrimination on the part, of Sundew-bristles would be told. But it is safer to wait for the report of the Committee to which these marvels were referred, and conclude this sufficiently "strange, eventful history" with some details of experiments made last summer by Mrs. Treat, of New Jersey, and published in the December number of the *American Naturalist*. It is well to note that Mrs. Treat selects for publication the observations of one particular day in July, when the Sundew leaves were unusually

active; for their modes vary with the weather, and also in other unaccountable ways, although, in general, the sultrier days are the most appetizing:

"At fifteen minutes past ten of the same day I placed bits of raw beef on some of the most vigorous leaves of *Drosera longifolia*. Ten minutes past twelve, two of the leaves had folded around the beef, hiding it from sight. Half past eleven of the same day, I placed living flies on the leaves of *D. longifolia*. At 12-48 one of the leaves had folded entirely around its victim, the other leaves had partially folded, and the flies had ceased to struggle. By 2-30 four leaves had each folded around a fly. . . . . I tried mineral substances—bits of dry chalk, magnesia, and pebbles. In twenty-four hours, neither the leaves nor their bristles had made any move like clasping these articles. I wet a piece of chalk in water, and in less than an hour the bristles were curving about it, but soon unfolded again, leaving the chalk free on the blade of the leaf. Parallel experiments made on *D. rotundifolia* with bits of beef and of chalk gave the same results as to the action of the bristles; while with a piece of raw apple, after eleven hours, "part of the bristles were clasping it, but not as closely as the beef, and in twenty-four hours nearly all the bristles were curved towards it," but not many of the glands were touching it."

To make such observations is as easy as it is interesting. Throughout the summer one has only to transfer plants of *Drosera* from the bogs into pots or pans filled with wet moss; if need be, allowing them to become established in the somewhat changed conditions, or even to put out fresh leaves, and to watch their action or expedite it by placing small flies upon the disk of the leaves. The more common round-leaved Sundew acts as well as the other by its bristles, and the leaf itself is sometimes almost equally prehensile, although in a different way, enfolding the whole border instead of the summit only. Very curious, and even somewhat painful, is the sight when a fly alighting upon the central dew-tipped bristles, is held as fast as by a spider's web; while the efforts to escape not only entangle the insect more hopelessly as they exhaust its strength, but call into action the surrounding bristles, which, one by one, add to the number of the bonds, each by itself apparently feeble, but in their combination so effectual that the fly may be likened to the sleeping Gulliver made fast in the tiny but multitudinous toils of the Lilliputians. Anybody who can believe that such an apparatus was not intended to capture flies might say the same of a spider's web. Is the intention here to be thought any the less real because there are other species of *Drosera* which are not so perfectly adapted for fly-catching, owing to the form of their leaves and the partial or total want of co-operation of their scattered bristles? One such species, *D. filiformis*, the thread-leaved Sundew, is not uncommon in America, both north and

south of the district that *Dionœa* locally inhabits. Its leaves are long and thread-shaped, beset throughout with glutinous gland-tipped bristles, but wholly destitute of a blade. Flies, even large ones, and even moths and butterflies, as Mrs. Treat and Mr. Canby affirm (in the *American Naturalist*), get stuck fast to these bristles, whence they seldom escape. Accidental as such captures are, even these thread-shaped leaves respond more or less to the contact, somewhat in the manner of their brethren. In Mr. Canby's recent and simple experiments, made at Mr. Darwin's suggestion, when a small fly alights upon a leaf a little below its slender apex, or when a bit of crushed fly is there affixed, within a few hours the tip of the leaf bends at the point of contact, and curls over or around the body in question; and Mrs. Treat even found that, when living flies were pinned at half an inch in distance from the leaves, these in forty minutes had bent their tips perceptibly towards the flies, and in less than two hours reached them! If this be confirmed—and such a statement needs ample confirmation—then it may be suspected that these slender leaves not only incurve after prolonged contact, just as do the leaf-stalks of many climbers, but also make free and independent circular sweeps, in the manner of twining stems and of many tendrils. Correlated movements like these indicate purpose. When performed by climbing plants, the object and the advantage are obvious. That the apparatus and the actions of *Dionœa* and *Drosera* are purposeless and without advantage to the plants themselves, may have been believed in former days, when it was likewise conceived that abortive and functionless organs were specially created "for the sake of symmetry" and to display a plant; but this is not according to the genius of modern science.

Sarracenias.—In cases of insecticide, next to be considered, such evidence of intent is wanting; but other and circumstantial evidence may be had sufficient to warrant conviction. *Sarracenias* have hollow leaves, in the form of pitcher or trumpet-shaped tubes, containing water in which flies and other insects are habitually drowned. They are all natives of the eastern side of North America, growing in bogs or low ground, so that they cannot be supposed to need the water as such. Indeed, they secrete a part, if not all, of it. The commonest species, and the only one at the north, which ranges from Newfoundland to Florida, has a broad-mouthed pitcher with an upright lid, into which rain must needs fall more or less. The yellow *Sarracenia*, with long tubular leaves, called "trumpets" in the Southern States, has an arching or partly upright lid, raised well above the orifice, so that some water may rain in; but a portion is certainly secreted there, and may be seen bedewing the sides and collected at the bottom before the mouth opens. In other species the orifice is so completely overarched as essentially to prevent the access of water from without. In these tubes, mainly in the water, flies and other insects accumulate, perish, and decompose. Flies thrown into the

open-mouthed tube of the yellow *Sarracenia* even when free from water, are unable to get out—one hardly sees why, except that they cannot fly directly upwards; and a microscopic *chevaux-de-frise* of fine sharp-pointed bristles which lines most of the interior, pointing strictly downwards, may be a more effectual obstacle to crawling up the sides than one would think possible. On the inside of the lid or hood of the purple northern species the bristles are much stronger; but an insect might escape by the front without encountering these. In this species the pitchers, however, are so well supplied with water that the insects, which somehow are most abundantly attracted thither, are effectually drowned, and the contents all summer long are in the condition of a rich liquid-manure. That the tubes or pitchers of the southern species are equally attractive and fatal to flies is well known. Indeed, they are said to be taken into houses and used as fly-traps. There is no perceptible odour to draw insects, except what arises from the decomposition of macerated victims; nor is any kind of lure to be detected at the mouth of the pitcher of the common purple-flowered species. Some incredulity was therefore natural when it was stated by a Carolinian correspondent (Mr. B. F. Grady), that in the long-leaved, yellow-flowered species, the lid just above the mouth of the tubular pitcher habitually secretes drops of a sweet and viscid liquid, which attracts flies and apparently intoxicates them, since those that sip it soon become unsteady in gait and mostly fall irretrievably into the well beneath. But, upon cultivating plants of this species, obtained for this purpose, the existence of this lure was abundantly verified; and although we cannot vouch for its inebriating quality, we can no longer regard it as unlikely. No sooner was it thus ascertained that at least one species of *Sarracenia* allures flies to their ruin, than it began to appear that—just as in the case of Drosera—most of this was a mere revival of obsolete knowledge.

The Insect-destroying Process.—This was well described sixty years ago, the part played by the sweet exudation indicated, and even the intoxication hinted at, although evidently little thought of in those ante-temperance days. Dr. James Macbride, of South Carolina—the early associate of Elliot in his "Botany of South Carolina and Georgia," and to whose death, at the age of thirty-three cutting short a life of remarkable promise, the latter, touchingly alludes in the preface to his second volume—sent to Sir James Edward Smith an account of his observations upon this subject, made in 1810 and the following years. This was read to the Linnæan Society in 1815, and published in the twelfth volume of its "Transactions." From this forgotten paper (to which attention has lately been recalled) we cull the following extracts, premising that the observations mostly relate to a third species, *Sarracenia adunca*, alias *variolaris*, which is said to be the most efficient fly-catcher of the kind:

"If, in the months of May, June, or July, when the leaves of those plants perform their extraordinary functions in the greatest perfection, some of them be removed to a house and fixed in an erect position, it will soon be perceived that flies are attracted by them. These insects immediately approach the fauces of the leaves, and, leaning over their edges, appear to sip with eagerness something from their internal surfaces. In this position they linger; but at length, allured, as it would seem, by the pleasure of taste, they enter the tubes. The fly, which has thus changed its situation, will be seen to stand unsteadily; it totters for a few seconds, slips, and falls to the bottom of the tube, where it is either drowned or attempts in vain to ascend against the points of the hairs. The fly seldom takes wing in its fall and escapes. . . . In a house much infested by flies, this entrapment goes on so rapidly that a tube is filled in a few hours, and it becomes necessary to add water, the natural quantity being insufficient to drown the imprisoned insects. The leaves of *S. adunca* and *rubra* [a fourth species] might well be employed as fly-catchers; indeed, I am credibly informed they are in some neighbourhoods. The leaves of the *S. flava* [the species to which our foregoing remarks mainly relate], although they are very capacious, and often grow to the height of 3 feet or more, are never found to contain so many insects as those of the species above mentioned.

"The cause which attracts flies is evidently a sweet viscid substance, resembling honey, secreted by or exuding from the internal surface of the tube. . . . From the margin, where it commences, it does not extend lower than one-fourth of an inch.

"The falling of the insect as soon as it enters the tube is wholly attributable to the downward or inverted position of the hairs of the internal surface of the leaf. At the bottom of a tube split open, the hairs are plainly discernible pointing downwards; as the eye ranges upward, they gradually become shorter and attenuated, till at, or just below, the surface covered by the bait, they are no longer perceptible to the naked eye nor to the most delicate touch. It is here that the fly cannot take a hold sufficiently strong to support itself, but falls. The inability of insects to crawl up against the points of the hairs I have often tested in the most satisfactory manner."

From the last paragraph it may be inferred that Dr. Macbride did not suspect any inebriating property in the nectar, and in a closing note there is a conjecture of an impalpable loose powder in *S. flava*, at the place where the fly stands so unsteadily, and from which it is supposed to slide. We incline to take Mr. Grady's view of the case. The complete oblivion into which this paper and the whole subject had fallen is the more remarkable when it is seen that both are briefly, but explicitly, referred to in Elliot's book, with which botanists are familiar. It is not so wonderful that the far earlier allusion to these facts by the younger Bartram should have been overlooked or disre-

garded. Fine writing was his foible; and the preface to his well known "Travels" (published at Philadelphia in 1791) is its full blown illustration, sometimes perhaps, deserving the epithet which he applies to the Palms of Florida—that of pomposity. In this preface he declares that "all the *Sarracenias* are insect-catchers, and so is the *Drosera rotundifolia*." "Whether the insects caught in their leaves, and which dissolve and mix with the fluid, serve for aliment or support to these kinds of plants, is doubtful," he thinks, but he should be credited with the suggestion. In one sentence he speaks of the quantities of insects which, "being invited down to sip the mellifluous exuvia from the interior surface of the tube, where they inevitably perish," being prevented from returning by the stiff hairs all pointing downwards. This, if it refers to the sweet secretion, would place it below, and not, as it is, above, the bristly surface.

Why should these plants take to organic food more than others? If we cannot answer the question, we may take a probable step towards it. For plants that are not parasitic, these, especially the Sundews, have much less than the ordinary amount of chlorophyll—that is, of the universal leaf green upon which the formation of organic matter out of inorganic materials depends. These take it, instead of making it, to a certain extent. What is the bearing of these remarkable adaptations and operations upon doctrines of evolution? There seems here to be a field on which the specific creationist, the evolutionist with design, and the necessary evolutionist, may engage in an interesting, if not decisive, "triangular duel."—*Garden*, *May* 1874.

On a new source of India Rubber from Pará.

Among the collection of natural curiosities which I made during a short stay at Pará, was a bottle of the juice of the massaranduba tree, which was given to me by my friend Capt. Bloem, as yielding gutta percha.

The principal use to which this juice is applied by the Brazilians is in mending broken glass and China. I saw several articles which were cemented with this juice, and am able to bear evidence as to the reported tenacity with which pieces of glass, &c., hold together after the juice has dried. This fact has been noted by Mr. Bates in his highly interesting book "The Naturalist on the River Amazons."

Bates, writing on the massaranduba, or cow-tree, says, "We had already heard a good deal about this tree, and about producing from its bark a copious supply of milk, as pleasant to drink as that of the cow. We had also eaten its fruit in Pará, where it is sold in the streets by negro market-women, and had

heard a good deal of the durableness in water of its timber. We were glad, therefore, to see this wonderful tree growing in its native wilds. It is one of the largest of the forest monarchs, and is peculiar in appearance on account of its deeply scored, reddish, and ragged bark. A decoction of the bark, I was told, is used as a red dye for cloth. A few days afterwards we tasted its milk, which was drawn from dry logs that had been standing many days in the hot sun, at the saw-mills. It was pleasant with coffee, but had a slight rankness when drunk pure; it soon thickens to a glue, which is excessively tenacious, and is often used to cement broken crockery. I was told that it was not safe to drink much of it, for a slave had recently nearly lost his life through taking it too freely."

Kingston, in his "Narrative of the Banks of the Amazons," says, "We went on a few yards further, when we stopped under an enormous tree, one of the giants of the forest. Its trunk was covered with deeply-scored reddish and rugged bark. Duppo patted it, saying, 'This my cow.' Another tree of the same species, but much smaller, grew near. He ran to it, saying, 'Small cow give better milk,' and began to attack it with his axe. After making a few strokes, out flowed a perfectly white liquid, which John, kneeling down, caught in the monkey-cup. As soon as it was filled, I handed him another, the milk continuing to flow in great abundance, so that we soon had four cups filled full of the tempting liquid. On tasting it we found it sweet, and of a not unpleasant flavour, and wonderfully like ordinary cow's milk.

"We returned to the hut with the prize. Domingos had meantime been boiling some coffee; as we had now no sugar, the fresh milk proved a most valuable acquisition. The Indians, however recommended us not to take too much of it. We kept it, intending to use it again in the evening, but on taking off the lid of one of the monkey-cups we found that our milk had thickened into a stiff and excessively tenacious glue. 'My cow good?' asked Sappo, as he saw us tasting the liquid. When we showed him the gluey substance in the evening, he inquired sagaciously, 'whether the milk of our cow would keep so long,' and we confessed that in that climate it would be very likely to turn sour. After this, on several occasions, we obtained fresh milk from the cow-tree for our breakfast and supper."

I must confess that my experience of its taste and flavour confirms what Mr. Kingston has written, especially as regards the recently collected juice, and I have no doubt that if the juice were carefully bottled up it would retain its freshness for a very long time, and without coagulating. I diluted a portion of this juice with water, after being bottled up for nearly two months, and my own impression of it, as well as that formed by several friends who tasted it at the time, were strongly in favour of its agreeable and milk-like properties.

Probably the unpleasant flavour described by Mr. Bates may be due to the juice being collected from a tin which has been filled for some time, and had lain exposed to the sun for many days, so as to have undergone slight decomposition.

The durableness of its timber in water has long been known to the Paraensees, who construct jetties and stages at their wharves principally of this wood, which they consider to be one of their most valuable woods for resisting decay under alternate exposure to air and water.

This should be a valuable wood for ship-building, since the durability of teak is said to be due to the existence of caoutchouc in its pores. The wood itself is very hard, and grows abundantly in the upland regions of the Amazons, but I am afraid the difficulty of transporting the trees when felled through the dense forest, among which it is always found, must remain an insurmountable barrier to its exportation on an extensive scale.

Several plants yielding milky juices have been noticed by travellers, among which may be mentioned, the cow-tree of Brazil, the Palo di vacca of the South Americans, and the Galactodendron utile of Kunth, the cow-plant of Ceylon (*Gymnema lactiferum*), the sap of which is used by the Cingalese for alimentary purposes, and the cream-tree of China.

Although travellers speak generally of these trees as being harmless, it is evident from the experience of Bates and others that the juices of such trees cannot be held to be innoxious. The cow-tree of Brazil belongs to the natural order *Artocarpaceæ*, a class containing many highly suspicious members. My specimen of the juice of this tree was much more limpid than that obtained from the siringia (*Siphonia elastica*), it was much lighter in colour, strongly resembling cream, and possessed a strong ammoniacal odour. In a tolerably close vessel it keeps much longer than the ordinary india-rubber juice without coagulating, which no doubt is due in a great measure to its more alkaline properties. It coagulates, however, under the same conditions as those which determine the coagulation of india-rubber juice obtained from the siphonia species. I obtained my specimens in the solid form by pouring the juice into a shallow dish and allowing it to stand for three or four days. The coagulation is rapidly accelerated by heat. The weight of solid india-rubber obtained from 22 ounces of juice was 14 ounces when dry. By destructive distillation it yields a large quantity of caoutchoucine mixed with other products obtained in the distillation of caoutchouc. Like ordinary india-rubber, it hardens by exposure to cold, and possesses great elasticity when soft. It does not melt without decomposition, and when melted remains soft and tarry. It is readily soluble in those menstrua which dissolve india-rubber, and is separated from its solution in ether on the addition of alcohol. The action of sulphur on it is precisely that which is so characteristic on india-rubber, and its behaviour to iodine, bromine, and

chlorine is in every respect similar. It possesses very high insulating properties, and no doubt is highly suited for those manufactures which depend upon a clean and pure india-rubber. My specimen is much harder and tougher than any india-rubber I have met with.

As the massaranduba grows in more healthy localities than the different species of siphonia, it is a question whether it would not be desirable to draw the attention of the Brazilian Government to this important discovery. It deserves notice that this juice is quite as rich in caoutchouc as the siphonia, whilst its collection would be less pernicious to the health of the population. I have been told that this substance is so plentiful that, if a demand could be created for it, it could be obtained for about one-third to one-half the price of the best Pará india-rubber. It was this statement which led me to examine it.

The copiousness with which the juice flows from the tree when cut, may be gathered from the remarks which I have quoted from Mr. Livingstone's book. Being more limpid than the juice obtained from the different varieties of siphonia, one would have imagined that it should flow more freely. This, I am disposed to think, is due entirely to the larger quantity of ammonia in the massaranduba, for the amount of solid matter is even greater than in the juice of the siphonia elastica. I may mention that the juices of both these plants which I examined were collected at the same time, the massaranduba juice being gathered from trees in the forests in the neighbourhood of Belem (Pará).

The precentage of solid caoutchouc from the massaranduba is about sixty-five, whilst the juice of the siphonia elastica yielded about 65 per cent., from which 20 per cent. to 25 per cent. would have to be deducted for water, so that, approximately, the siphonia would contain only 50 per cent. of dry, solid caoutchouc. I propose sending these specimens to the Museum of the Society of Telegraph Engineers, where any one interested in the subject can examine them.

I cannot close this paper without expressing surprise that a substance which has so long and so frequently arrested the attention of travellers and naturalists should have remained without being examined before. Probably the other lactescent juices referred to in this paper may eventually be found to owe this appearance to an emulsion of caoutchouc, in which, in addition to ammonia, saccharine and mucilaginous matters contribute to its being so perfectly blended with the watery portion of the juice, and prevent its being so easily or readily separated, as is the case with the generality of india-rubber yielding plants.—*T. Bruce Warren in Journal of the Society of Arts, July*, 1874.

Monthly Proceedings of the Society.

Thursday, the 5th February, 1874.

J. A CRAWFORD, ESQ., *President in the Chair.*

The proceedings of the monthly Meeting in December were read and confirmed.

The chairman read the Report from the Council

Proposed by Baboo P. C Mittra, seconded by Dr Tonnerré, and *resolved*, that the report be adopted

The members next proceeded, in accordance with the Bye-Laws, to the election of Officers and Council for the current year, and Messrs J Mackillican and T. M Francis, as Scrutineers, reported the result to be as follows:

President—Mr J A Crawford

Vice Presidents—Rajah Ramanath Tagore, Mr W Stalkartt, Dr George King, and Mr W H Cogswell

Secretary Mr A H Blechynden

Council—Mr R Blechynden, Baboo Pratapa Chandra Ghosa, Baboo Peary Chand Mittra, Dr C Fabre Tonnerre Mr E Broughton, Rajah Suttyanund Ghosal, Baboo Gonendro Nath Tagore Mr W Swinhoe, Mr W Pigott, Mr A Rogers Mr S H Robinson and Mr M Henderson

Standing Committees—The names of the following gentlemen were added to certain Committees in which there are vacancies

Sugar—Mr H B Turner *Fibres*—Mr W H Cogswell *Implements*—Mr J H Haworth

Fruit and Vegetables—Messrs Cogswell, Pigott, Rajah S C Ghosal, and Baboo P C Mittra

Tea—Mr A Carritt

Finance—Mr W Pigott

Garden Committee—Dr G King and Mr A Rogers

The Council submitted the following list of names of those who, though formally proposed and elected in 1871, had failed to respond to their election notices:

Messrs. C F F DeRoxar, N M Gasper, A[illegible], Capt. V Gaurain, Lieut. R Hunter, Rajah Madho Rao, and Baboo [illegible] and Dass

Resolved, that their names be removed from the list of Members.

The following gentlemen were elected ordinary Members:—

Koer Jugput Sing, Messrs T Lewis, Ingram, J E O'Connor, John Boxwell and W E Ponder.

The names of the following gentlemen were submitted as candidates for election:—

Edgar Hill, Esq., Indigo Planter, Beylah Concern, Benares,—proposed by Lt.-Col. G. B. Fisher, seconded by the Secretary.

E. G. Jenkinson, Esq., Civil Service, Saharunpore,—proposed by Col. W. B. Irwin, seconded by the President.

Dr. Henry Whitwell, Officiating Principal Assistant, Opium Agent, Ghazeepore,—proposed by Major W. S. Young, seconded by the Secretary.

The following contributions were announced:—

1. Flora Sylvatica of Southern India, Part 28, by Major Beddome, from the Government of India.

2. Icones Plantarum Indiæ Orientalis, Part 10. By Major Beddome. From the Government of India.

3. Report on Revenue Administration of British Burmah, for 1872-73. From the Chief Commissioner.

4. Catalogue of Plants in the Agricultural and Horticultural Society's Garden, Madras. From the Society.

5. Report on the production of Tobacco in India, by Mr. J. E. O'Connor, Registrar, Department, Agriculture, Revenue, and Commerce. From the Government of India.

6. Papers connected with the cultivation and preparation of Tobacco, compiled by Mr. P. Robinson. From the Compiler.

7. Proceedings of the Asiatic Society of Bengal for November 1873. From the Society.

8. On the sacred weights and measures of Israel, (Vol. 1) 12 Copies, by Lt. Pogson. From the Author.

9. A small quantity of pomegranate seed, acclimatized at Buxar, from Cabul stock. From Mr. W. H. Bartlett.

Mr. Bartlett states, that "two individuals from a tree of this description grew to an unusual size, one as large as an ordinary human head, and one the size of a small shaddock; the first was perfect, not having one imperfect seed." And in a subsequent note, in reply to an enquiry for further particulars, Mr. Bartlett adds,—"It must be borne in mind that those two fruits were grown under special circumstances. I had carefully manured the tree with light manure, in a trench dug round the tree a little distance from the roots, so that there should be no direct contact between the roots and the manure; then every day all the bath-room water with soap-water from the tub or the wash basin used to be poured into this trench. I made a hobby-horse of the thing for the time, but I may mention that the moment the tree first showed signs of flowering, I ceased all watering, and only watered occasionally after the fruit got to a good size; in short until the rudimentary seeds must have formed."

10. A tuber of *Boussingaultia baselloides*. From Capt. S. MacTier.

The following is an extract of Capt. MacTier's letter:—

"I send to-day by E. I. R., a large tuber of *Boussingaultia baselloides*, and

should like to know whether it is edible, or can be employed in any way, as the plant is easily cultivated and yields an enormous crop of tubers. About 14 months ago, I got a few small roots from England, and they have now produced masses of tubers, forcing their way well above the surface of the ground. The plant is very hardy, for a dog having broken the stem of one about 6 inches above the ground, I covered the end disconnected with the ground with earth, and the plant never even flagged, but at once sent out roots from the broken stem. The plant rapidly climbs to a height of 15 or 16 feet, and might grow higher, but the eaves of my house stop it. The flowers are white and fragrant. My plants flowered about the end of the cold season and again in the rains. The plant seems to like a shady situation, and remains a bright refreshing green all the year round. I shall be glad of any information as to possible utilization of the tubers."

Mr. Kurz of the Royal Botanic Garden, to whom this tuber was referred, thus writes regarding it:

"I have examined the tubers of *Boussingaultia baselloides* which you sent me. I can find nothing palatable in them, and I fear they will not be considered edible unless they could be seasoned in a similar way as King Louis's cook had done with the gloves that were so much prized by the gourmands, until they heard what they really had eaten. I find nothing published about the uses of *Boussingaultia* and, therefore, I suspect that also the natives of South America do not eat them. They are very mucilaginous and still more so when cooked. An ally of this plant, *Basella*, is much cultivated all over India as a potherb, but, like all other sags, is hardly of a nourishing character."

11. A collection of fruit grafts of peach, orange, and lemon. From Dr. Bonavia, Superintendent of the Public Garden, Luckuow.

12. A few roots of the "Lily of the Valley." From T. M. Francis, Esq.

13. A small quantity of mahogany seed from Chittagong. From Mrs. Bruce.

14. A portrait (in chalk) of Col. Robert Kyd. From R. Blechynden, Esq.

This portrait, which was taken more than 80 years ago, is in an excellent state of preservation. Col. Kyd proposed to the Court of Directors the formation of a Botanic Garden near Calcutta, and on its establishment undertook the duties of Honorary Superintendent from 1787, until his death in 1793. An interesting paper entitled "Notes on the foundation of the Royal Botanical Gardens," by the late Dr. Thomas Anderson, Superintendent of the Gardens, is published in the Journal, Vol. 1, N.S. The best thanks of the meeting were tendered to Mr. Blechynden for this interesting gift.

Dr. S. C. Mackenzie submitted a set of photographs (3) of various kinds of vegetables raised in the Presidency Jail Gardens, from seed furnished by Messrs. Vilmorin, Andrieux, & Co., of Paris. Dr. Mackenzie also sent for exhibition at the previous meeting on the 29th ultimo several excellent specimens of these vegetables raised in highly manured ground.

PROVISION OF SEEDS FOR 1874.

A report was brought up from a Special Committee in respect to the provision of seeds for the current year. The report, with certain alterations, suggested by the Council, was adpoted. The Committee recommend that the regular supplies of vegetable seeds be obtained from N. America and France, and small quantities of acclimatized seeds from Ootacamund. That the regular supplies of flower seeds be procured from France and Germany, and a small supply of acclimated seeds from Ootacamund; the first half of these to arrive in September for country members, and the second half by end of October. All the vegetable seeds by middle of August; particular attention to be paid to packing.

DISEASE OF THE "KODO" IN THE BUSTEE DISTRICT.

Read a letter from P. Wigram, Esq., Offg. Collector of Bustee, on the above subject:

Resolved, that the same be published in this day's Proceedings, with the view of eliciting, if possible, a remedy for this disease.

"Can you tell me any thing about a peculiar disease which has this year largely affected the Kodo *(Paspalum frumentaceum)* in this district. The grain has come up as usual, but a large quantity of it, though there is nothing apparently wrong, produces intoxicating effects when eaten. This is not new; the disease is thoroughly recognized by the natives who call grain thus affected "Matauna Kodo"—and I find it noticed both by Elliot and Chevers. Elliot says (Races of N. W. P. of India, Vol. II., p. 374) that it only occurs where Kodo has been sown two years running in the same field."

"Dr. Chevers mentions it in his Medical Jurisprudence, pp. 302 to 304. He says, apparently on Dr. Bonavia's authority, that the disease usually appears if the Kodo is ripening about September and rain happens to fall on it."

"Mr. W. Peppe who owns a large tract of land in this district, gave me a similar story last year, as the result of his experience, *viz.*, that if not cut when ripe in the Hindu month of Bhador (9th August to 6th September in 1873) but allowed to remain till Kwar (7th September to 4th October) and rain fell on it, the Kodo would become Matauna.

"But this year no rain whatever has fallen since September, and the grain is very largely affected.

"Since I saw the notice in Dr. Chevers' book, I have tried to get the experiment made of having the grain washed and eaten as rice, but I have not yet received a report of the effect. I doubt however whether it will be fairly tried for I can only act through the Tehsildar, and natives are shy of experiments.

"I have made a large land-owner promise to sow some of the Matauna grain next season and see what the result is.

"But what I want especially to know at present is whether there is any way of remedying the evil and making it fit for food. We are so short of all grain this year, that the withdrawal of any quantity from the market is a serious evil."

DISEASE-DESTROYING PROPERTIES OF EUCALYPTUS GLOBULUS.

Submitted an application from the Deputy Commissioner of Jubbulpore, applying for seeds of *Eucalyptus globulus*, "which has the credit of rapidly drying up unhealthy swamps."

The Secretary also submitted similar applications from at least a dozen other quarters, which he had been able to meet very partially, but had applied to the Madras Agricultural Society and to Melbourne for larger supplies of seeds, to enable him to respond more fully to these applicants, and probably to many more, now that the curative properties of this valuable tree are becoming more generally known. The Secretary took the opportunity of calling attention to papers on the subject in various publications, more specially to an interesting article (with figures) in a recent number of the *Gardener's Chronicle;* and to a valuable report by M. Raverett Wattel, on the *Eucalyptus* tribe, its introduction, culture, uses, &c, published in the Journal of the Acclimatization Society of Paris. The following translated extract refers specially to E. *globulus* —

"It is above all in obstinate cases where quinine and other febrifuges fail, observes M. Malangre, that the leaves of *Eucalyptus globulus* produce marvellous and almost incredible results. I have seen persons afflicted with intermittent fever for many years, that is to say where fits recur periodically and they have never been able to obtain a complete recovery, their life appeared as threatened. Thanks to this treatment, they have resumed all the appearance of health, its force and vigour.

In his lectures, says M. Professor Gubler, M Ahumada expresses himself in these words. "I can assure you that the infusion of leaves of *Eucalyptus globulus* in the treatment of intermittent fevers produce marvellous results. If you could see the number of persons who come to me in search of this remedy, and the despair of those to whom I am unable to give leaves, because my trees have become completely stripped, your doubts would soon vanish.

Again, the Algerian observers employ language not less favorable, and there are reports on all sides of success experienced in the province of Algiers and also in that of Oran. Drs. Lambert, Mares, and Trotter have been able to observe recovery from fevers which would not yield to quinine.

It is the same in Corsica where frequent cases of intermittent fever have enabled Dr. Regulus Carlotti, of Ajacio, to make many observations on this important subject. We owe to him a very remarkable memoir on the therapeutic action and the elementary composition of the bark of *Eucalyptus globulus*, in which strengthened at the time by his own experiences, and those of Dr. Tedeschi, a distinguished Physician of Corte, he expresses himself very decidedly on the success obtained. According to him, the *Eucalyptus* not only cures habitually, but in obstinate cases it would appear to offer advantages, very decided, over the sulphate of quinine.

Finally, Dr. Gimbert of Cannes, who has pursued since 1855 the most laborious researches into the physiological and therapeutic properties of the *Eucalyptus*, thinks most highly of this new agent. "It is a happy discovery for medicine, he writes to us, and the magnificent results I have obtained, place the *Eucalyptus* in the rank of the chief known medicines."

The following extract from the *Gardener's Chronicle*, as already alluded to, will also be found interesting:—

"In the *Comptes Rendus* for October 6, p. 764, M. Gimbert narrates the success of his experiments in improving the miasmatic climate of some parts of Algeria by plantations of *Eucalyptus globulus*. The tree grows rapidly, and possesses the power of destroying the malarious agency which is supposed to cause fever. It absorbs as much as ten times its weight of water from the soil, and emits camphorous antiseptic vapour from its leaves. The same tree has been tried with success at the Cape of Good Hope. A farm some 20 miles from Algiers was noted for its pestilential air in the spring of 1867; 13,000 Eucalyptus were planted there, since which time not a single case of fever has occurred. Numerous other like cases are cited. We presume these statements are substantially correct, although there may be some errors of detail, or interpretation of facts. A similar case is on record with reference to the sunflower. The Observatory at Washington, U. S., was placed in a very unhealthy marshy situation, and at certain periods of the year fever was rife in the neighbourhood, but after the ground was annually sown with Sunflower, the sanitary condition was much improved. As to the Eucalyptus, the honour of discovering this property is due to Sir W. Macarthur, of Camden, Sydney, Australia, to whom the credit is given by M. Naudin in an article in the *Revue Horticole*, 1861, p. 205, entitled "Plantations Hygieniques." This is a new and most important fact for the forest conservators.

The fame of the good qualities of Eucalyptus globulus, the "Blue Gum-tree" of Tasmania, has extended even to the columns of the daily press, and public attention being thus directed to it, a few further notes upon a tree which is of daily increasing importance may be of interest. As is well known the numerous species of Eucalyptus, known as gum-trees, iron-barks, or stringy-barks, are among the most characteristic features of Australian and Tasmanian vegetation. Many of them are extremely valuable as timber trees; others yield a resinous juice, which, when hardened, possesses powerful astringent qualities; and many are useful in various ways too numerous to mention. Among them all, however, there is none of more general utility or economic importance than E. globulus.

Even from an ornamental point of view this tree is well worthy of cultivation. The trunk, of which the outer layers of bark detach themselves, as in the Oriental Plane, is smooth and ash-coloured; the leaves are bluish green, or, when young, often glaucous-white, often from half a foot to a foot in length, and the flowers are large and axillary, growing close to the stem, either singly or in clusters of two or three. The tree sometimes attains the height of 200 feet; but often flowers

when not above 10 feet high. It is a native of valleys and moist localities of wooded mountains in various parts of Victoria, as well as of Tasmania.

Besides its very great value as a timber tree, this species of Eucalyptus, in common with many others, is of importance as a honey-producing tree. The flowers yield a large quantity of honey, and are greatly affected by bees; at least, such is the case in Australia, where the honey-bee of Europe, introduced there, spread in a few years in a remarkable manner, and soon established itself in the forests, in which the Eucalypti form nearly 99 per cent. of the vegetation. The leaves, probably from their coriaceous and resinous nature, are singularly proof against the ravages of locusts. This was noticed by M. Ramel in 1865, in a part of Senegal where E. globulus had been introduced, when the leaves of all other trees were devoured by the locust, those of E. globulus resisted their attacks. It has been proposed to employ the leaves and other portions of the tree in medicine, but Mr Broughton, the Government chemist of Ootacamund, does not find in either bark or leaves any traces of quinine, which was supposed to enter into their composition. He says:—"Much has lately appeared in the papers and quasi-scientific journals concerning the valuable qualities of the Eucalyptus globulus as a febrifuge. In the *Lancet* for April 20, 1872, a notice is given of the uses of this tree medicinally, in which it is stated that all parts are most favourable as a febrifuge medicine, and also that the leaves, when smoked, are most efficacious in allaying pain, calming irritation, and procuring sleep. This article furthermore informs us that Professor Vauquelin obtained an alkaloid from the bark which crystallised like quinine as a sulphate, and which yielded the ordinary reaction of quinine with chlorine, water, and ammonia. I have examined the bark and leaves, and have the honour to state that neither quinine, quinidine, cinchonidine, nor cinchonine is contained in the plant in any proportion." A French chemist, M. Cloez, has extracted from the leaves an essence analogous to camphor, to which he gives the name eucalyptol. This substance, which possesses the agreeable odour of the plant in the highest degree, seems to exercise upon the system an action similar to that of most other essential oils. Mixed with water, it yields a pleasant rather bitter camphor-like flavour. In Mauritius an infusion of the leaves was administered with some success in malarious fever, the leaves being sold for this purpose at 6*d*. per ounce. Cigars made from the leaves were exhibited in the Paris Exhibition of 1867, and recommended as being very efficient in promoting digestion; and in the last International Exhibition were some cigarettes made from the foliage, prepared by a chemist at Melbourne, who urges their employment in bronchial and asthmatic affections.

[Dr George King, who was unavoidably absent from the meeting, has since, at the Secretary's request, obligingly furnished the following particulars, which are introduced here to make the subject more complete.]

"*Eucalyptus globulus* has of late been credited with the properties of drying up marshy ground and of destroying the fever poison which is usually exhaled from such ground in warm countries. A good many people have therefore of late

applied for seeds with the view of establishing plantations in Bengal. My own experience of *Eucalyptus globulus* is that it will not grow in even moderately damp soil. It has been tried at Lucknow, Saharunpore, and Lahore, places very much drier than Calcutta, and the experience is that plants do well enough as long as their roots remain in the superficial dry soil, but as soon as they get down to the water line, and that is very superficial all throughout the rains, they sicken and die. About Calcutta I have never seen *Eucalyptus globulus* thrive at all well even during its first year, and while its roots ramified only in the driest obtainable soil. On the Nilgiris, where, although the rainfall is heavy, the drainage is excellent, the tree grows wonderfully. Indeed, the gum tree plantations on these hills are quite a feature in the scenery, and promise to become very valuable. At the Himalayan Hill Station of Ranee khet, I saw some trees three years ago which promised to do well, but there again the soil is open and the drainage excellent.

Moreover, from the fact of its thriving so well at elevations of from 5,000 to 7,000 feet, I believe the plains of India are too hot for this tree.

As to the reputed effect of the tree in making feverish places less so, or even entirely healthy, I can only suggest that possibly the localities so reclaimed may not have been swampy. Swampy places are not the only ones that are feverish, witness Central India and Scinde, and the reputation of *Eucalyptus globulus* as a fever-destroying tree may have been gained in a dry country. At all events I should be very sorry to plant a marshy feverish spot in Bengal with this tree in the hope of making it healthy, for I do not believe the species could be coaxed into growing into a tree in the water-loged soil of this Province.

A good deal has been written about the value of *Eucalyptus* as a remedy in malarious fever, and various elegant preparations of it are now advertised by a fashionable firm of druggists in London. Some of these have been tried in the Royal Victoria Hospital and Army Medical School at Netley, but the verdict is that the medicine is of small value in severe attacks, although it appears to have some good effect in chronic cases where quinine disagrees or has failed to effect a complete cure. Mr. Broughton's recent analysis shows that the tree contains no alkaloid like quinine. Whatever medicinal properties it may possess are due to fragrant resins with which all parts of the tree abound."

GROWTH OF VARIOUS ESCULENTS AS SUPPLEMENTARY OF THE NATIVE FOOD SUPPLIES OF INDIA.

In his letter reporting on the tuber sent by Captain MacTier, Mr. Kurz adds the following remarks on the above subject:—

"It would be very important, indeed, to have our attention directed to root crops, especially to those that are easy of cultivation and of a very amylaceous and nourishing nature. The ever-recurring famines in this country would suggest such, and it would really be a boon if the various roots, tubers, &c., not only of India, but still more so those of Tropical America, and Africa were collected and

subjected to a regular examination and to experimental cultivation, with view of supplanting by and bye, the numerous sags of little real nourishing qualities and of alleviating the miseries to which the improvident natives are exposed.

"As long as it is not possible to store rice by prohibition of export of the same year's harvest (which after all could only be commenced during a year of unusually heavy crops) we must necessarily look upon nourishing tubers as the only crops that may be expected to stand best droughts on the one hand and on the other to give rapid and abundant supply of food in time of need."

The Secretary intimated he had very recently received a communication from Mr. Henry Cope, at present residing in London, on the same subject, of which the following is an extract:

"Will you allow me to say a few words to your Society through you, on a matter of so great importance in these days of probable scarcity of food, if not famine, in Bengal.

I observe that Sir George Campbell, the Lieut.-Governor of Bengal, has recommended the introduction of vegetables, with the view of supplementing the food supplies of the country. I cannot say with certainty whether I made this suggestion years ago to your or to the Punjab Society, but the records of one institution or the other will shew that I did so, with the full conviction that it was very undesirable to depend so exclusively, as is the case in India, on any one particular class of food, and that it was especially within the province of the Society, whichever it may have been, to press the subject on the attention of the Government, who should in the first place distribute a suitable quantity of seed with the view of making a commencement accompanied by general instructions as to the mode of cultivation, &c. I remember specially pointing out that Mangold Wurzal should be selected as calculated to afford food for both man and beast."

COMMUNICATIONS ON VARIOUS SUBJECTS.

From T. M. Francis, Esq., a paper on the propagation of plants by leaves.

From C. Brownlow, Esq., a note on the Atlas-worm: its mode of feeding, &c.

These were referred to the Committee of Papers.

From H. Beadon, Esq., forwarding a wax-yielding insect and specimen of the wax and tree on which it attaches itself.

The following is an extract of Mr. Beadon's note:

"I send you herewith a small box, by favor of C. E. Clark, Esq., containing a spray of a jungle tree called locally 'Ruttongadura' (the d is the palatal d pronounced generally like the letter r.) I found it at a place called Chandowrie, in Pergunnah Khurkdha of this district, and seeing a curious wax-like substance on the leaves caused by the insect which will be seen on the stem and leaves. As I do not remember to have seen the insect before except in these parts, and am curious to know if the substance has any economic value, I should be glad if you could let me know what it is. If it be of any value, I am glad to know

how the insect could best be cultivated. The piece in the paper was one piece which surrounded the stem like a crust, and when rolled between the fingers it seems to be wax."

The Secretary mentioned that this is probably identical with the wax from Ranchee, submitted some time ago by Mr. Peppe. Agreed that it be also forwarded to Mr. F. Moore of the India House Museum.

From Messrs. V. Moran & Co., with two twigs of Tea bush attacked by an insect, with request for information as to the mode of treatment for eradication. (To be forwarded to Mr. Moore).

The following is extract of letter from Mr. Wingrove, of Gowhatti, by whom the branches are sent:

"I am sending you by post some pieces of wood from Tea bushes, of which I am sorry to say I have observed several more, especially among the Assam and Hybrid plants, which are full of eggs or chrysales of some insect. The natives tell me that the insect is a kind of caterpillar (borer,) and I shall esteem it a favor if you would make enquiries regarding it and let me know the amount of mischief the plants are likely to suffer from it. It seems to have attacked the healthiest new wood, and apparently the wood has been so healthy, that it has closed over the wound. I have shewn it to some planters here and they with myself have not observed it before. I have not been able to get a specimen of the parent of these."

From the Collector of Ghazeepore, with request for information as to the best method of preparing flax fibre, to meet an application on the subject from the Commissioner of Benares.

The Secretary mentioned he had given such full information as the records of the Society furnish.

From the Secretary, Agricultural and Horticultural Society, Saitkaira, applying for some aid on behalf of their annual exhibition.

Resolved that two bronze medals be sent to be awarded as prizes for best specimens.

From Messrs. Schroder Smidt & Co. intimating their inability to report on the substance prepared from the juice of *Landolphia Owariensis* as it is quite unknown to them. (Sent by the Conservator of Forests, British Burma, and referred to in Proceedings of December meeting.)

From Mr. W. F. Pondor, Honorary Secretary, Agricultural and Horticultural Society, Cachar, returning thanks for the three bronze medals voted last year, and states in what manner they have been appropriated.

The President read a letter from Sir J. P. Grant, Governor of Jamaica, to Sir W. Grey, intimating that the Superintendent of the Botanical Garden, Jamaica, will send for the Society's new Garden, a collection of plants, according to the list which he, the President, had forwarded some time ago. The collection may be expected about the middle of the year.

For the above communications and presentations, the best thanks of the Society were accorded.

Proceedings of the Society.

Thursday, the 19th March, 1874.

W. H. COGSWELL, ESQ., *V. P., in the Chair.*

The proceedings of the January meeting were read and confirmed.

The following gentlemen were elected members :

Messrs. Edgar Hall, E. G. Jenkinson, and Dr. Henry Whitwell.

The names of the following gentlemen were submitted as candidates for election :—

Harrison Spencer, Esq., Tea-Planter, Darjeeling,—proposed by Mr. A. B. Inglis, seconded by the Secretary.

W. A. Campbell, Esq., Manager, Sungoo River Tea Plantation, Chittagong,—proposed by Mr. P. L. F. Langlois, seconded by the Secretary.

A. Chamarett, Esq., Surveyor General's Department, Calcutta,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

C. W. Clarke, Esq., Jamalpore,—proposed by Mr. J. Craven, seconded by the Secretary.

W. R. C. Wright, Esq., Dehree Indigo Concern, Shahabad,—proposed by Mr. Craven, seconded by the Secretary.

John Martin, Esq., Calcutta,—proposed by Mr. J. A. Crawford, seconded by Mr. A. Rogers.

W. C. Tresham, Esq., Nujeebabad, via Bijnour,—proposed by Mr. A. Boulderson, seconded by the Secretary.

H. E. Thomson, Esq., Superintendent, Government Telegraphic Department, Calcutta,—proposed by Mr. A. Rogers, seconded by the Secretary.

James Fleming, Esq., Manager, Salgunga Tea garden, Cachar,—proposed by Mr. W. Aitchison, seconded by the Secretary.

S. U. Phipps, Esq., Custom House, Calcutta,—proposed by the President, seconded by the Secretary.

R. H. Carew, Esq., Tea Planter, Cachar,—proposed by Mr. W. Aitchison, seconded by the Secretary.

The following contributions were announced :—

1. The Gardener's Year Book and Almanack for 1874, from Dr. R. Hogg.

2. Report on the Administration of Bengal for 1872-73. Records of the Geological Survey of India, Vol. VI., Parts 3 and 4. From the Government of Bengal.

3. Observations on the filtration of the Hooghly water, and on the muddy water of the Hooghly, &c. From Mr. D. Waldie.

4. Iconones Plantarum Indiæ Orientalis, Parts 11 to 15. Flora Sylvatica for Southern India, Part 28. From the Government of India.

5. Proceedings of the Asiatic Society of Bengal, for December 1873 and January 1874. From the Society.

6. Catalogue of Plants in the Agricultural and Horticultural Society's gardens, Madras. From the Society.

7. A large collection of Orchids from Chuttuc. From Mr. J. K. Hudson.

8. A small collection of Orchids from Cachar. From Mr. C. E. Blechynden.

9. Bulbs (25) of *Lilium auratum*. From Capt. Lawrell.

10. Seeds of *Gloriosa superba*. From the President.

11. Seeds of the "Granadilla" (Passiflora quadrangularis?) From Dr. M. Cattley.

12. Seed of a *Calamus* from Assam. From Mr. C. J. Simons.

13. Seed of Mesua ferrea from Assam. From Dr. J. E. Grey.

14. Roots of 4 kinds of Bamboo from Cachar. From Mr. C. Brownlow.

Letters were read—

From Capt. E. Butler, forwarding a few potatos, as specimens of a crop raised at Cowcolly Light House, by Mr. James Daniel, the Superintendent.

The following is a memo. from Mr. Daniel, of his mode of growing these potatos:—

The seed potatos I procured from the potato merchants in town, care being taken to select the brown, rough-coated ones, about the size of a walnut, about the beginning of September; these I kept spread out in a room till the latter end of October, by which time they had all germinated. They were then planted in ridges, about a foot apart, and in pairs. The soil is clay and sand manured by ashes. The ashes are got by burning heaps of straw, dead leaves, and other refuse in the patch. It is then well ploughed and cleared with a rake of all grass-roots, weeds, and hard substances, such as broken brick, pieces of earthenware, bits of coal, &c. The ridges are then formed and the potato set about the close of October. In a month's time the plants will require earthing up, which must be repeated as they advance in growth. I ought to state that the seed must not be set too deep in the ridges, the depth of the seed potato itself is quite sufficient, lightly covered with earth, and leaving some of the shoots visible, and a small quantity of water poured round, not on each.

From the Commissioner, Presidency Division, submitting certain specimens of Country produce exhibited at the Show of the Saitkara Agricultural Society in February last, and asks for a report on them. (Referred to respective Committees.)

From Assistant Secretary, Chief Commissioner, British Burmah, submitting another sample of Jute which is used by the Hill men in Northern Arracan, for making rope, and asking for a report on market value and quality.

The Fibre Committee (Mr. S. H. Robinson) report on this specimen "as a good medium quality jute, strong, but short length, not more than 4 feet including the tops which have been cut off, but its great defect is its marks of branching, shewn by the numerous black marks where branches have thrown off, and which render the fibre weak at those places and consequently less valuable for machinery use. Present value about 3-8 per maund (would have been worth 4-12 annas per maund more, but for the above defect) being about 1 rupee less than current value of best Serajgunge."

From Lieutenant J. F. Pogson, Simla, offering certain remarks on the improvement of the indigenous Cotton of India; and on the subject of the earth-nut (*Arachis hypogea*) as food for man in times of scarcity.

From Under Secretary, Government of India, Agricultural Department, applying for a large quantity, a ton or less quantity, of Queensland Maize for cultivation in the Andamans.

The Secretary mentioned that the Society were unable to meet this application, but he had referred Mr. Lyall to the Superintendent of the Model Farm at Madras.

From Assistant Secretary, Government of Bengal, asking for some copies of the last monthly proceedings, (February) of the Society, in reference to the information therein contained respecting the valuable properties of *Eucalyptus globulus*. The Commissioner of Burdwan has recommended that some trees be provided to try the experiment of its efficacy in the fever districts of his Division. Complied with.

From Baron Von Mueller, Melbourne, and from the Department of Agriculture at Washington, applying for the Society's publications, and offering to reciprocate.

From C. J. Simons, Esq., forwarding branches of tea and other trees affected by the thread blight.

From Colonel R. Murray, submitting specimens of young tea wood eaten by a species of borer, which is in the wood. The Secretary stated that the insect would seem to be dead, but he had sent it, as also the thread blight, to Mr. Grote, for a report thereon.

From Collector of Nuddea, some particulars respecting the growth and curing of tobacco in his district, in response to the Society's Circular.

From Collector of Jessore, to the same effect.

Mr. G. Bartlett exhibited 8 geraniums in flower, including two double flowering varieties, probably the first seen in bloom in Calcutta. The colors are red, white, scarlet, and light salmon. The kinds known as Madame Vacher and Cerise were in the collection; all exceedingly healthy and well grown. Marks to be awarded at next meeting.

Mr. S. H. Robinson presented a very healthy seedling geranium to the garden, raised from Neilgherry seed sown in October last. He also exhibited two geraniums, red and white, raised from cuttings from the same locality: also specimen leaves of the indigenous Tea tree of Cachar, 8 inches long.

Thursday, the 15th April 1874.

W. STALKARTT, Esq., *V. P., in the Chair.*

The proceedings of the last meeting were read and confirmed.

The following gentlemen were elected Members:—

Messrs. Harrison Spencer, W. A. Campbell, A. Chamaret, C. W. Clarke, W. R. C. Wright, John Martin, W. C. Tresham, H. E. Thomson, James Fleming, S. U. Phipps, and R. H. Carew.

The names of the following gentlemen were submitted as candidates for election :—

Lieut.-Col. Harry A. Rooke, Bengal Army, Cawnpore,—proposed by Dr. R. H. Perkins, seconded by the Secretary.

W. B. Amberton, Esq., Indigo Planter, Ruttempore Factory, Kishnaghur,—proposed by Mr. J. G. Meugens, seconded by the Secretary.

J. S. Gray, Esq., (Smeal & Co.,) Cachar,—proposed by Dr. G. R. Ferris, seconded by Mr. W. Stalkartt.

Manager, Public Garden, Etawah,—proposed by the Secretary, seconded by Mr. W. Stalkartt.

E. H. Cowie, Esq., Merchant, Calcutta,—proposed by the Hon'ble B. D. Colvin, seconded by Mr. W. H. Cogswell.

Roop deo Rajah of Ali-Rajpore, viâ Sirdarpore, Central India,—proposed by Col. W. Kincaid, seconded by the Secretary.

James Macdonald, Esq., C. E., Allyghur,—proposed by Sir James Wemyss, Bart., seconded by Mr. W. Duthoit.

Rejoined,—Dr. D. Brandis.

The following contributions were announced :—

1. Annals of Indian Administration, Vol. 17, Parts 1 and 2. From the Government of Bengal.

2. Selection of Papers regarding the Hill Tracts between Assam and Burmah. From the Government of Bengal.

3. Journal of the Asiatic Society of Bengal, Part 1, No. 4. From the Society.

4. An assortment of Conifer seeds, *Pinus excelsa, P. Gerardiana, P. Webbiana, Abies Smithiana, Cedrus Deodora* and *Juniperus communis*. From the Superintendent, Royal Botanic Garden, Calcutta.

5. Seed of *Eucalyptus globulus* just received from Melbourne. From Messrs. Gisborne & Co.

6. Seeds of two kinds of Passiflora, *P. maliformis* and *P. quadrangularis*. From Dr. W. Cattell.

Resignation of the President.

Read the following letter from Mr. J. A. Crawford :—

"To the Members of the Council of the Agri-Horticultural Society of India.

"My approaching departure from this country obliges me to place in your hands my resignation of the Presidentship of your Council, to which the Members of the Society first did me the honor to elect me in 1868, and to which they have done me the further honor of annually re-electing me ever since. In

closing my active connection with the Society, I would take this opportunity of expressing my obligations to you, one and all, for the support that has been accorded to me in my endeavour to administer the affairs of the Society.

"I will only add that if at any time my services can be of any use to the Society, I shall only be too glad to exert them in its interests. With my warmest wishes for the welfare of the Society, I bid you farewell."

Submitted the following Resolution from the Council, passed at a special meeting held on the 30th March:—

"While accepting the resignation of Mr. Crawford as President of the Society, the Council would place on record their sense of his earnest desire for the welfare of the Society, as evidenced in the zeal and ability he has manifested during the long period of his Presidentship, extending over six years. The Council would further beg to propose the nomination of Mr. Crawford as an Honorary Member, and the presentation to him of an appropriate address."

Submitted the following copy of Address:—

"The Council and Members of the Agricultural and Horticultural Society of India cannot accept your resignation of the office of President, which you have held during the past six years, without placing on record and conveying to you their warm appreciation of the manner in which you have discharged its duties. They feel that your untiring activity in the interests of the Society, coupled with your business habits, your practical knowledge, your ability, and your love for your work, have laid them one and all under great obligations. They beg to annex copy of the Resolution of the Council passed on receipt of your letter, as well as of a Resolution by which you have been elected an Honorary Member of the Society. Reciprocating fully the kind feelings expressed by you for the welfare of the Society, and wishing you health and usefulness in your native land, they now bid you, heartily, farewell."

Proposed by Mr. W. Stalkartt, V. P., seconded by Baboo Peary Chand Mittra, and unanimously resolved:—

"That this Meeting desires to place on record its sense of the very valuable services rendered to the Society by Mr. Crawford, and that this Meeting cordially approves of the Address now submitted and of the recommendation of the Council to elect him an Honorary Member."

Donation to the New Garden.

The Secretary having intimated to the Meeting that just previous to his departure, Mr. Crawford had handed him a currency note for one thousand rupees as his donation towards the new Garden,—it was proposed by Mr. W. H. Cogswell, seconded by Baboo Pratapchunder Ghose, and unanimously *resolved*,—"that the best thanks of the Society be tendered to Mr. Crawford for this very handsome donation."

Election of President.

A recommendation was next submitted from the Council that Dr. George

King, Superintendent of the Royal Botanic Garden, be elected President of the Society, and the same was unanimously confirmed.

RESULT OF EXPERIMENTAL CULTIVATION OF SUNFLOWER AT BANGALORE IN 1873.

Submitted letter from the Officiating Secretary to the Chief Commissioner of Mysore, forwarding a statement, received from Colonel Boddam, in respect to his second year's experiments with imported Russian Sunflower seed.

Six pounds of imported giant Russian Sun-flower seed, which are double the size of ordinary Country seed, was sown in drills, 1 yard apart, at Bangalore, on one acre of first class raggi land, manured with 50 bandy loads of town refuse, on the 29th August 1873; date of harvesting, 20th December to 1st January 1874.

The plants reached 7 to 8 feet in height, bearing one large head; 6 were measured taken from a plot of average growth. Following is the result:—

No. 1.	35 inches	in circumference,	weight	3 lbs.,	1,875	seeds.
„ 2.	29 „	„	„	1 lb. 4 oz.,	1,4[illegible]	„
„ 3.	27 „	„	„	1 „ 4 „	1,140	„
„ 4.	27 „	„	„	1 „ 4 „	1,202	„
„ 5.	27 „	„	„	1 „ „	970	„
„ 6.	25 „	„	„	1 „ „	1,102	„

The leaves were sun-dried and pounded, about 500 lbs. of such dry fodder realised, which used mixed with meal and bran, &c., is good food for milch cows, and will keep a long time.

The seed was first husked by women and converted into coarse meal (20 seers of raw seed making 9¼ of meal) and this was then pressed for oil, fifty seers of the meal yielding three gallons of oil and 35 lbs. of oil cake.

The empty seed heads and stalks make fine fuel, which subsequently yields ten cwts. of ashes very rich in potash, excellent manure for coffee and tobacco.

The stalks are said to be used in China for fibre to mix for the China grass cloth.

I have valued the oil this time at nine annas instead of twelve annas per quart, and with the view to ascertaining its market value, a large quantity has been sent for experiment and report to the Agent and Manager, Madras Railway Company, also to the Commissariat and Ordnance Departments, Bangalore Central Jail, Cubbon Hotel Keeper, and Government Printing Press; and these Departments have been requested to furnish a report of the result of their experiments, and what price they would give per gallon for the oil.

OUTLAY INCURRED.

	Rs.	As.	P.
Manure	25	0	0
Ploughing, sowing, and harrowing	11	0	0
Cost of seed	1	0	0
Assortment of land	4	0	0
Harvesting	4	0	0
Watch pay	*12	0	0
Cost of husking and expressing oil	61	6	5
Rs.	118	6	5

RETURNS.

1,800 seers of seeds which will produce 50 gall. oil @ 9 annas per qt.	112	8	0		
Refuse as fuel	9	0	0		
Leaves as fodder	5	0	0		
Oil cake	6	0	0		
Potash	6	0	0		
				138	8	0
Deduct outlay				118	6	5
Profit				20	1	7

* The item Rupees 12 incurred for watching the crop is an extraordinary charge, the land available being uninclosed and near the native town, the flowers were liable to be stolen.

THE TEA BUG OF ASSAM.

The Secretary submitted the following extract of a letter from Mr. Grote on this subject:—

"Now about your Tea Bug, which, on referring to your *Gardener's Chronicle*, February 21st, you will find I brought before our R. H. S. Scientific Committee. Mr. Westwood, to whom I had previously sent copy of Peal's paper, was not at the Meeting, nor was A. Murray nor McLachlan, our other Entomological Members. Westwood's letter to me however is published *in extenso*, and I now enclose another from Mr. F. Moore, which expresses an opinion in support of Westwood and assigns the bug to Helopeltis, a genus described by Signoret who has figured a Ceylon species. I have pointed out to Mr. Westwood that his proposed remedies are hardly applicable to large areas of plantation. I hope that the pessimest view of the bug's ravages may not be borne out by results. Similar insect visitations have occurred and again disappeared in the coffee plantations of Ceylon and the Wynad. Please try and obtain two or three score of specimens

of these bugs. Peal's illustrations are very creditable to him or his artist, and your Society has done great service in publishing the whole series of them."

The following are Messrs. Westwood's and Moore's letters above referred to :—

"It is well known to me," observes Mr. Westwood, "from the very remarkable upright horn on the scutellum. It belongs to the Cimicideous family (Capsidæ), and is closely allied to a species which sucks out Chrysanthemum buds and greatly damages the blooms. The only chance of checking it seems to me to ascertain the place of deposit and destruction of the eggs if possible. Another plan (which has been suggested for checking the ravages of the Vine Tortrix) is to burn green weeds to windward of the plants. I should also think that if bird-limed strings were stretched over the plants, great numbers would be trapped, or light bags with the insides coated with some sticky material run along the top of the plants, like fishermen's landing nets, the flies would be thrown and caught in the nets."

"I have succeeded," writes Mr. Moore, "in making out Mr. Peal's Tea Bug of Assam. It is a species of *Helopeltis*, a genus of Hemipura (family Capsidæ) characterized by Signoret in the Annales Society Entom. of France, 3rd Series, pt. 12, fig. 2, and of which four species only are as yet known, one from Ceylon and two from the Indian Archipelago (Wagion and New Guinea). The Assam species much resembles that from New Guinea, and from its habit of feeding upon the juice of the tea plant, I have named it *Helopeltis theivora*."

Letters were read—

From R. Knight, Esq., Asst. Secretary, Government of Bengal, in respect to the poppy blight on plants in the Botanic Garden and Society's Garden.

From Dr. Geo. King, Superintendent, Royal Botanic Garden, intimating the transfer to the Society's Gardener, of all the plants, tools, &c., belonging to the Society's old garden.

From Commissioner, Presidency Division, on tobacco culture, &c. as pursued in the 24-Pergunnahs.

From Under Secretary, Government of India, Agricultural Department, applying for a maund of Carolina paddy for experimental cultivation in Assam.

From Secretary, Board of Revenue, Allahabad, enquiring if the Society can assist the Board in procuring seed of the Kotung bamboo.

A recommendation was submitted from the Council for a grant of Rs. 15 towards the Establishment. Agreed to.

Mr. Geo. Bartlett submitted, as requested, the following notes regarding the Geraniums, in flower, exhibited at the last Meeting—

They were received from a friend at Simla, who in August last put down 12 cuttings, 3 to 6 inches in length, in a small box, which was despatched in October undisturbed. I received 9 of them alive about the end of that month, and got them into 4-inch pots immediately. In about 7 weeks I was enabled to shift them into 9-inch pots and in which they now stand.

The soil made for them consisted of—

Quarter charcoal and potsherds.

Quarter silver sand and manure, equal parts.

Half common garden soil.

A week after the last shift, they were subjected to three bottom waterings, one in each week, and placed in a shady situation where they had the benefit of the morning sun for three hours, where they still remain.

Twelve marks were awarded to Mr. Bartlett for these plants.

Thursday, the 21st May, 1874.

W. H. COGSWELL, ESQ., *V. P., in the Chair.*

The proceedings of the last meeting were read and confirmed.

The following gentlemen were elected members:

Lt.-Col. Harry A. Rooke; Manager of the Public Garden, Etawah, Messrs. W. B. Pemberton, J. S. Gray, E. H. Cowie, James Macdonald, and Roop Deo Rajah of Ali-Rajpore.

Rejoined.—Messrs. B. J. Yate and W. S. Creswell.

The following gentlemen, who were elected members at the last monthly meeting, have signified their inability to take up their Membership: Messrs. James Fleming and C. W. Clarke.

The following contributions were announced:—

1. Patent Office Reports from 1869 to 1871, (7 Vols.) Report of Commissioner of Agriculture for 1871, and Reports of Department of Agriculture for 1872. From Government of United States of America.

2. Memoirs of the Boston Society of Natural History, Vol. II., Part 2, and Nos 2 and 3, and Proceedings, Vol. XV. for 1872. From the Society.

3. Selections from his records No. 17; Memo. on the Value of *Eucalyptus globulus*. From the Financial Commissioner of the Punjab.

4. Proceedings from November, 1873, to March, 1874, and Annual Report. From the Agricultural and Horticultural Society of Madras.

5. Proceedings for February, 1874. From the Asiatic Society of Bengal.

6. Report on the cultivation of Jute in Bengal. From the Government of Bengal.

7. Journal of the Acclimatisation Society of Melbourne for 1873. From Baron F. Von Mueller.

8. A further supply of seed of *Eucalyptus globulus* from Melbourne. From Messrs. Gisborne & Co.

9. Seed of *Pinus longifolius* for the Society's Garden. From J. O'Connor, Esq.

10. Seed (2 lbs.) of Bamboo from Burdwan. From C. T. Buckland, Esq.

Mr. Buckland remarks, that there are three kinds of Bamboo which have

flowered this year, under the names of Beur, Cawa, and Bashini. Of these the Beur, [*Bambusa spinosa* ?] has flowered most freely, and of this he sends seed.

11. A few tubers of eight varieties of Achimines and of hybrid Begonias (hybrids of Sedani and Pearcei) for the garden. From Dr. T. Beaumont.

12. A further supply of Mahogany seed. From W. H. Cogswell, Esq.

The following is extract from Mr. Cogswell's note, sending this seed for the garden:

"I send three cones, or seed vessels, which I have gathered from the Mahogany Trees (Swietenia,) in my garden at Tittaghur. Each cone will contain on an average forty or fifty seeds, and as they are quite fresh, all will readily germinate. I have to suggest that they should be sown at the Society's Nurseries without delay. Dr. King, of the Botanical Garden, is anxious to get Mahogany seed for distribution in Bengal, and as the tree grows so well, and is so very valuable, you had, therefore, better let him have a portion of these seeds. I think the subject is one well worth the attention of the Members of the Society, and the collection and forwarding of such seeds would prove a valuable aid, and enable us to strengthen the hands of the Superintendent of the Botanical Garden. I find that the oldest trees are the seed-bearing ones, but owing to their dense, handsome rich foliage, it is almost impossible to detect the seed cones, large though they be. This year I sent a mally up every tree to thoroughly examine them, and having found the seed cones, I had a thin piece of white cloth, a small bag in fact, tied round them, so that in the event of their being blown off the trees, during the strong winds prevailing at this season, the seeds would not be lost, for the moment they do mature, the four sections, or walls, of the pod or cone separate, leaving their inner coating or skin only, which dries rapidly, hardens, becomes shrivelled, and drops to the ground, leaving the light, fragile seeds exposed to the winds to be lost.

"All the seeds which I have collected for some seasons past have generally matured towards the middle and end of April, but most of my trees stand in great shade. Where trees are planted in an open situation, I consider seeds may be expected to mature about the close of March, or early in April, and I advise a search being made for them early in March, to protect the cones in the above manner, as I am satisfied that without some such precautionary measures, a very heavy percentage of seed is entirely lost to the country. The plant is of rapid and vigorous growth and requires very little attention when young.

"I may mention that one of my seedlings, now 3½ years old, has attained the height of about 18 feet."

The Secretary observed, that the demand for Mahogany seed was becoming greater daily. It would, therefore, be a great help to the Society if other members, similarly situated, would follow the good example of Mr. Cogswell. The small quantity hitherto received had merely sufficed for garden wants, to raise up

a stock for future distribution.

13. A second large supply of Orchids, from Chattuck. From C. K. Hudson, Esq.

14. A small collection of Orchids, from Chattuck. From Oswyn Weynton, Esq.

The Council submitted the following recommendations which were unanimously agreed to: That Mr. M. Henderson fill a vacancy in the Office of Vice President, and that Messrs. L. Berkeley and John Martin fill vacancies in the Council.

The Secretary placed on the table a copy just received from the Press, of Journal, Vol. IV., Part 2, and drew attention to the catalogue of plants in the new garden, including much useful information on several points, namely, new and rare plants, plants with handsome foliage, propagation of plants in various ways, with hints on the management of Roses. Some extra copies have been struck off to meet a probable demand from the public generally, for the valuable information it contains

The Secretary further drew attention to a copy of reprint from a recent number of the Journal of the Prize Tea Essays of Mr Watson and Col. Money. The Council had determined on reprinting these Essays in consequence of a demand for them and the first edition being out of print. The Council had, moreover, thought it advisable to put these Essays under one cover to make it more complete, as one contains information not introduced in the other, and *vice versa*.

The recommendation from the Council at the last meeting for a grant of Rs. 15 towards the establishment was withdrawn at their request.

Fibre-yielding Plants

Submitted the following letter from Lieut. J. F. Pogson, dated Simla, 9th May, with specimens of the fibre and grass therein referred to.

"By this day's bangy post, I have sent to your address a small parcel containing as follows, *viz.*.

1. "Packet of seeds of the Perennial Ghee ah-Turooee.

2. "Sample of fibre obtained by immersing green stems of the creeper (Ghee-ah-Turrooee) in alkaline water.

3. "Sample of fibre obtained by operating on dried stems of the creeper, gathered in October, 1873, when flowering had ceased, and the leaves had commenced to fall. The stems were dried in the shade, and operated on five months after gathering.

4. "Sample of "*Bha-bhur*" grass, common to the hot valleys of these hills, and also largely met with in the Sewallick Valley. It makes first-class "*well ropes*," and the *Bheesties* prefer it to "*Sunn*" and "*Moonjh*" as a rope fibre. This grass rope resists the action of water better than any thing else. At Umballa, the price is one and a half *maund* for the rupee.

"A well rope, made with this grass, lasts for over two years, and then re-

paired, for a few pice, and will last for six months longer. If tarred and treated as a rope made from hemp, it would probably be imperishable in, and under water.

"I think if the "*Bha-bhur*" grass was cultivated as a crop, cut when green, and operated upon, that it would yield a fibre fit for weaving into cloth.

"The straw of the "*Ghee-ah-Turooee*" is very strong, and could easily be woven into bags and matting, the former would answer well for rice, sugar, grain, saltpetre, &c., &c.

"The plant being a perennial, the expense of producing the material is confined to the first operation of sowing, and as it can be grown any where, the ryot's wife would soon learn how to plat the straw, (just as the date leaf is platted) for conversion into sacks.

"If weaving is understood, and may be practised without loss of caste, the fibre either twisted or untwisted, could be woven into sacks, and the valuable *jute* thus set free would be turned to account. These sacks when done with, would supply the British paper manufacturer with a very superior material for conversion into pulp and paper.

"If caste and indolence prevent the material under notice from being economised, it might be prepared for export, as a fibre for the paper-maker.

"To attain this end, the fresh cut stems should be tied up into bundles of convenient size, and subjected to the "water-retting process," care being taken not to over-rett the stems, as this makes the straw brittle and reduces its strength.

"The green stems are not injured by rain, hence the bundles may be left in the open, until there is room for them in the retting place. The green stem harvest will last till the end of August. *When* the plant ceases to flower, the stems, when dried, are brittle, and the fibre corresponds. The sample sent proves this. But if this reduction of strength is of no consequence to the paper-maker, then the harvest may be continued till the cold weather sets in.

"As the growth of fruit interferes with the production of stem growth, the ryots should be instructed to gather the flowers, as soon as open; and as they are good eating, the flowers will supply an excellent vegetable curry, from day to day, for months."

A NEW MODE OF PROPAGATING PLANTS.

Read a letter from Messrs. Schroder, Smidt, & Co., on the above subject, and submitted twelve lithographic illustrations and papers descriptive of a new method, of which Mr. Ossenhop is the patentee, of multiplying, in a rapid way, trees, shrubs, and plants, by means of twigs, the method being now for the first time laid by him before the public after an experience of 24 years in Europe, Asia, and Africa.

TOBACCO CULTURE AT DINDIGUL.

Read the following letter from Messrs. Campbell & Co., and submitted the lithograph alluded to:

"We forward you by "banghy" pre-paid, a tin case containing two copies of lithographs of an exotic tobacco plant raised in our plantation here, from seed sent out by Dr. Hooker, from Kew, to Hon'ble J. D. Sim, Madras.

"We have raised a higher stem and larger leaf before this, but we never succeeded so well in raising a thin-webbed, elastic, quick-burning leaf, in any former experiments.

"Dr. Hooker, we believe, called the seed "Manilla.'

"We took no particular trouble with this plant. There were many, about the same size. On the contrary, in starting planting operations last year, we did not look with much favor on the experiment. We had seed to plant ¼ acre from Kew.

"The ground was not specially prepared for this particular seed, though of course all our soil is generally well looked after, where too strong, it is reduced, where too poor, it is enriched, the plants are thus dieted; too much vigor is likely to produce a coarse leaf, and rough web is thus prevented.

"Under a powerful sun, with irrigation and manure, quantity and not quality, is here too much sought after.

"We trust these lines may encourage others to persevere in attempt to introduce exotic tobaccos into India."

Letters were read

From the Department of Agriculture, applying for flax seed for trial in Burmah. Complied with.

From Dr. Forbes Watson, Curator of the India Museum, London, acknowledging receipt of large sample of the Koorta gum of Cachar (see Proceedings of meeting of Dec. 1873) and promising to communicate the result in due course.

From Messrs Law, Somner, & Co, of Melbourne, acknowledging receipt of order for seeds for current season, and promising it their best attention.

From Messrs. Vilmorin, Andrieux & Co, of Paris, forwarding an invoice of 50 collections of vegetable seeds as precursor to the general collection.

Thursday, the 25th June, 1874.

W. STALKARTT, ESQ, V. P, *in the Chair.*

The proceedings of the last meeting were read and confirmed.

The following gentlemen were proposed as members:

C. J. Penny, Esq., M. D., Civil Surgeon, Umballa,—proposed by Mr. W. A. Robinson, seconded by the Secretary.

A. Sells, Esq., C. S, Ghazeepore,—proposed by Mr C. F. Carnac, seconded by Mr. W. Duthoit.

Daniel Fuller, Esq., Tea Planter, Chittagong,—proposed by Mr. R. M. Daly, seconded by the Secretary.

Superintendent of the Surat Jail,—proposed by the Secretary, seconded by Mr. S. H Robinson.

G. W. A. Boileau, Esq., Furreedpore Silk Concern,—proposed by Mr. W. Ridge, seconded by the Secretary.

Takile Sedenath Sing, Zemindar of Kerabally,—proposed by Mr. G. T. Peppè, seconded by Mr. H. Beadon.

A. G. Watson, Esq., Tea Planter, Chittagong,—proposed by Mr. R. Macalpine, seconded by the Secretary.

H. T. Cresswell, Esq., Shahpore Oondee Factory, Barrh, Tirhoot,—proposed by Mr. W. S. Cresswell, seconded by the Secretary.

Octavius Steel, Esq, Merchant, Calcutta,—proposed by the Secretary, seconded by Mr John Martin.

Omesh C Dutt, Esq., Vice Chairman, Calcutta Municipality,—proposed by Dr. Tonnerre, seconded by the Secretary

H. Glas Smith, Esq., Calcutta,—proposed by the Secretary, seconded by Mr. R. Blechynden.

S Collins, Esq., Calcutta,—proposed by Baboo P. C. Mittra, seconded by the Secretary.

Rejoined, C. K. Hudson, Esq.

The following contributions were announced

1. Forest Administration Report for 1872-73, in two parts, with Appendices; and Records of the Geological Survey of India, Vol VII., Parts 1 and 2. From Government of Bengal.

2. Report of the Committee of the Bengal Chamber of Commerce from November, 1873, to April, 1874. From the Chamber.

3. Journal of the Asiatic Society of Bengal, Part 2, No. 4, 1873; Part 2, No. 1, 1874; Part 1, No. 1, 1874; and Proceedings for March, April, and May, 1874. From the Society.

4. Report of the Agricultural and Horticultural Society, Central Provinces, for 1873-74. From the Chief Commissioner.

5. A glazed case of rare ornamental plants. From Messrs. Veitch and Sons of Chelsea.

The Gardener reports the receipt of these in very good condition. Out of 37 plants, only 6 were found to be dead.

6. Another large supply of Orchids. From C. K. Hudson, Esq.

7. A seedling of *Mesua ferrea*, raised from seed presented by Dr. Gray of Jorehaut. From Dr. S. C. Mackenzie.

8. Some tubers of *Alocasia macrohiza variegata* and offsets of Chrysanthemums recently indented from Mr. W. Bull. From Dr. T. Beaumont.

9. Seeds of double Zinnia and *Ipomœa rubra cerulea*. From G. Bartlett, Esq.

10. A quantity (10 lbs.) of seed of *Bambusa stricta*. From the Superintendent of the Royal Botanic Garden.

11. A few mangoes grown at Cowelly Light House. From Captain E. Butler. Captain Butler's object in sending these mangoes, as in the case of the potatos

at a recent meeting, is to show what can be done (with a little trouble) within half a mile of the sea face

12 Two bunches of purple grape (Malaga?) From Mr C E Price

The following are Mr Price's remarks regarding his treatment of the vine from which these grapes were taken

'I have much pleasure in giving a few particulars regarding the bunch of grapes sent you on the 8th Instant

I do not know how old the vine actually is, but my mally told me he saw it planted some 7 or 8 years ago

It is growing on a bamboo trellis against the west pillars of our verandah, exposed to the full influence of the sun after mid day, without any shelter whatever and the heat there is very excessive

As the vine had never fruited before I subjected it to the following treatment with very favorable results I think It bore about 20 bunches of grapes, six or seven of which were larger than that sent you

About the middle of December last I had its roots exposed until the leaves fell off when it was pruned of all branches thinner than a man's small finger, and the thicker ones scraped with a knife, the roots were then covered over with a mixture of three parts of well rotted cow manure, and one of common garden soil and watered copiously every day Once a week blood was applied to its roots

'The vine put forth its leaves vigorously the grapes forming at the same time, and these ripened towards the end of May

"No doubt as you say the grapes would have been twice their size, better developed and better ripened if they had been thinned when first forming, but as I never had any previous experience in the culture of the vine, I thought it a great success to have made this one fruit at all

The Head Gardener submitted a flower of *Lilium auratum* from the bulbs recently presented by Captain Lawrell Also blossom of *Hibiscus rosea sinensis miniatus semi plenus* and *Passiflora Imperatrice Eugenie* from plants indented from Mr W Bull of Chelsea

Floral Notes

The Secretary next submitted the following extract of a letter to his address from Mr Samuel Jennings late a Vice President of the Society now in England, descriptive of some of the flowers at one of the spring shows of the Royal Horticultural Society

I wish you had been with me yesterday afternoon (16th April) at the Great Flower Show at the Royal Horticultural Society at South Kensington, it was a glorious show of spring flowers, early Rhododendrons, Azaleas and Clematis, together with a very fair sprinkling of Orchids What strikes me now on seeing fine specimens of those Orchids we are accustomed to grow in our Calcutta Gardens

is, that in England they flower so much more abundantly than in India. On the other hand, neither in the size of the individual blossoms, nor in the depth and brilliance of their colours, do they come up in quality to Calcutta grown plants. I notice this particularly in Phalœnopsis Schilleriana, which here produces astonishing masses of bloom, but mostly pale in colour, and only about half the size of those sometimes seen in Calcutta. Only one plant at all came up in colour and size, and that I saw at Mr. Bull's Nursery a few weeks ago, an excellent figure of which will appear in No. 4 of my Work on Orchids: this is, however, admitted to be an unusually handsome strain. The plants that struck my attention most at the flower show were a glorious mass of Dendrobrium Nobile covered entirely with blossoms. Another Dendrobrium fimbreatum oculatum in very full flower. A plant of D. densiflorum had a single spray 14 inches long. Cypripedium hirsuitissimum, with, I should think, a dozen flowers in one pot, and the new Cypripedium argus from the Philippines, the lateral petals of which are covered with black round spots, a fine species. There were also some remarkably fine Masdivallias, a cool Orchid from Peru, of such singular colour that I doubt very much if the same purplish mauve tint is to be found in any other known plant so rich and intense: this is Mas. Harryiana, and the same colour, but lighter, in Mas. Lindeni. Cattleya Skinneri was there in fine condition, with several spikes of large rosy purple flowers, a most striking object. I also saw an immense plant of Oncidium ampliatum, far larger in its truss of bloom than any I had seen in India. The Odontoglossums were also in fine force, amongst which was a single plant of the new O. vexillarium, with flowers as large as Phalœnopsis grandiflora, white-stained, with a lovely delicate rose colour.

I think the great attraction of the Show was, however, a collection of Clematis, exhibited by Messrs. Jackman and Sons, of Woking. I had no idea that this beautiful climber had been brought to so much perfection and with so many varieties, from the deepest purple to the purest white: these are plants that ought to do in India, as they take a wide range of temperature; they are comparatively inexpensive; you should, I think, give them a trial. They are used here as trellis plants, for walls, pyramids, standards, rockeries, where they trail like ivy, and even pinned down in borders, and, from the prodigality with which they bloom, ought to be a valuable acquisition. Some of the flowers measure as much as five to six inches in diameter. Amongst the kinds I observed were: Vesta, very large, pure white; Lady Londesborough, silver gray, with chocolate anthers; "The Queen," delicate mauve lilac; Fortunei, double white, tinged with blush pink; Lord Gifford, dark purple; Baroness Burdett Coutts, pale pink, and many others.

Early Rose, particularly Marechal Neil, made a grand show, but none were equal in size or colour to those I grew in Allahabad. Some of the new Roses are very good indeed, particularly Madame Lacharine, H. P. white, with a pale rose center, and Mad. Prud. Homme, a splendid cherry red, with dark center.

Perhaps, it may be interesting to your Members to learn that Loquats are being sold in the streets of London at six for a penny, and in very good condition too: they were an importation from Madeira.

TEA BUG.

Read a letter from Mr. S. E. Peal of Sepakati, Sibsagur, Assam, promising, as requested, to send some more specimens of Tea Bug as soon as they make their appearance.

In connection with the above, the Secretary called attention to a recently received number of the *Gardener's Chronicle*, in which is a notice by Professor Westwood of the Tea Bug in question, and it was agreed that the same be published in the proceedings of this day's meeting.

The following is an extract from the Professor's paper:

THE TEA BUG.—It is unfortunate at a time when a "Free breakfast table" is considered as one of the political requirements of the day, that one of the principal ingredients of the meal should be subjected to the attacks of a minute enemy, which will, in all probability, if not checked either by natural or artificial means, materially diminish the supply. The establishment of large Tea plantations in different parts of the East, Assam, Java, &c., with the view of competing with the Chinese, has hitherto, to a certain extent, been successful, and the proprietors were beginning to dream of profits to the extent of 30 or 40 per cent. An insect has, however, appeared, which is about to check the growth of the plant to a very considerable extent, and we have the authority of a competent observer in stating that the "bug blight is steadily on the increase, and can affect the crop to fully 40 per cent., when bad: gardens otherwise capable of yielding 1,000 maunds, say, reduced to 700 or 800." Instead of attacking the old, and, for practical purposes, useless leaves (as is the case with the red spider, which is stated never to be found on the young and soft Tea leaves), this insect selects the tender and more juicy leaves, which are, in fact, those which are selected for consumption, puncturing them with its long and slender proboscis, in the same manner as an aphis. The attention of the public has been forcibly drawn to the subject by S. E. Peal, Esq., in a paper published in the *Journal of the Agricultural and Horticultural Society of India* (Vol. IV., Part 1, new series), in which he has detailed the method of the attack of the insect, and the extent to which it is injured.

The following is Mr. Peal's account of the progress of the disease:—

"On the tips of the young vigorous shoot being punctured, it has died as certainly as if nipped off, and the eyes below in the leaf axils shoot out vigorously, and ere the bug can do serious damage, one or two shoots have attained some size and carry several leaves; but as the insects increase in size these tips are again attacked, and other shoots start from other eyes, though attaining a less vigorous growth, and in a short time we have a regular 'broom' (or besom),

where not one leaf on the tip has been taken by us, but has been killed off, or sucked dry, by the bug alone. When this is the case, growth will have come to a complete stand-still, as every shoot requires from, say, 40 to 60 days to mature from an eye to be fit to pluck. The recovery of the Tea is slow unless pruned, and then the cure is about as bad as the disease, as far as our out-turn of crop is concerned. It is unfortunate that this bug is a direct competitor with us for young leaf, that it lives on the juice that actually makes 'tea,' and that the conditions most favourable for us are also ditto for them."

The insect which commits this serious mischief is a field bug (genus Cimex, Linnæus) belonging to the numerous family Capsidæ, or plant-sucking bugs, of which we have many closely allied species in this country. One, for instance (Capsus danicus), sucks ripe Raspberries, giving the fruit a very disagreeable odour and taste. Another (Phytocoris campestris) infests the young shoots and buds of Chrysanthemums, disfiguring the flowers by rendering portions of the petals abortive.

It was first described sixteen years ago by M. Signoret, who has devoted so much attention to the hemipterous insects, under the name of Holopeltis Antonii, after Dr. Anton Dohrn, the founder of the zoological station at Naples, in the *Annals of the French Entomological Society* for 1858 (pl. 12, fig. 2), from a specimen obtained from Ceylon. In 1871 we received specimens from Java, communicated by Herr Snellen van Vollenhoven, as injurious to the Tea plantations in Java, and now Mr. Peal has found it pursuing its injurious mode of life in the Tea plantations of Assam and Cachar. As we are informed by Dr. Hooker that the same variety of the Tea-plant has been propagated in these different localities, there can be no doubt that the insect has been imported with the plants, and that its appearance in these distant settlements is no proof of a difference of species, as might at first sight be supposed.

When the insect has assumed the still active pupa state, the rudimental wings are developed about one-third of the length of the abdomen, and from the scutellum arises a thick upright spine knotted at the tip, which is still more elongated in the perfect state of the natural size and magnified. Mr. Peal says that as the insect increases in size the colour deepens, but it is semi-transparent until full grown, when it turns black on the head and thorax, and white on the abdomen. Our Tea specimens from Java have the head black, the prothorax, scutellum, and scutellar horn pale fulvous, the abdomen chestnut, the antennæ and legs blackish, and the four wings semi-hyaline, slightly brownish, with the oblique division between the corium and apical membrane darker brown. M. Signoret figures his species with the prothorax redder, and a yellow marginal spot on the middle of the sides of the abdominal rings. A peculiarity of the insect is that the tips of the basal joint of the antennæ and of the thighs are, as it were, slightly knotted or tubercular. We have not seen the two species

from New Guinea and Wagrin, mentioned by Mr F Moore of the India Museum, in a communication to the Scientific Committee of the Horticultural Society

"An observation with which Mr Peal concludes his description of the insect, mentions the important fact that it has no set breeding time or broods It is consequently so much the more difficult to apply any decided remedy for its destruction at any fixed period of its existence The most feasible plan which has suggested itself to my mind for the extirpation of the insect, is to draw a long well tarred, or bird limed strip of cloth or linen over the trees, the insects, being very timid and active (such at least is the case with their English allies), would easily be roused, and trying to take wing, would be trapped by the sticky material Fumigation by burning weeds to wind ward (certainly not sulphur or charcoal), would also be effective if it could be made continuous Possibly, however this sudden outburst of the attack may be only temporary, as was the case with the injury to our Red Currant trees by Aphides a few years ago, and it is to be hoped that Nature will herself put an end to the disease

Letters were read—

From Dr Gc King from the Government Cinchona Plantation, Mungpoo, Darjeeling conveying to the Society his best thanks for the honor they have done him in electing him to be their President in succession to Mr Crawford

From I Halsey Esq Mudhoopore, Punjab, on its climate and productions. "If ever there was a place for a garden —observes Mr Halsey—"it is here I can grow nearly all tropical plants, I can grow most English ones We have neither the heat of Lahore and Umritsur nor their great cold, the result is a very beautiful mixture of vegetation The mangoe as you see it in Oude, the bamboo as in Bengal The orange in fruit nearly all the year round Strawberries in any quantity wild raspberries many trees only found at 5 and 6,000 feet of the Hymalayas Sugarcane, wheat, and rice all in the same soil With such a soil, with such a climate, anything could be done, but, as usual with so prolific nature man is extremely vile All the English plants grow magnificently, and we have only to send them a night's journey up the mountains to be out of harm's way"

From M Rustomjee, Esq, notifying the despatch from Bombay, per *S S. Asia*, of one hundred mangoe grafts for the new garden

The Secretary mentioned that when the order for these grafts was sent in April last year it was stated that great care ought to be observed in selecting good, strong, stout stem seedlings for grafting on That this precaution was neglected in some grafts sent to Calcutta from Bombay last year, and every graft perished, the slender seedlings being insufficient to support the heavy stalks grafted thereon From the Gardener's report it would appear these instructions were entirely ignored, as the following remarks by Mr Head would show — 'On June 1st, one hundred mangoe grafts were received, four of which were dead, and about eight have since died The grafts were not in good condition, the grafting was

also very bad, the scion being much too large for the stock, which is a very bad practice, the stock being unable to supply sufficient sap for the maintenance of the scion, which although uniting and growing for a time, the growths become weak and the plant ultimately perishes."

From W. D. Ireland, Esq., Deputy Commissioner, Henzada, British Burmah, applying for a quantity of the best "Patna" Paddy for experimental purposes.

The Secretary reported he had been able to meet this requisition in a satisfactory manner, through the kind aid of Baboo Peary Churn Mittra.

From John Horne, Esq., Director, Royal Botanic Garden, Mauritius, acknowledging receipt of seeds of timber trees, and promising to reciprocate in the shape of Palm seeds for the new garden.

From Messrs. Vilmorin, Andrieux & Co., of Paris, and D. Landreth & Son, of Philadelphia, enclosing invoices for seeds, and statements from various parties resident in India bearing testimony to the goodness of seeds supplied last year, in refutation of complaints from Members of the Society.

Thursday, the 30th July, 1874.

W. H. COGSWELL, ESQ., *V. P., in the Chair.*

The proceedings of the last meeting were read and confirmed.

The following gentlemen were elected members:

Dr. C. J. Penny, Superintendent of the Surat Jail; Messrs. Daniel Fuller, G. W. A. Boileau, A. G. Watson, H. T. Creswell, Octavius Steel, Omesh C. Dutt, H. Glas Smith, S. Collins, A. Sells, and Takile Sedenath Sing.

The names of the following gentlemen were submitted as candidates for election:

Dr. W. Schlich, Conservator of Forests, Bengal,—proposed by Dr. G. King, seconded by the Secretary.

Secretary, Local Funds, Raipore,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Krishna Dhan Ghose, Civil Surgeon, Rungpore,—proposed by Mr. W. Dodgson, seconded by Baboo P. C. Mittra.

Baboo Premchund Burrall, Calcutta,—proposed by Dr. Tonnerre, seconded by the Secretary.

Col. J. Tennant, R. E., Roorkee,—proposed by Mr. L. Berkeley, seconded by the Secretary.

A. Chardon, Esq., Beniagram Factory, Dhoolian,—proposed by the Secretary, seconded by Mr. Cogswell.

Lieut.-Col. C. D. W. S. Grant, Madras Retired List, Secunderabad,—proposed by Mr. Thos. Cole, seconded by the Secretary.

Manager of the Kallain Tea Garden, Cachar,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Superintendent of the Public Garden, Dera Ghazee Khan,—proposed by Mr. Robinson, seconded by the Secretary

Manager of the Heroncherra Tea Garden, Cachar,—proposed by Mr. Steel, seconded by Mr Cogswell

Manager of the Panicherra Tea Garden, Cachar,—proposed by Mr. Steel, seconded by Mr Cogswell.

Rajah Pirthee Sing of Awah, Agra,—proposed by Mr. J. Simson, C. S., seconded by Baboo P C Mittra

Nawaub Ahmed Alim, Russapugla,—proposed by the Secretary, seconded by Mr W Swinhoe

Rajah Narendra Krishna Deb Bahadoor,—proposed by Baboo P C. Mittra, seconded by the Hon'ble Rajah Ramanauth Tagore Bahadoor, C S. I.

E Morris, Esq, Manager, Hongkong and Shanghai Banking Corporation,—proposed by Mr W Stalkartt, seconded by Mr C Halford

The Hon'ble Rajah Jotendro Mohun Tagore Bahadoor,—proposed by Baboo P C Mittra, seconded by the Hon'ble Rajah Ramanauth Tagore

Robert Knight, Esq, Assistant Secretary, Government of Bengal,—proposed by Baboo P C Mittra, seconded by the Secretary.

G F Mewburn, Esq, Merchant, Calcutta,—proposed by Mr W. Pigott, seconded by the Secretary

Manager, Burma Company Limited Rangoon,—proposed by Mr Pigott, seconded by the Secretary

Secretary, Recreation Ground and Gardens, Jamalpore,—proposed by Mr D. W Campbell, seconded by Mr W Stalkartt

W F Gibbon, Esq, Jurcoleah, Chumparun,—proposed by Mr T. M Gibbon, seconded by the Secretary

R M Ross, Esq, Merchant, Calcutta,—proposed by Dr. Tonnerre, seconded by Mr Pigott

C H Denham, Esq, C E, Howrah,—proposed by Mr. Cogswell, seconded by Mr Stalkartt

Baboo Gokul Nauth Chatterjee,—proposed by Baboo P C. Ghosa, seconded by Dr Tonnerre

Rajah Komul Krishna Deb Bahadoor,—proposed by Baboo P. C Mittra, seconded by the Hon'ble R M Tagore.

Syud Wazeer Ally, Gya,—proposed by Mr. C. M Jerdon, seconded by the Secretary

Baboo Gocul Chunder Dutt,—proposed by Mr Cogswell, seconded by Mr. Stalkartt.

R H Hollingberry, Esq, Assistant Secretary, Financial Department,—proposed by Baboo P C Mittra, seconded by Mr. L Berkeley.

A D'B. Gomess, Esq, Commissioner of the Soonderbunds,—proposed by Mr. W. Swinhoe, seconded by the Secretary.

Rejoined.—F. Jennings, Esq., Calcutta, and C. W. Voss, Esq., Ganjam.

The following contributions were announced:

1. Addition to list of principal Timber trees for Victorian Industrial Culture. From the Author, Baron Ferd Von Mueller.

2. Report on Meteorology, Museum, and Horticultural Gardens, Oude, 1873-74. From the Commissioner of Oude.

3. Note on Lac, by J. E. O'Connor. From Government of India.

4. Report on the Administration of British Burma during 1872-73. From the Commissioner.

5. Report on the progress and condition of the Royal Gardens at Kew, during 1873. From Dr. Hooker, C. B.

6. Proceedings, Asiatic Society of Bengal, June and July, 1874. From the Society.

7. A collection of seeds of timber and other useful trees. From the Superintendent, Royal Botanic Garden, Calcutta.

8. A collection of orchids from the Andamans. From J. N. Homfray, Esq.

9. Seed of *Eucalyptus globulus*. From Capt. E. H. Collen.

10. Pomegranates grown in Cowcolly Light House. From Capt. E. Butler. As in the case of the mangoes at last meeting, and the potatos at a previous meeting, Capt. Butler sends this fruit to shew what can be raised, with a little trouble, within half a mile of the sea face.

11. A cask of Ollendorff & Co.'s dissolved Peruvian Guano. From Messrs. Ede & Hobson.

This guano has been transferred to the Gardener for experimental purposes.

Mr. Lynam submitted for inspection 2 pots of Caladium, the "Ducharte" and the "Albert Edward."

REPORTS ON THE PRESENT POSITION OF THE SOCIETY.

The Council submitted the following Reports from the Finance and Garden Committees, with a recommendation for their adoption:—

REPORT OF THE FINANCE COMMITTEE.

The Finance Committee beg to report to the Council that they have entered carefully into an examination of the present financial position of the Society. They find that after payment of all liabilities against the Society to the close of the current year, and after absorption of the vested fund to the amount of Rs. 42,700, there will remain a deficit of about Rs. 5,060.

2. From a careful examination of the details of expenditure, it appears that this unfavorable position of affairs has been occasioned, *firstly*, to the relinquishment since 1871 of the Government annual donation of Rs. 5,000, *secondly*, to the great and unprecedented demand in establishing and maintaining the new garden at Alipore, and *thirdly*, to an unusual diminution of members by resignations and non-elections. This last was foreseen from many complaints last year of the consignments of seeds not being of the usual good character.

3. So much in respect to the past. Your Committee have gone carefully into the several heads of expenditure, and have to report favorably in other respects of the working of the Society. Since 1868, the Secretary's establishment has been reduced for native writers from Rs. 120 to Rs. 56 per mensem. The menial establishment (peons, durwans, bearer, &c,) will not admit of any reduction At the commencement of 1869, a new department, that of agency for despatch of seeds to members, was formed This was very much needed. It has worked satisfactorily, both to the Society and its members. It fully pays itself, and leaves a yearly balance to credit It would, therefore, be impolitic to disturb this arrangement

4 The Committee are not prepared to recommend reduction of certain present membership privileges in the shape of seeds and journal, as it would assuredly lead to great dissatisfaction, the more so as this has hitherto been working satisfactorily, and without loss to the Society

For Gardener's house and ground	20 700
Cost of laying out garden, tanks, wells and propagating houses	9 220
Purchase of plants, tools &c	4 911
	34 840
Passage money, &c to Gardener	2 2 2
Establishment to June 1874	10 03
Rs	47 105

5 Though the new garden has been a great drain on the Society's resources,* indeed has mainly reduced it to its present low position, your Committee are not prepared to recommend, for the consideration of the Garden Committee, its temporary closing, provided immediate measures can be taken to improve, permanently, the income of the Society

6 From a carefully prepared estimate of receipts and expenditure for the next year, it appears that if the garden is to be maintained with its present staff, and only limited requirements added thereto, a monthly sum of Rs 500* will be required for it, or Rs 6,000 per annum, which will exceed the present income by Rs. 4,450, the liabilities will, therefore, increase from Rs 5,060 to Rs. 9,510 at close of 1875

*Establishment	Rs 4 0
Contingencies	,, 70
	500

7 To meet this additional demand on the resources of the Society, your Committee would recommend that an urgent general appeal be made to every member, to return new members.

17*th July*, 1874.

Since the above was written, the Committee have seen the report of the Garden Committee (in reference to para 5 of this report,) from which they learn that the Garden Committee are of opinion that the garden can be made self-supporting, or in other words that the proceeds by sale of ornamental plants and fruit grafts, &c, will realize about Rs. 6,000 per annum.

*28*th July*, 1874.

W. H. COGSWELL.
R. BLECHYNDEN.
W. PIGOTT.

REPORT OF THE GARDEN COMMITTEE.

The Garden Committee have had before them a report from the Finance Committee, regarding the present reduced financial position of the Society. From this, it would appear, that the whole of the vested fund has been appropriated for the establishment of the garden, and that a monthly sum of not less than Rs. 500 will now be required for its future economical maintenance.

In order to aid in placing the Society on a more equable position as respects receipts and expenditure, the Committee are of opinion, that immediate steps should be taken towards assisting to make the garden self-supporting; they therefore, recommend--

1*st*.—That the Society should use their best endeavours to make the garden more a *Nursery* Garden, than an *Ornamental Flower Garden*, and that to the attainment of this object, the larger portion of the land be strictly devoted to the purpose of a Nursery Garden only. That the portion now set apart for mango stocks for grafting, be devoted to that only. That another part be set apart for lichees, and other Indian fruit trees of sorts. Another, for the most approved peach trees. That only the most approved sorts of fruit trees be kept, and the rest destroyed. That a further portion be set apart solely for roses, and this should be as near water-supply as possible; and that a portion consisting of about 500 kinds should always be maintained to be kept up by importing, at least 100 to 200 fresh kinds every year from Melbourne, France or Belgium, England, Lahore, Utakamund, Cawnpore, Lucknow, Agra, and Saharunpore. That a further portion be set apart for ornamental shrubs and flower plants.

2*nd*.—That the whole efforts of the Society should be strained for the purpose of multiplying plants of all sorts; that every year an assortment of plants should be made out of the stock in hand for the use of members, to be supplied for distribution according to Rules, namely, an assortment, not exceeding 50 popular plants, including roses, be allotted gratuitously to each member requiring them annually, and a collection of fruit grafts, not exceeding 25, at the usual fixed rates; that the remainder be kept for sale, so as to make the garden self-supporting. That a catalogue of all the plants available for sale be carefully prepared, with the prices of every plant, and the same be widely circulated.

3*rd*.—That for the purpose of stimulating him to make the garden self-supporting, the Head Gardener be allowed a small percentage (to be hereafter determined) on all the gross profits that may be realized.

4*th*.—Your Committee, are lastly of opinion, that if the above recommendations be adhered to, and judiciously carried out, the garden should be self-supporting next year, and be worked as a source of profit hereafter.

Calcutta, 29th July, 1871.

W. H. COGSWELL.
WILLIAM SWINHOE.
CH. FABRE TONNERRE.
JOHN MARTIN.
W. PIGOTT.

The reports were adopted.

Floral Notes.

The Secretary submitted the following extracts of a letter to his address, from Mr. S. Jennings, in continuation of that read at the last meeting, regarding a Show of the Royal Horticultural Society of London, held on the 13th May last.

A few notes on the Royal Horticultural Flower Show of Wednesday, may not be unacceptable. A great deal of what I said regarding the show, I attended a month ago, again applies. Clematis were in fine show, also early Rhododendrons and Azaleas. Roses were stronger of course. I wonder if ever such magnificent exhibition specimens will ever be grown in India. Our old friend, Mr. Fer-minger, was there, though I did not see him till yesterday, when we met at the Royal Academy; he seemed to think that specimens such as we saw were not so beautiful as plants in a natural state, growing freely in the open air. I do not quite agree in this, for surely when a plant is carefully nursed, and brought to perfection in size, habit, and equality of bloom, it must be a more striking object than when it is allowed to take its untrained form. Many of our old favorites were there, as La France, General Jacqueminot, Victor Verdier, John Hopper, Gloire de Dijon, &c, and I still hold the same opinion as regards the superiority of the individual flowers produced in the upper provinces; but in no case have I ever seen in India, so grand a *tout ensemble*. All the plants in the same form, the same size, about five feet high from the tub, the bloom equally distributed over the whole plant, all the flowers equally expanded, every shoot in its right place, like a gigantic bouquet, perfectly arranged. Amongst the most striking of roses, not so well known in India, were "Charles Lawson," a very large full rose, of a rich rosy tint, "Lælia," very large open-petalled pink, "Duke of Edinburgh," fine form, crimson velvetty, and "Bessy Johnson," a charming blush rose.

Of Orchids there was a splendid display, especially a collection exhibited by "Lord Londesborough" including some very rare plants, such as Lœlia majalis, seldom flowered well in this country, and a nice plant of Dendrobium Parishii, with extra long pseudo bulbs. The flowers were, however, poor as compared with our Indian plants, but the most striking difference I noticed was in a well-grown plant of Vanda teres, with a single miserable panicle of pale washy flowers. This I was told by a gentleman who has had considerable experience of orchids in England, was a fine spike; I simply replied, that such a specimen would scarcely be thought worthy of exhibition in one of our Calcutta flower shows.

I also had a good opportunity of observing the difference between the two very similar Burmese Dendrobiums, Jamesianum, and infundibulum. In the size and form of the flowers they are much alike, the upper portion of the labellum of the former is a fine reddish orange colour, whilst in the latter it is pale canary yellow. In habit, the former is stouter and more hairy in its stems, the latter is slender and longer. I also saw the wonderful Cyprepedium cauda-

tum, with its astonishingly long lateral petals, hanging down like strings on each side of the flower, at least 20 inches long. There were also some fine plants of Cattleya Mossiæ.

Amongst the most striking plants worthy of attention on your side, I noticed the following:

Anthurium Scherzeranium.—Compact habit, single dark green, shining leaves, almost like an orchid in appearance; flowers rise above the foliage, like a curious piece of scarlet coral, half enclosed in a broad brilliant scarlet sheath.

Ficus parcelli.—A magnificent shrub, from the South Seas; leaves broad, pointed, and marbled and blotched in four distinct shades of green, one almost white. This is one of the grandest variegated leaved plants ever introduced, and it has a valuable quality, that as the plant grows older, the variegation strengthens. You certainly ought to have this, it seems to grow freely from cuttings.

Dracæna gemma.—A fine plant, with bronzy foliage and crimson and dark green streaks. Its peculiarity is that instead of its leaves growing out straight, like "D. terminalis," they curve under gracefully.

Casurina Sumatrana.—An immense improvement upon your old Casurina. Its foliage is very graceful and feathery, almost like Asparagus, and quite as fine. The habit of the plant is also vastly superior, the branches are pendent, almost "weeping" like some of the firs.

Adyseton (Alyssum) *Orientale* and *saxatile*.—Two charming border plants, producing masses of brilliant light yellow flowers, which ought, I think, to do well where the old Sweet Alyssum thrives.

Medinilla magnifica.—A most noble-looking shrub, with very large, broad, dark-green shining leaves, and magnificent long rosy bracts. It is a stove plant here.

Though of but little practical interest to Indian Horticulturalists, I cannot close this note without remarking what a grand improvement has been effected in Calceolarias during the past dozen years; a stand of these plants with their bright yellow pink, and brown flowers, richly spotted and mottled, is a most effective display.

TEA BLIGHT.

Letters were submitted on the above destructive pests, with specimens therein referred to:

A planter residing in Tezpore, in Upper Assam, thus writes under date 11th July:

"I send by to-day's post a sample box full of a kind of insects that attacked a few bushes in the garden. Luckily I saw it in time, and had them taken off, and the trees pruned low down, the trees round about smoked with cow-dung, dried, and a thin solution of lime and water spread over the surrounding ground. You never saw anything like the damage they did to 6 trees in one night. There was not a leaf or new shoot left. Mr. —— came over on purpose to see it, and he said all the time he has been in Assam, he had never seen anything of the kind.

I am very glad it has not spread, as, if it did, you would not get a seer of tea until the bushes began yielding. After having been pruned, only 8 trees have been attacked, and I can see no other on any more. The pieces of stem and leaf round the covers of these insects are from the tea tree."

It was agreed to send these to Mr. Moore of the Indian Museum.

Mr. S. E. Peal, of Sapakati, Upper Assam, in reply to an application for further and better specimens of the Tea bug, referred to in his paper, published in a recent number of the Journal, writes: "Curiously enough the bug is not here this year; the early and unexceptionally heavy wet may have something to do with it. I am looking out for specimens for you. We have no mosquito either here this year, so far, which, in connection with the above, is noteworthy."

Messrs. Playfair, Duncan, & Co. submit specimens of the tea bug, the same as that described by Mr. Peal, forwarded to them by Mr. W. Aitchison, of Doloo Garden, Cachar, who thus writes regarding them:

"I got these insects caught and put in a quinine bottle, and I killed them with tobacco smoke. I only put 3 puffs of smoke into the bottle and shut it up for 1½ minutes, when all had fallen down to the bottom seemingly dead. I then opened the cork and allowed the smoke to escape, and not one insect again showed signs of life. I was obliged to thoroughly dry the insects, indeed to bake them, in order that they might not go bad on the way, hence the brittle state of their delicate limbs."

Grasses and Fodder Plants.

The Secretary drew the attention of the Meeting to a valuable and interesting paper from Dr. Schomburgh, of the Royal Botanic Garden, Adelaide, Australia, on "Grasses and Fodder Plants;" more especially to the following portion relative to a particular description of grass *(Panicum spectabile)* which the Society has been endeavoring, but hitherto, ineffectually, to introduce into India, as a variety suitable for Upper Bengal and the N. W. Provinces:—

"For the introduction of the following splendid summer grass we have to thank Mr. H. W. Phillips, North Adelaide. No doubt it is a rival of the prairie grass, and stands our summer better than any other kind. It is also a panic grass (*Panicum spectabile*, Nees?). Mr. Phillips has kindly given me the following notes regarding this most valuable grass:—

'"This grass came up in my garden near the aviary, and no doubt came with the canary seed which I bought from Messrs. Hackett. It is very prolific, seeding abundantly; it can also be propagated from the large couch roots, which run a great distance under ground, any joint of which will grow. This seed should be gathered as it ripens, for it sheds easily. It will grow in the driest places; one plant came up between the wood and cement at the end of the verandah, which is so covered with passion flowers that it never got any water; still it grows notwithstanding all the traffic. The growth is very luxuriant, shooting vigorously about October, and continues to do so until the cold, wet

weather sets in; it grows three or four feet high, with tall spikes of seeds, which are very pretty, and the roots are often a yard long, and as large as a little finger. Instead of feeling the late extremely hot weather, I noticed it had grown much during the week. It is very sweet and succulent, and cattle eat it greedily; but it must not be sown in arable land, as it would be difficult to eradicate it. It would be useful on runs, not only for feed, but also for stopping bush fires. If a plough was run across and across the run, and either seed or roots planted, it would form a belt of green no fire would pass; or if eaten down, which it most likely would be, there would be a bare space to stop the fire. A single line would soon spread a yard wide. A seedling will cover a square foot the first year, and the roots can be taken up and planted without any fear of clearing the ground. It will come up again quite thickly, every rootlet growing. The roots also mat together, so that it is useful to plant to prevent water-courses washing away the soil, for which purpose I have given a large quantity of roots to Mr. Mais for the waterworks. In stony places, if a stone is raised and a joint or root placed under it, it will shoot up all round, and never wants re-sowing. You will be able to give the best information about time and mode of sowing; if too early the slugs eat it off, and I think it should be pretty deep, or the ants and birds eat it; it will sometimes lay two or three years in the ground.

"I have circulated the seed far and wide. I have distributed more than 1,000 packets; through Mr. Todd it has been sent to every telegraph station between Port Augusta and Port Darwin; a friend going home overland took nearly 100 packets for distribution on the route; another friend who travelled through Western Australia distributed and planted it wherever he went, and I am now sending a parcel to the Cape. I gave half the original plant, when about four years old, to a sheep-farmer. It filled a corn-sack, and the man had to make two trips to carry it away. It does not thrive so well in the hills; for, although it will grow, it is never so luxuriant as on the warmer plains."

Resolved.—That an application be made to Dr. Schomburgh for seed of this grass.

Communications on various subjects.

Letters were also read

From C. E. Livesay, Esq., Baroon, regarding specimen of cotton and seed, as described in the following extracts of letters:

May 28.—"Enclosed, in the same parcel, is a little cotton on which I should like to have an opinion. It is from a tree cotton plant, found growing in a neighbouring village in the Gya district, and is a perennial and very prolific."

June 21*st.*—"Yours of the 18th to hand. The cotton tree from which I sent you the sample is a solitary specimen in my garden, now two years old, and must have been when cut down, or rather pruned, about nine feet high, and as many in diameter. To me it appears more like a shrub, but the parent tree from which I

got the seed has been described to me as a large tree. Since I received your letter, I have made more particular inquiries; the tree or trees (there are only three or four) in a neighbouring village in the Gya District, do not appear to differ from my one in size, but in age being 10 or 12 years old, and the owner cannot tell from where the seed came originally. The plant is very prolific and bears twice in the year; and although the pods are very small, they are very numerous, and bear down the branches with their weight. I send you by this post some more of the cotton containing the seed, and also a small packet of seeds."

Mr. S. H. Robinson reports on this cotton as "good color, clean, soft silky fibre, good length for Bengal, and strong, properly separated from the seed would be worth 17 Rs. per bazar maund, in present dull market. The circumstance of this sample being from trees 10 to 12 years old, tends to show that the soil and climate are well adapted for cotton growing."

From W. H. Smith, Esq., Manager, Dehree Concern, Shahabad, sending some cotton which grows almost wild round about his factory.

Mr. Robinson also reports on this cotton as somewhat like that from Baroon in appearance, "but irregular in length and weak in staple; looks as if gathered from old trees which have degenerated. If separated from the seed, would be worth 13 to 14 Rs. per maund at present."

From W. L. Heely, Esq., Inspector General of Jails, forwarding a piece of gunny cloth made from the fibre of *Abelmoschus esculentus*, at the Jessore Jail, and requesting a report thereon.

Mr. S. H. Robinson, a Member of the Fibre Committee, thus reports on this cloth:

"The gunny is made into a bag which measures 29″ by 29″; present value, about Rs. 22 per 100 bags. The size most in demand is 40″ by 29″, of which the price for mill-wove gunny from jute is Rs. 28 to 32 per 100. The sample submitted is of hand-made cloth and not so close in texture as the jute fabric, and therefore not so well suited for general purposes, especially seeds and grains, and is therefore rather less in value than the difference in size alone would indicate. Being, however, very strong, it is even better for some purposes, such as coal bags, than the mill-wove kind, and in *limited* quantities, would find a sale at the above relative price to jute gunny. As to the probable profit on the manufacture, that must of course depend on the cost of production of the Abelmoschus fibre as compared with the current rate for jute."

From the Deputy Commissioner, Sumbulpore, asking for a report on Tobacco grown in the public garden, at his station, from acclimatized Virginian seed, received from the Government Botanical Garden at Saharunpore.

Mr. W. Swinhoe, a Member of the Committee, reports as follows:

"The tobacco you have sent for my inspection is very inferior stuff. The leaves are small and no care has been taken in the preparation of it. It seems

to have been properly dried, and then, in the state in which it had dried, to have been damped, and, without any attempt to open and flatten out the leaves, been heaped up in some damp place, so that it has become sodden and ruined. In its present state it is nothing but a bundle of stalks with little ragged parts of the leaves remaining in the stalks. If people will take no care in preparing and curing tobacco, it cannot be expected that any good or marketable commodity can be obtained."

From Dr. G. S. Sutherland, Inspector General of Prisons, Oude, sending down specimens of Rhea fibre prepared in the Jail at Lucknow, for examination and report.

The following is the report of the officer in charge of the Jail regarding the mode of preparation of the finer (carded) specimen.

"The cutting of the plant is begun immediately after the rains, *i. e.*, in the middle of September, or 1st week of October. Only a sufficient number of stalks are cut as can be barked in one day, the bark must be separated *at once*, if left over-night, gummy matter from the wood exudes and spoils the fibre. The separation is effected by breaking the wood across into short pieces, and peeling off the bark in long strips. After separation from the wood, the brown cuticle of the bark is removed by scraping with small blunt knives or pieces of broken glass. Maceration is begun at once; the time necessary to rot the fibre varies according to season, being a week in the warm, and 10 or 12 days in the cold weather. The following liquid is employed: 2 oz. "Sujjee" (impure carbonate of soda) is boiled in a gallon of water, till 1-3rd of the water is evaporated. The mixture is allowed to stand, to let any sediment settle to the bottom, the clear liquid is then poured into an open earthen vessel; into this about five seers of the cleaned bark is put, and sufficient water added to cover it. When decomposition begins it must be weighted so that it may be kept constantly under water: exposure to the air during rotting, tends to give the fibre a brown tinge. Nothing is required to be done during the process. When rotted, it is removed from the water, well washed, and dried. The washing is continued till the fibre is perfectly clean and bleached. It is prepared for spinning by combing with small horn or wooden combs. The fibre may also be picked by hand, but the process will take longer. The object of the combing or picking is merely to place the fibres parallel to each other and remove all knots and tangles. Working with a comb, one man cannot prepare per day more than ½ oz. of fibre such as sample, one seer therefore takes 64, and 2 seers, 128 men. One man could cut the stalks, bark, and rot sufficient for two seers fibre in one day, so that two seers of sample require the labor of 129 men to prepare fibre fit for spinning."

The uncarded sample, Dr. Sutherland states, can be produced at one-tenth of the cost of the other.

The Secretary mentioned he had examined both these specimens, having also had the benefit of Mr. W. Stalkartt's opinion. The finer specimen is very

superior, suitable for spinning into the finest class of fabrics, but its cost, at the lowest £800 per ton, would prove a bar to its use. Fibre of this quality can be worked up in England from the raw material and is valued at £200 per ton. The second specimen has been apparently prepared by the water retting process which has weakened it so considerably as to render it worthless. If prepared by the dry process, such fibre would probably fetch from £ 60 to £ 65 per ton in the English market.

From Patrick Stirling, Esq., Palumpore, Kangra, with a sample of oats. "In case you care to see them," writes Mr. Stirling, "I send you a sample of oats grown here from Scotch seed, given me by a friend. Four maunds sown, gave me 52 maunds when cleaned and stored. I believe these are the only oats grown in this district, and I should like to know how they bear comparison with any you have. I have been asked by many of the zemindars for seed, as they wish to sow them for their ponies."

Mr. Greenhill values the sample at Rs. 2-11 per maund, against Rs. 2-9 for the best Patna oats.

From Major W. S. Clarke, Deputy Commissioner of Luckimpore, Assam, sending a specimen of "Mishmee Teeta" and requesting information thereon. Given.

From Joseph Armstrong, Esq., Collector of Poorce, forwards specimen of a tree, common in his district, the seeds of which yield oil, which is extensively manufactured, and wishes to know the botanical name.

The Secretary mentioned that the specimen in question belongs to *Calophyllum inophyllum*, the "Sooltan Chumpa" of Bengal.

From Dr. Imthurn, Tezpore, Upper Assam, in respect to the introduction of *Eucalyptus globulus* in his district:

In reply to your favor of the 8th ultimo, I beg to acknowledge, with thanks, receipt of 3 packets of Eucalyptus seed, and also of a packet of Mysore thorn seed.

The latter seeds grow vigorously, but my experiments with the Eucalyptus seeds are not so satisfactory.

I found it impossible to get the seeds to germinate in the open, apparently owing to the soil being too moist.

Sown in pots, the seeds germinated pretty freely (from one-third to one-half of the number sown.) The time required for the germ to appear above ground was from 5 to 12 days, generally nearer the former term. The young plants, unfortunately, look weak and premature, and are very slow in making leaves.

The stalk bearing the cotyledons seems to have grown too fast, and proves too tender. Heaping up fine earth round the stalk does very little good, beyond preventing the stalks from bending under the weight of the cotyledons.

I have often noticed the same premature state with cold weather plants, which I wanted to raise during the rains, so as to have early seedlings. As

causes are, as far as my experience goes, either

Too rich soil, or

Too much humidity, or

Too little light (reflected or direct,) or

Too high temperature.

I have varied my experiments so as to satisfy myself that the premature state of the young Eucalyptus plants is not due to any of the first three causes just mentioned, and it seems, therefore, that the high temperature was the cause of the weakly state of the young plants.

The Secretary intimated that Mr. Sulpiz Kurz, of the Royal Botanic Gardens, had obligingly offered the following remarks on Dr. Imthurn's letter; that he had sent Dr. I. a copy thereof, and some seed of *E. rostratus*.

"I think like you that the failure of *Eucalyptus globulus* in Assam, is ascribable both to too great moisture and heat. It is true that the tree grows best in moist vallies of Victoria and Tasmania, and must there be subjected to a good deal of dry heat during the hot season, but still the distribution which ranges from 37 to 44° South Latitude, indicates its unfitness for the Assam climate, while it will no doubt prosper in the N. W. Provinces, etc., and still better in the Mediterranean countries.

Dr. F. V. Mueller has sent us another species, less temperate than the above, *viz.*, *E. rostratus*, and I enclose a few seeds for Dr. Imthurn for an experiment in Tezpore. Dr. F. V. Mueller thinks that this is the best kind for tropical regions in India, and possibly Dr. Imthurn may be inclined to try it, and let us know by and bye with what results."

For the above contributions and communications, the best thanks of the Society were accorded.

Thursday, the 27th August, 1874.

WILLIAM STALKARTT, ESQ., *V. P., in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members:

Dr. W. Schlich; Secretary, Local Funds, Raipore; Dr. Krishna Dhan Ghose; Baboo Premchand Burrall; Col. J. Tennant; Lieut.-Col. C. D. W. S. Grant; Manager of the Kullain Tea Garden; Superintendent of the Public Garden, Dera Ghazee Khan; Manager of the Heroncherra Tea Garden, Cachar; Manager of the Panicherra Tea Garden, Cachar; Rajah Perthee Sing; Nawaub Ahmed Alim; Rajah Narendra Krishna Deb Bahadoor; Messrs. A. Chardon, E. Morris, Robert Knight, G. F. Mewburn, the Hon'ble Rajah Jotendro Mohun Tagore Bahadoor; Manager, Burma Company Limited; Secretary, Recreation Ground and Gardens, Jamalpore; Messrs. W. F. Gibbon, R. M. Ross, C. H. Denham;

Baboo Gokulnauth Chatterjee; Rajah Komul Krishna Deb Bahadoor; Syud Wuzeer Ally, Baboo Gokul Chunder Dutt; Messrs. R. H. Hollingberry and A. D'B. Gomess.

The names of the following were submitted as candidates for election:

Rajah Gopal Sing of Jaboonh,—proposed by Col. W. Kincaid, seconded by the Secretary.

F. W. Holl, Esq., Nundeekotee, Hope Town,—proposed by Mr. John Stalkartt, seconded by Dr. Tonnerre.

Superintendent, Taj Gardens, Agra,—proposed by Mr. J. Simson, C. S., seconded by the Secretary.

T. Blissett, Esq., Government Telegraph Department,—proposed by Mr. John Martin, seconded by Mr. W. H. Cogswell.

H. E. Abbott, Esq., Manager, Jauntpore Factory, Tirhoot,—proposed by Mr. T. M. Francis, seconded by the Secretary.

J. H. Branson, Esq., Barrister,—proposed by Mr. W. Swinhoe, seconded by Mr. W. Pigott.

H. Remfry, Esq., Solicitor,—proposed by Mr. Swinhoe, seconded by the Secretary.

Manager, Local Funds, Baitool,—proposed by the Secretary, seconded by Dr. Tonnerre.

J. Ditmas, Esq., Tea Planter, Balleeparrah Garden, Assam,—proposed by Mr. George Grace, seconded by the Secretary.

C. Twyford, Esq., Tea Planter, Adelabannie Garden, Assam,—proposed by Mr. Grace, seconded by the Secretary.

J. F. Farquharson, Esq., Nun Matti Garden, Gowhatty,—proposed by the Secretary, seconded by Dr. Tonnerre.

The Hon'ble Mr. Justice Romesh Chunder Mittra,—proposed by Baboo P. C. Mittra, seconded by the Hon'ble Rajah Romanauth Tagore, Bahadoor, C. S. I.

Manager, New Gola Ghat Assam Tea Company,—proposed by the Secretary, seconded by Mr. Pigott.

Manager, Hanwall Tea Estate, Jorehaut,—proposed by the Secretary, seconded by Mr. Pigott.

Manager, Dessai Purbutea Tea Company, Jorehaut,—proposed by the Secretary, seconded by Mr. Pigott.

Moulavi Kabiruddin Ahmed, Calcutta,—proposed by Baboo Protapchandra Ghosa, seconded by Dr. Tonnerre.

Moulavi Abdool Jubbar, Calcutta,—proposed by Baboo P. C. Ghosa, seconded by Dr. Tonnerre.

R. Hadenfeldt, Esq., Merchant, Calcutta,—proposed by Mr. R. M. Daly, seconded by the Secretary.

A. V. Roberts, Esq., Assistant Engineer, Irrigation Works, Kurruckpore,—proposed by the Secretary, seconded by Mr. R. Blechynden.

The General Manager, Singell Tea Company, Darjeeling,—proposed by Mr. W. Pigott, seconded by the Secretary.

Manager, Teendarea Tea Company, Darjeeling,—proposed by Mr. Pigott, seconded by the Secretary.

Baboo Hemchunder Gossain, Serampore,—proposed by Mr. Swinhoe, seconded by Mr. Cogswell.

A Davies, Esq., Calcutta,—proposed by Mr. Martin, seconded by Mr. Cogswell.

Rejoined.—C. T. Davis, Esq., Solicitor, Calcutta.

The Superintendent of the Surat Jail, who was elected at the last meeting, has signified his inability to take up his membership.

The following contributions were announced: —

1. Annals of Indian Administration for 1872-73. Annual Report of Royal Botanic Gardens, Calcutta, for 1873-74. Correspondence relating to the famine in Bengal and Behar, October, 1873 to May, 1874, and special Narratives of the drought in Bengal and Behar, 1873-74. From the Government of Bengal.

2. Memoirs of the Geological Survey of India, Vol. X. part 2, Palæontologia Indica, Vol. 1, 1. From the Superintendent of the Geological Museum.

3. Journal of the Asiatic Society of Bengal, Part I, No. 11, 1874. From the Society.

4. Memoirs of the Literary and Philosophical Society, Manchester, Vol. IV, N. S., and Proceedings of the Society, Vols. 8 to 12. From the Society.

5. Twenty-second Annual Meeting of the British Indian Association, Calcutta. From the Association.

6. A further quantity of orchids and a few palms, &c., from the Andamans. From J. N. Homfray, Esq.

7. Cuttings of Chrysanthemums. From G. Bartlett, Esq.

8. Seed of the "Mysore Thorn," *Cæsalpinia sepiaria.* From the Agricultural and Horticultural Society, Bangalore.

9. A few pods of sugar loaf cabbage seed, raised in his garden, at Monghyr. From J. Craven, Esq.

Mr. Craven writes that more than ten cabbages flowered in his garden in March last, but only one went into seed. They received no particular attention except a liberal watering twice a week, in January and February, and three times a week in March.

RECOMMENDATIONS FROM THE COUNCIL.

That, as proposed by the Finance Committee, a portion of the vested funds to the extent of ten thousand rupees, be sold to defray outstanding liabilities. Agreed to.

That, as proposed by the Garden Committee, a commission of ten per cent. be allowed the Head Gardener on all sales of plants from the Garden. Agreed to.

The Secretary announced, with reference to several applications from Members, that the Society's consignments of flower seeds are expected in all next month, (September.)

Tea Blight.

Some further notes on this subject were submitted:—

Mr. S. E. Peal, writing from Sibsagur, Upper Assam, under date 2nd August, offers the following remarks:

"Some little time ago, I promised you Tea Bugs when they appeared, and subsequently sent word that there seemed few, if any, this year.

"I now find I was rather premature in this, as they are again causing damage.

"This year they seem to have shewn later than is usual, however, which is so far favourable: what the cause is, I cannot say.

"I have now, in less than half an hour, got a score or so of all ages, and shall send you a bottle ere long.

"I would draw your attention to the remedy suggested by Professor Westwood, *i. e.*, well tarred lines taken across the tea; the cure proposed is worse than the disease. "Tar" would alone ruin us in many ways, and the area is far in excess of what Professor Westwood must imagine. Gardens are often 300, 400, and 500 acres in extent, perhaps full of hills, or small, jungle-filled hollows of the tea, interspersed with forest trees and stumps.

"It would be extremely difficult *indeed* to find a sheet of tea where such a principle could be applied at all, certainly less than 1 per cent. of the tea areas.

"Again, tar would probably adhere to the shoots if soft enough to enable the insects to stick, and the shoots so touched would need to be *most* carefully picked out and destroyed, as a flavour of tar in the "Tea" would, I fancy, hardly be appreciated.

"But the insect really does most of its damage ere fully winged, and if disturbed, almost always *drops through the bush*, and thus some other way of treating the case is radically necessary. I capture them of all ages best by a camel hair pencil and small bottle of *spirit* (wide-mouthed bottle.) Once I see one, I seldom miss it, but they are not always easily *seen*.

"I need hardly say that "capture by hand" would not clear even half an acre —we must trust to nature and time. Every animal and plant has some special enemy or enemies; as we extend feeding grounds for the bug, we must expect it to increase until, in turn, its enemy does the same, and holds it in check far more effectually than *we* can. I do not think it was introduced with the plant; we have the tea indigenous here, and I much doubt if the insect confines itself to that plant alone, or did so hitherto. Can you tell me any thing about the little orange beetle? I fancy I see cause and cure there.

"Large enemies we can cope with, the smaller they are, the worse for us, as is always the case."

The Secretary mentioned that he had lost no time in sending to Mr. Moore, of the India House Museum, the orange beetles alluded to by Mr. Peal. Mr. Peal reports that they "eat the stems of young Tea shoots, wholly or partially through. The stem at once falls over, withers, and dies crisp and dark."

The Secretary next read the following extracts from letters he had recently received from a Tea Planter in Cachar:—

July 21st, 1874.—"Thanks for your note of the 15th, just to hand. We have had men working at the blight since the first week in May, and so far we have been able to keep it partially under control. I have made the discovery, that however effectually we may be able to destroy the insects on the bushes, they turn up from the jungle where they breed and hatch in strong force and settle on the bushes. The only thing, therefore, to be done, is to cut and burn the surrounding jungle, as extensively as possible. It is a great point gained to be able to know that we can destroy these insects. It is curious now to look back upon the exploded theory of atmospheric influences and poverty of soil.

31st July, 1874.—I have been working away at the blight since the 1st May. It appeared in April, and I made a mistake in not commencing the smoking business sooner than I did. In some of the places I have been working upon, I have cleared away the animals entirely. I have learned a great deal this year. One thing is perfectly clear—it is possible to keep the blight in check. But to do this, all the teelah surroundings where they harbour and breed, must be cleared away and burnt during the cold weather. It is the insect that is being hatched in the adjoining jungle that we are now contending against. They will not get the same head-way this year, as on former occasions; they lay their eggs in the stem, and I am having these carefully plucked off altogether. We are on the fair way of being able to deal successfully with this horrid plague. The only thing I am sorry for is that I did not commence earlier this season."

Tobacco.

Letrs were next brought to notice from the Secretary, Department of Agriculture, Revenue, and Commerce, submitting specimens of Tobacco raised in the Settlement of Port Blair and in Travancore, and from the Commissioner of the Presidency Division, with specimens grown at Baraset and Satkaira.

The report of the Tobacco Committee, (Messrs. Swinhoe and Eisenlohr) is altogether favourable on the Tobacco from Port Blair, but those from Travancore and the neighbourhood of Calcutta, they consider almost valueless.

Safflower.

The next communication read was a letter from the Commissioner of the Presidency Division, forwarding a letter from the Collector of Jessore, with enclosures, relative to experiments made on the culture of Safflower in that district. Specimens of the Safflower and oil extracted from the seed were also forwarded. The Collector of Jessore states, "that the reports of the Deputy Ma-

gistrate of Magoorah and Nurrail, in whose sub-divisions only the experiments have been tried, shew conclusively that Safflower can be reared in the low alluvial grounds to the east of the district, and this being known it will be for capitalists, if they find it worth their while, to introduce the cultivation."

The following is a report obligingly furnished by Messrs. Toulmin and Co., on the above specimens:

"We have carefully examined the Safflower sample, and also the oil sample: the latter we can offer no opinion of, as it never comes to market.

"The sample made of the flower by Mr. Oman is almost entirely useless from want of sufficient care being taken in its manipulation. The other sample of flower from "Narail" has evidently been carefully prepared, but without a sufficient knowledge of the delicateness required in working the article, and in consequence, the cakes are much misshapen. Its value in to-day's market, properly prepared, would be about rupees twenty-eight per bazar maund.

"We have much pleasure in sending you a few cakes of good flower, suitable for our market here, and the value of which to-day is about rupees thirty-four per bazar maund."

In reference to the above, the Secretary called attention to some notes in the descriptive catalogue of the Indian Department of the International Exhibition of 1862, on Safflower oil, of which the following is an extract:—"When properly refined or prepared, it is used in India for culinary and other purposes. This oil deserves more consideration than it has hitherto received in this country [England,] and if once fairly introduced, there is no doubt whatever of its becoming a staple import. It is used in some of the Government workshops as a "drying oil." It is believed to constitute the bulk of the celebrated Macassor oil."

In another report it is said to form the basis for fancy soaps.

The Secretary placed on the table, from the Society's collection of oils, two samples of this particular description; one presented so long ago as in 1845, the other in 1849. The latter is still beautifully clear and of fine color.

Communications on various Subjects.

Letters were also submitted:

1. From the Secretary, Chief Commissioner, British Burma, forwarding certain printed papers upon the subject of the Agricultural Shows, which have been held on the different districts of this Province during the past year, and inviting consideration as to the extent to which the Society can co-operate with the Government in the encouragement of the growth of improved crops, and the improvement of Agricultural stock, by awarding medals, or other prizes for any special head in any of the districts. The letter concludes thus: "Mr. Eden would suggest that perhaps the Society might be able to induce some of the merchants connected with the export trade, to give prizes for any article of produce in which they are specially interested."

It was agreed, on the recommendation of the Council, to place 12 bronze medals, at the disposal of the Chief Commissioner, for prizes for such articles of produce as he may consider most worthy of development.

2. From the Assistant Secretary, Government of Bengal, enclosing a memo. regarding a recent flowering of the Bamboo in the Malda district, and requesting such information on the subject generally, as can be afforded.

3. From the same, conveying the Lieutenant-Governor's thanks for the information given in response to the above.

4. From the Deputy Commissioner, Luckimpore, Assam, forwarding a sample of a creeper called "Saganlota" in Assamese, which grows in abundance all over the country, and is chiefly used by the natives as a febrifuge.

Mr. Kurz, to whom this specimen was referred, recognizes it as that of *Tinospora cordifolia*, Miers. "Several of these Menispermaceæ," adds Mr. Kurz, "are well known for their febrifugal qualities, and more especially so *Tinospora crispa*, a decoction of which is sometimes used as a substitute for quinine in the Malayan Archipelago."

5. From H. D. Mackenzie, Esq., Munguldye, Durrung, Assam, of which the following is an extract :—

"I am not a member of your Society, but I was much interested in reading the remarks of Dr. Imthurn of Tezpore, in respect to the introduction of the Eucalyptus (Blue gum) in this district. About three years ago I got up some Eucalyptus and silver wattle seeds from Tasmania, but unfortunately, nearly all the seed was destroyed before reaching me, but out of a number of the former seed I planted in the open air, I got about twelve very fine plants. These were planted out, when about a foot high, to the spot I wished them permanently to remain in, but to my surprise in one night they were all cut down by crickets, but one fine plant, about two feet high, which was growing lustily. My Mali very foolishly, to protect this plant, went and put split bamboos all round and then covered the whole up with thatch, which of course excluded all air and light. The mistake I discovered too late to save the plant. If I recollect right, the seeds were put down about November, but I am of opinion that the Eucalyptus will grow well enough here. The destruction by crickets can be prevented as in tea seedlings. I am a native of Tasmania, and consequently able to judge of the healthiness of the plants I had. The only one wattle plant I got, grew up to about ten feet high and died, it got very sickly the last year, but whether from climatic influence or not, I am unable to say.

"If you could send me a few good Eucalyptus seeds in an envelope about November, I would be glad to try them, as I believe, if the gum tree would grow in Assam, many a poor fellow would be saved from the dreaded fever."

6. From W. McCornish, Esq., (Sanitary Commissioner's Office,) Madras, dated 23rd May, in reference to the account submitted at the last meeting regarding *Panicum spectabile*, "I shall be very much obliged to you—writes

Mr. McCornish," if you can assist me in procuring some seed of this grass for trial in this part of India. Our railway Engineers have a problem yet to solve, *viz.*, how to bind their embankments of regur ('black cotton soil') so as to prevent scour and wash after heavy rain. The account of the matting of the roots of this grass seem to hold out a hope that it may be of service to them, and if it turns out half as well as it is described, it should be a very valuable plant in India, where our useful grasses are by no means numerous. Any expenses in connection with the seed, I shall be happy to disburse, and I promise to give the cultivation of the grass a fair trial."

For the above contributions and communications, the best thanks of the Society were accorded.

Thursday, the 24th September, 1874.

WILLIAM STALKARTT, ESQ., *V. P., in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members :—

Rajah Gopal Sing, Superintendent, Taj Gardens, Agra ; Messrs. F. W. Holl, T. Blissett, H. E. Abbott, J. H. Branson, H. Remfry, J. Ditmas, C. Twyford, J. H. Farquharson ; Manager, Local Funds, Baitool ; the Hon'ble Mr. Justice Romesh Chunder Mittra ; Manager, New Gola Ghat Assam Tea Company ; Manager, Hanwell Tea Estate, Jorehaut ; Manager, Dessai Purbuttea Tea Company, Jorehaut ; Moulavi Kabiruddin Ahmed ; Moulavi Abdool Jubbar ; Messrs. R. Hadenfeldt, A. V. Roberts, A. Davies ; General Manager, Singell Tea Company, Darjeeling ; Manager, Teendarea Tea Company, Darjeeling ; and Baboo Hemchunder Gossain.

The names of the following were submitted as candidates for election :

Alfred Ernest Abbott, Esq., Tikala Factory, Tirhoot,—proposed by Mr. T. M. Francis, seconded by the Secretary.

Edward Dubois de Saran, Esq., Danapore Factory, Purneah,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

E. J. Barton, Esq., C. S., Bogra,—proposed by Dr. Geo. King, seconded by Mr. W. Stalkartt.

Dr. Alexander Lyons, Civil Surgeon, Bogra,—proposed by Dr. King, seconded by Mr. Stalkartt.

Captain H. W. Toogood, Superintendent, Sulkea Salt Golahs,—proposed by Mr. W. H. Jones, seconded by the Secretary.

Manager of the Champdanee Jute Mills Company,—proposed by Mr. W. Pigott, seconded by Mr. Cogswell.

W. G. Parcel, Esq., Manager of Kewanly Garden, Cachar,—proposed by Mr. Thomas Chennell, seconded by the Secretary.

Frank A. Lazarus, Esq.,—proposed by Captain W. B. Collins, seconded by Dr. Tonnerre.

Baboo Surdharee Lall, Zemindar, Bhauglepore,—proposed by the Secretary, seconded by Mr. Stalkartt.

C. Deas, Esq., C. E., Ramkistopore, Howrah,—proposed by Mr. Stalkartt, seconded by Mr. J. J. Whitty.

Chunder Kirtee Sing, Maharajah of Munneepore,—proposed by Dr. R. Brown, seconded by the Secretary.

His Highness Narayan Rao, Maharajah of Dewass,—proposed by Dr. T. Beaumont, seconded by the Secretary.

Rejoined.—Nilladhur Singh Deo Bahadoor, Feudatory Chief of Killa, Sonepore.

The following contributions were announced :—

1. Beddome's *Flora Sylvatica*, Nos. 1 & 2. From Government of India.

2. Records, Geological Survey of India, Vol. VII., Part 3. From the Government of Bengal.

3. Fragmenta Phytographiæ Australiæ; by Baron Von Mueller. From the Author.

4. A collection of Plants from Pondicherry. From R. M. Daly, Esq.

5. A further small collection of Plants from Andamans. From J. N. Homfray, Esq.

6. A collection of acclimatized vegetable seeds raised in his Garden at Purneah. From G. W. Shillingford, Esq.

Fibres.

Letters were submitted from Messrs. Gillanders, Arbuthnot, and Co., and the Secretary, Board of Revenue, N. W. Provinces, with specimens of fibre. That received from Messrs. Gillanders, Arbuthnot, and Co., is from Burmah, and is reported on by the Committee (Messrs. Stalkartt and Cogswell) as "sun hemp" of fair quality and strength, but badly cleaned, worth about 5 Rs. per bazar maund, against Rs. 6 if it had been well cleaned. The other specimen from Mr. Buck is from the Chandi forests in the Bijnore district, opposite to Hurdwar, and the local name is "Beemul," and is in general use in the hills. The Committee report unfavorably on this sample as "having been rendered almost valueless in its preparation. It is harsh, excessively weak, and quite worthless for spinner's purposes, fit only to be reduced to pulp by the paper manufacturers."

In reference to this second fibre (Beemul), the Secretary drew attention to the following extract from an interesting report by Captain Huddlestone, Assistant Commissioner of Gurhwal, which is published in Vol. VIII. of the Society's Transactions:

"The Beemul is a small tree growing in all parts from 13 to 15 feet in height, in warm situations, but not very plentifully in the jungles, and as single trees

on the edges of the terraced fields. Sold in bundles at 2 and 3 annas each, weighing 2 seers 3 chittacks each bundle. The stock of the Province may average about 50 maunds. It is only manufactured in Gurhwal, very little being made in Kumaon, though the tree grows there, having a greater supply of the "Malloo" creeper. The branches of this tree (Beemul) are cut from July till March, or at all seasons, save the spring.

"The leaves are given to the cattle, and the sticks are soaked for a month or 40 days in water, and when dry are beaten on stones and the bark is stripped off. One tree will give about 5 seers of the inner fibre fit for making into ropes and string, which are used for tying up cattle, and stringing cots with. It is not either very strong or durable, and is not to be had in any quantity, the women make use of the green bark for cleaning their hair."

A draft of circular letter to members, inviting co-operation, was submitted by the Council and agreed to.

Letters were read—

From F. Halsey, Esq., from Madhopore, in the Punjab, proposing to undertake the raising of seeds, vegetable, and flower, for the Society, at a small cost for gardener's wages and other incidental expenses. Resolved, on the recommendation of the Council, that Mr. Halsey's kind offer be thankfully accepted, and the sum of Rs. 25 per mensem, be placed at his disposal to meet the necessary expenditure.

From Messrs. Arthur Lucas and B. Smyth & Co., forwarding assortments of vegetable seeds for trial from Messrs. C. & J. Lee, of Hammersmith, and Messrs. Sutton and Sons, of Reading.

Thursday, the 26th November, 1874.

DR. GEORGE KING, *President, in the Chair.*

The proceedings of the September meeting were read and confirmed.

The following gentlemen were elected members :

Messrs. A. E. Abbott, E. Dubois de Saran, E. J. Barton, W. G. Parcel, F. A. Lazarus, C. Deas, Dr. Alexander Lyons, Captain H. W. Toogood, Manager of the Champdanee Jute Mills Company, Baboo Surdharee Lall, Maharajah Chunder Kirtee Sing, and His Highness Narayan Rao.

The names of the following Gentlemen were submitted as candidates for election :

Clarence Fitzpatrick, Esq., Pleader, Delhi,—proposed by Mr. Vilters Berkeley, seconded by the Secretary.

Leslie H. Mooney, Esq., Manager, Kangra Valley Tea Company, Gopalpore,—proposed by Mr. P. Stirling, seconded by the Secretary.

Rajah Kishen Chunder Bhunge, of Killah Mohurbhunge,—proposed by Mr. T. E. Ravenshaw, seconded by the Secretary.

Edmond S. Carlisle, Esq., Punsah Factory, Chumparun,—proposed by Mr. M. Henderson, seconded by Mr. W. R. Browne.

His Highness, the Nawab-Nazim of Bengal, Munsier Ali,—proposed by Col. E. Thompson, seconded by the Secretary.

Mrs. J. Mackinnon, Mussoorec,—proposed by Mr. Allen Stokes, seconded by Mr. W. Stalkartt.

Major F. A. Buckley, (37th N. I.) Landour,—proposed by Mr. Edwin Sturmer, seconded by the Secretary.

John H. S. Gilman, Esq., Sonapore Tea Factory, Gowhatti,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Duncan Mackinnon, Esq., Merchant, Calcutta,—proposed by Mr. W. Stalkartt, seconded by Dr. Charles Barclay.

Baboo Dwarkanath Dutt, Patuldanga,—proposed by Baboo P. C. Mittra, seconded by Baboo Shamachurn Law.

Rejoined.—F. T. Rice, Esq., of Bailpaharree Factory, Midnapore, and George Taylor, Esq., Barrister, Bombay.

CONTRIBUTIONS.

1. Revenue Reporter for N. W. Provinces, Vol. III., No. 1. From E. T. Atkinson, Esq., C. S. Mr. Atkinson presents this copy of the Reporter, as it contains an article on Sugar-cane cultivation, which he thinks may be of interest to some of the members.

2. Note on Vanilla, by J. E. O'Connor. From the Government of Bengal.

3. Report for 1873 on the Government Botanic Garden, Adelaide, South Australia. Catalogue of the plants under cultivation in the Garden. Papers read before the Philosophical Society of Adelaide. From Dr. R. Schomburgh, Director of the Botanic Garden.

4. Transactions of the Asiatic Society of Japan, from October 1873 to July 1874. From the Society.

5. Administration Report on the Hill Tracts, Northern Arakan for 1873-74. From the Commissioner of British Burma.

6. Address at 20th Annual Meeting of the Scottish Arboricultural Society. From the Author, Dr. H. Cleghorn.

7. Journal Asiatic Society of Bengal, Part 2, No. 2, 1874, and proceedings for August 1874. From the Society.

8. Proceedings of the Agricultural and Horticultural Society of Madras, from April to October 1874. From the Society.

9. A small collection of Palms from the Royal Botanic Garden, Mauritius, (*Latanias, Stevensonia grandifolia, Vahea Madagascariensis, Pandanus Mauritiana, Alpinia magnifica*, &c.) From Mr. J. M. Horne, Sub-Director.

10. Cuttings of a new *Croton* and *Dracæna*; also cuttings of *Aralia Guilfoylei, Eranthemum elegans* and some *Bromelias, Bilbergias, Achimines*, &c. From the Hon'ble Louis Jackson.

11. A collection of orchids and useful trees, from the Andamans. From J. M. Homfray, Esq.

12. A small quantity of Tea seed of the finest description, indigenous, hybrid

and China. From Captain J. H. Williamson.

13. Seed of nine kinds of *Eucalyptus*. From Baron Von Mueller.

14. Seed of Nepal geranium. From C. Nickells, Esq.

15. Seed of *Panicum spectabile*. From Dr. Schomburgh.

The Secretary mentioned that Dr. Schomburgh had obligingly supplied this seed in response to an application made to him in connection with an extract read at the July meeting from his interesting paper on grasses. Several applications for this seed had already been complied with, and a small portion sent for trial to the Garden.

16. A small collection of acclimated flower seeds from the Botanic Garden at Bangalore. From Col. E. Boddam.

TEA.

Mr. John Stewart, Managing Proprietor of Doolahal Factory, north Luckimpore, Assam, sends a specimen of tea shoots with ten separate buds, instead of one, as never having seen the like before he thinks it may be uncommon and of some interest. Mr. Kurz, of the Royal Botanic Garden, reports that "such growth is not unusual, and in most cases the result of rich soil and vigorous vegetation. It is simply cohesion between the branches themselves which thus form apparently a simple stem, with increase of leaf buds, according to the number of the branches thus united. The present case is an approximation to fasciation, indeed intermediate between simple cohesion of axial parts and true fasciation, where numerous buds are produced in close apposition, so that the branches become more or less compressed."

Messrs. Playfair, Duncan, and Co. submit the following extract of a letter from Mr. Chennell, Superintendent of the Eastern Assâm Company's Garden, Debroghur, Assam, regarding some cocoons which he has found on his plants:

Tea Bug Cocoons.—"I take the liberty of sending you two cocoons, which I hope won't be discharged before they reach you. You will find one cocoon will supply some 2,000 or more insects. I have now in a bottle some 2 or 3,000 specimens of them, which I am rearing and watching their metamorphoses. I have several samples of these "Tea Bugs," as Mr. Peal designates them, in different stages of maturity, but none has yet developed wings. I can well understand the facility with which they can puncture the tender leaves of the tea plants, for on taking one of these half-grown insects between my fore-finger and thumb, it darted its rostellum or proboscis into my flesh, and extracted blood. The pain was as severe as if a sharp and fine needle was plunged into the finger, and the pain lasted for 20 minutes; this continuance of pain for so long a time, I timed the duration, makes me believe that it injected poison into the wound. I discovered these cocoons to be those of the Tea Bug, which produces the Cachar or Black Blights, quite accidentally. I saw one of them on a tea bush which I plucked off to see what would come out of it, as I had never seen one on a tea-plant before, though I have often seen them on jungle trees. I put the cocoon in one of the bottles you sent up for tea samples, and closed the mouth

of it with paper rolled up into a ball for a stopper, and placed it on my writing table. About three weeks after this, one morning when sitting at the table to write, I was immediately covered with what I thought were ants, but soon found the table to be literally covered with these little insects which I found swarming out of the bottle. They have a peculiar kind of locomotion, they run very rapidly for a short distance, and then take a little jump. They are very active indeed. In their young stage they look very like miniature mantises or daddy-long legs. I feed them with young tea-leaves, but have not yet been able to detect that punctured appearance which they produce on the leaves of bushes growing outside. I am now subjecting them to a crucial test, to ascertain whether they produce the blight for which they get credit. I have several dozens of them in a bottle which I have put under a tea-bush, and have inserted a tender twig of the bush into the bottle, and fixed it there by a piece of sheet-lead, which I have carefully soldered round the twig so as to fit it closely to prevent the insects escaping; and this piece of lead which is sufficiently large to wrap round the mouth of the bottle, is firmly secured by a piece of cord so as to preclude all possibility of escape. The lead is plentifully punctured, to give lots of ventilation. So circumstanced, the insects are exactly as they would be in their natural mode of existence, and having living leaves to operate on, with the concomitant exposure to atmosphere, perhaps the deposition of fungus will occur in the punctured and enfeebled leaves, and produce blight. If by this experiment the enclosed sprig gets attacked with the blight, I shall let you know and send you the affected leaves. The failure of the plucked leaves in not showing the blight is, I think, owing to their withering too soon, for the fungus seems to be deposited. If you fail to obtain specimens of these Tea Bugs from the cocoons I am sending, I shall be glad to send you others if you care to have them. The little insects will, I believe, thrive on any kind of tender leaves. One of the cocoons, if you will examine it, you will find is attached to a sprig of Hibiscus; the tree from which it is taken is growing in my flower garden; so if you wish to cultivate them, and watch their very interesting habit and transformations, you will have no difficulty in doing so, as the Hibiscus shrub must be very common in Calcutta. The insects which I have kept for some time have three times cast their exuviæ. I have them, in their several stages of growth, preserved in spirits for the Economic Museum, as also caterpillars—their moths I have set, and other insects which attack and damage the tea bush. I have also specimens of the different kinds of blight which afflict the tea plant, but have not been able to secure any specimens of blister-blight, as the time for them is past. I enclose a sample of blighted leaf produced by the tea bug. You will see it resembles Mr. Peal's drawings, or rather I should say Mr. Peal's engravings are true representations of the living specimens. Drawings of the insects are enclosed too, which are true to nature.

"Before concluding, I must say that this is the first year these bugs infested this garden. I never noticed them before. If they were present, I am certain I

would have detected them. They abound in the garden just now, and are committing sad ravages on the flush. I have put on men to search for these cocoons, and am destroying them by boiling, hoping thereby to keep the beings in abeyance, if they can't be completely exterminated."

From the following remarks of Mr. Wood-Mason, of the Indian Museum, it is evident that the above have no connection with the tea bug:

"In answer to your letter, just received, I beg to inform you that the so-called cocoons are the egg-cases of a species of *Mantis*; the Mantidæ are all purely carnivorous insects, other insects being their prey. The eggs, which are long and narrow, are arranged by the ♀ very regularly, in rows, each in a separate cell, forming an oval or globular mass enveloped in a viscid glairy substance, that in hardening becomes yellow; the egg mass being glued to the twigs by this same substance. These orthopterous insects have their fore-legs singularly modified for seizing their prey, their dentate tibiæ folding back upon their spiny femora, and thus forming most perfect prehensile and retentive organs. I return the enclosures herewith. It is impossible for any body to determine the species from these egg-capsules.

"These insects are provided with most powerful biting organs, the parts of the mouth not having the form of piercing stylets as in the bugs, which are sectorial from birth to death!"

Sun-Flower Oil.

The Assistant Secretary, Government of Bengal, submits copy of correspondence regarding the experimental cultivation of the sun-flower as a protective against malaria, together with samples of the oil and oil-cake produced therefrom in the Municipal Garden at Burdwan, and requests that they may be valued, and the Lieut.-Governor favored with the results.

The Secretary read the following report obligingly furnished by Dr. G. R. Ferris on these samples:

"In answer to your note of the 29th ultimo, accompanied with samples of Sun-flower oil and Sun-flower oil-cake, desiring report on their value, I have to inform you that neither of the productions having yet come into the commercial market, I have been unable to obtain their commercial value, and can only be obtained by supplies of large quantities every month, or two months, during a period of six to twelve months, being placed on this and home markets for sale, when their respective value would be proved by competition and comparison with productions possessing similar qualities. My view of value, is, that at the best market, with the most favourable demand, the *producer* will not realize more than twelve rupees, Rs. 12 per maund, for the Sun-flower oil, and one rupee four annas, Rs. 1-4 per maund, for the Sun-flower oil-cake."

The Secretary further called attention to the following extract from a recent number of the Pharmaceutical Journal:

"The great variety of valuable properties belonging to the sun-flower seed has

been much neglected. No plant produces such fine honey and wax, and when the flower is in blossom, bees abound on it. The produce will be according to the nature of the soil and mode of cultivation; but the average has been found to be fifty bushels of the seed per acre, which will yield fifty gallons of oil. The oil is excellent, when refined, for table use, for burning in lamps, for soap-making, and for painting, especially for mixing green and blue paints. The maro, or refuse of the seeds of the above quantity, after the oil has been expressed, made into cakes, will produce 1,500 lbs., and the stalks, when burnt for alkali, will give 10 per cent. of potash. The green leaves of the sun-flower, when dried and burnt to powder, mixed with bran, make excellent fodder for milch cows. It makes a beautiful soap, particularly softening to the hands and face, and is pleasant to shave with. The cake is superior to linseed for fattening cattle. Sheep, pigs, pigeons, rabbits, poultry of all sorts, &c., will fatten rapidly upon it, and prefer the seed to any other; it causes pheasants in particular to have a much more glossy plumage and to be plumper in the body. It also increases the quantity of eggs from poultry fed with it. The seed, shelled, makes, when ground very fine, sweet flour for bread, particularly tea-cakes."

Mr. C. S. Turnbull submitted copy of a paper on the cultivation of silk in Japan—from the *London Gazette.* (Transferred to the Committee of Papers.)

Thursday, the 31*st December*, 1874.

Dr. George King, *President in the Chair.*

The proceedings of the last Meeting were read and confirmed.

The following were elected members:

Messrs. C. Kirkpatrick, L. H. Mooney, E. S. Carlisle, J. H. S. Gilman, D. Mackinnon, Mrs. J. Mackinnon, H. H. the Nawab Nazim of Bengal, Major F. A. Buckley, Rajah Kishen Chunder Bhunge, and Baboo Dwarkanath Dutt.

The names of the following gentlemen were submitted as candidates for election:

J. Carey, Esq., Civil Engineer, Indore,—proposed by Major F. Lukin, seconded by the Secretary.

W. S. Halsey, Esq., C. S., Humeerpore,—proposed by Mr. J. Duthoit, seconded by Sir James Wemyss.

Shah Nurul Hossain, Behar,—proposed by Baboo Bimola Chunder Bhuttacharjee, seconded by the Secretary.

Abdool Kureem, Lohundam, Behar,—proposed by Baboo B. C. Bhuttacharjee, seconded by the Secretary.

J. E. Grimley, Esq., Superintendent, Nizam's Public Garden, Hyderabad,—proposed by Conductor T. Cole, seconded by Mr. S. H. Robinson.

Dr. R. C. Sanders, Mozuffernuggur,—proposed by the Secretary, seconded by the President.

Maharajah Coomar Radhapersaud Sing, Doomra, Shahabad,—proposed by the Secretary, seconded by Mr. Cogswell.

Augustus H Moore, Esq , Dekia Jalu Factory, Jorehaut, Assam,—proposed by Mr G F Pinney, seconded by the Secretary

As a Corresponding Member Samuel Jennings, Esq , London, on the recommendation of the Council

CONTRIBUTIONS

1 Firminger's Manual of Gardening for India, 3rd edition From the Author.

2 Records of the Geological Survey of India, Vol VII, Part 4, (2 copies). From the Govt of Bengal

3 Memoirs of the Geological Survey of India, Vol XI, Part 1 From the Superintendent

4 Note on the distribution of *Reh* and *Oosur* From E T Atkinson, Esq.

5 Journal of the Asiatic Society of Bengal, Part 2, No III, and Part 1, No III, and Proceedings for November 1874

6 A small collection of Palm and other seeds from the Royal Gardens, Kew. From Dr Hooker C B

7 A packet of fresh seeds of *Cedrus deodara* from Simla From J O'Connor, Esq

8 A small quantity of China tea seed From Messrs Williamson Magor &Co.

9 A set of dried specimens shewing the various means adopted to increase the genus *Ipecacuanha* and some seeds of the same from Dr George King on behalf of Mr Andrew Jaffrey, of the Cinchona Plantations

FUNGI FROM INTERIOR OF A WHITE ANT HILL

Read a letter from Mr W K Gibbon Senior dated Doolha Gorackpore, 15th September 1874 on the above subject *(See body of this Part)*

The Secretary next read some remarks, obligingly furnished by Dr D D Cunningham

ROOSA OIL

Read the following extracts of letters from Mr H Leeds, Deputy Conservator of Forests Western Division, Central Provinces, and of Mr Fernandez, Assistant Conservator, regarding certain specimens of Roosa Oil *(Andropogon nardoides)*

"I send by parcel post one small bottle containing a specimen of Roosa oil as sold in the bazaars here, and one of the same oil distilled by Mr Fernandez, Assistant Conservator in this Forest Division I shall feel much obliged if you will favour me with an opinion regarding the specimens, and tell me what you think is the value of the oil distilled by Mr Fernandez, and whether there is generally sufficient demand in the bazaars as to make it worth while to manufacture it, in any large quantity, which would be remunerative

"I forward Mr Fernandez's note in original, which please return.

Mr Fernandez writes—

"I send you three specimens of Roosa oil The clear oil in the cylindrical bottle is what I have been distilling, that in the Eau de Cologne bottle, is a sample

of what is sold at Mortukna (price 2 annas a tola, by weight, or Rs. 10 a seer;) the third bottle contains the best sample of the oil sold at Harda (price 3 annas a tola, or Rs. 15 a seer). I have tested the Harda oil by putting a drop of it on a clean piece of white paper; even a temperature higher than boiling point, could not volatilise it. It is adulterated to the extent of at least 60 per cent. I have not tested the Mortukna sample, as I have not uncorked the bottle. Its black colour is no doubt owing to its having been dry distilled. It contains a large quantity of matter in suspension, which is apparent on inspecting the bottle. Stains made by my oil disappear in 24 hours, and in a few seconds if held over a fire.

"It is a pity there is no considerable demand for the oil, as we can produce practically an unlimited supply of it."

The Secretary remarked that only one, the distilled, of the three specimens noted had reached him. That is a good specimen, superior to those in the Society's collection. The demand for this oil in the Calcutta market is, however, so very limited, that a value cannot be fixed on it. The specimens placed on the table for comparison with that distilled by Mr. Fernandez had been long in the Society's possession, the one from Shahabad since 1837, and two others from the Western Presidency since 1856, of which particulars are recorded in the Transactions and Journal. It is also referred to in O'Shaughnessy's Pharmacopœia, and in the descriptive Catalogue of the Indian Department of the International Exhibition of 1862, of which the following is an extract:

"The specimen sent from Jubbulpore is not supposed to be the pure produce, as every endeavour to obtain unadulterated oil has failed. The best is said to be pressed at Ajmere. A miserable imitation of this oil is occasionally manufactured at Saugor. Twenty seers of the grass, which grows wild over the station and district, are mixed with two seers of common Teel oil, and then slowly distilled. The oil thus becomes highly impregnated with the peculiar roosa flavour, and is sold as such at 4 Rs. a seer. Grass oil is never taken internally by natives, but they have a great faith in it as a stimulant to the functions of the several organs, when rubbed on externally. They also use it as a liniment in chronic rheumatism and neuralgic pains, and though they place great reliance on its virtues, its expense prevents its being used generally. It has a fragrant aromatic smell, persistent and very agreeable at first, but after a time the odour becomes unpleasant, and gives many people a feeling of sickness with headache. The natives use it for slight colds also, to excite perspiration, by rubbing in a couple of drachms on the chest before the fire or in the heat of the sun. From information collected, it appears that the pure unadulterated oil has been used by many European officers with most wonderful effect in cases of severe rheumatism; and indeed, such appears to have been the effect of its application, that two good rubbings of the pure oil on the part affected produce such severe burning as to render a third application almost impracticable. In the cases brought to notice, the second application was found sufficient to ensure perfect cure."

The Secretary further called attention to an oil from an allied plant (*Andro-*

pogon Iwaranchusa? Royle) presented by Dr. A. H. Cheek in 1857, from grass grown near Benares, and in the district of Mirzapore, which though much less known than the Roosa oil, is considered a very valuable oil, "both as a stimulating liniment, and embrocation in rheumatism and neuralgic affections, and also as a stomachic stimulant of great efficacy." The native name for the grass is "Hurdwar-i-koosa."

Letters were read from Dr. George King, submitting a memorandum from Mr. Jaffery, of the Cinchona Plantation, on the cultivation of the Ipecacuanha plant, and another from himself—"a history of the Introduction of the Medicinal Ipecacuanha plant into Bengal" (Transferred for publication in the Journal)

From Mr John Smith, Curator, Royal Gardens, Kew, acknowledging receipt of two cases of mango grafts, forwarded in return for plants received from Kew.

A. H BLECHYNDEN,
Secretary.

REPORT

OF THE

Agricultural and Horticultural Society

OF

INDIA.

Report from the Council at the Annual General Meeting held on the 4th February, 1875.

At the commencement of another year it devolves upon the Council to submit to the members a few remarks in connection with the operations of the Society during 1874.

The progress of the Society, during the past year, as regards the election of new members, is rather in advance of the two previous years, namely, 112 elections in 1874, against 89 and 87 respectively in 1873 and 1872, besides ten old members rejoined. The deductions, however, by resignations (66) and deaths* (15) are, unfortunately, greatly in excess of the last two years. Three names have also been removed consequent on non-response to notices of elections. It has likewise been found necessary to remove 23 members from the list, 14 owing to continued long absence (as provided by Section 6 of Chapter IV. of the Bye-Laws.) and 9 for non-payment of subscriptions for the last two years. The actual number of paying members at the close of the year is shewn at 675, or 12 more than last year. It may not, however, be out of place to mention that of this number, 92 members, who are supposed to be resident in the country, have not contributed to the funds of the Society during 1874. In addition to the above 675 nominal paying members, the Society comprises 32 life members, 20 Honorary, Associate and Corresponding, with 113 absent in England, bringing up the total to 839 members, as specified in the subjoined classified statement.—

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* William Becher, W. F. Campbell, Dr. Archibald Campbell, Achille Courjon, Dr. W. Craddock, Col. R. Duffin, Captain W. Rust D'Eye, Captain Thos. Hutton, W. J. Judge, Col. F. L. Mackeson, W. J. Millie, W. Minto, Pearee Mohun Banerjee, R. W. Snow, and H. LePoer Wynne.

CLASSIFICATION.	In 50 previous years.	In 1871.	In 1872.	In 1873.	In 1874.	Gross Total.	Total real number at the close of 1874 after deducting lapses.
Honorary Members ...	20	2	0	0	0	22	9
Associate Members ...	6	0	0	0	0	6	2
Corresponding Members	14	0	0	0	1	15	9
Civilians ...	693	24	14	10	14	755	160
Merchants and Traders...	606	14	10	10	18	658	130
Agriculturists ...	596	22	27	19	41	705	201
Military Officers ...	639	34	12	15	4	704	93
Medical Officers ...	229	8	8	7	6	258	46
Asiatics ...	267	16	8	8	25	324	100
Clergy ...	39	0	1	1	0	41	8
Law Officers ...	121	4	4	2	6	137	27
Miscellaneous ...	137	9	3	17	8	174	54
	3,367	133	87	89	123	3,799	839

N. B—Of these 839 Members, 141 are resident in Calcutta, 550 in the country, and 148 in Europe.

The Council record, with much regret, the demise of Capt. Thomas Hutton, F. G S., of Mussooree, and of Dr. Archibald Campbell, late of the Bengal Medical Service, a life member. Capt. Hutton was a corresponding member and a contributor for 30 years, of various interesting and valuable papers on sericulture and other subjects. Capt. Hutton has probably done more, during a series of years, as a naturalist, to bring to notice the various silk-yielders of India than any other writer on the subject. Dr. Campbell was also a valued correspondent in former years, previous to his retirement from India. He contributed, when Assistant Resident at Nepal, a valuable paper on the agriculture and rural economy of that country; and subsequently,

whilst resident at Darjeeling, many interesting and useful notes on tea cultivation in that district; also on its timber trees, on cotton, munjeet, fibres, and other cultures. Since his departure from India, Dr. Campbell had ceased his correspondence with the Society, but in connection with other Societies in England, and more especially with the Society of Arts, he continued to the last an advocate of the interests of the country in which he had been so long a dweller.

The Council have also to allude to the loss sustained by the departure from India, during the past year, of Mr. J. A. Crawford, late President of the Society. The Society unanimously nominated Mr. Crawford, an Honorary Member, and presented him with an address in April last, just previous to his departure, in which they expressed their appreciation of the manner in which he had discharged the duties of the Office during the long tenure of six years.

The Council regret their inability to report any improvement on the financial position of the Society. The amount of receipts for subscription this year is Rs. 19,987-8-9 against Rs. 21,522-8-7 last year. The sale proceeds of surplus imported seeds realized Rs. 1,674 against Rs. 2,856 last year. The accruings of interest on vested fund is 265-12 less this year. Briefly, the receipts this year are Rs. 3,397 less than last year, notwithstanding the gratuityof Rs. 2,500 from the Government of Bengal towards the Metcalfe Hall extraordinary repairs, and of Rs. 1,000 from Mr. Crawford for the garden.

The ordinary expenditure, exclusive of the payment for imported seeds and repairs to the Hall, is Rs. 17,200-15-6, or Rs. 2,517 less than last year; while the expenditure on garden account is not less than Rs. 12,999-9-3, or only Rs. 2,000 under that of last year.

It will be seen that a continuance of the garden on so expensive a scale, cannot be sustained any longer; the accounts for the year under review having closed with a deficit of Rs. 2,287.

The arrears from members who have availed of their privileges is Rs. 1,390-11-10 or Rs. 292-3 more than last year. The balance of arrears for three years, 1871-73, may be stated as follows:—

1871	...	279	5	0			
1872	...	102	0	0			
1873	...	247	6	3			
					628	11	3
Arrears for		1874			1,390	11	10
				Total	2,019	7	1

a large proportion of the old arrears of Rs. 628-11-3 will, it is feared, have to be written off; and, as in previous years, it is

estimated that 200 to 300 Rs. will probably have to be placed to debit of profit and loss of arrears of last year.

The entire vested funds of the Society having been absorbed in consequence of heavy expenditure on garden account, and the Council having now to depend solely on the monthly sources of income, has, working on the experience of the past, estimated its receipts for the current year at Rs. 23 to 24,000 and its expenditure, from 18 to 20,000, leaving more or less Rs. 3 to 4,000 towards the expenses for the maintenance of the garden.

The new garden at Alipore, as previously intimated, was opened on the 1st July last for the distribution of plants to members. One hundred and sixty-two members indented, but only 152 availed of delivery orders. From returns made by the Gardener, it would appear that 4,520 ornamental plants, including roses, have been distributed; besides 1,130 grafts and seedlings of fruit trees, and 5,942 cuttings of ornamental shrubs and rose plants. So far as meeting the wishes of members, generally, the distribution has not proved so satisfactory as the Council could wish, particularly in respect to new plants and roses. Of ordinary more popular plants, the garden was well-stocked previous to the arrival of the Gardener in 1873, and the fruit grafts were supplied from the Society's old orchard; and so, in these particular plants, the requisitions of members have been fairly responded to. The Council regret to report that the experiment of throwing open the garden to the general public for the sale of ornamental plants, as a means of making the garden in some measure self-supporting, has proved a failure. The whole question of the economy of the garden is now under consideration and revision by the Garden Committee.

The Council have to record their obligations to several contributors to the garden, more especially to the following:—

Dr. E. Bonavia, Superintendent, Public Garden, Lucknow, for fruit grafts.

Dr. T. Beaumont, for tubers of rarer kinds of Achimines, Alocassias, Begonias, &c.

Mr. W. H. Cogswell, for Mahogany seed.

Mr. J. O'Connor, for Pine and other seeds.

Mr. R. M. Daly, for a collection of plants from Pondicherry.

Dr. Hooker, C. B., a small collection of Palm and other seeds from the Royal Gardens, Kew.

Mr. J. N. Homfray, for Orchids from the Andamans.

Mr. J. M. Horne, Sub-Director, Royal Botanic Garden, Mauritius, for a collection of Palms.

Mr. C. K. Hudson, for Orchids from Sylhet.

The Hon'ble Louis Jackson, for a small collection of rare plants.

Dr. Geo. King, Superintendent, Royal Botanic Garden,

Calcutta, for assortments of seeds and collections of plants at various times.

Captain Lawrell, for a good supply of bulbs of Lilium auratum.

Mr. J. Swinhoe, for a Wardian case of camellia plants.

Mr. W. Stalkartt, for a large supply of mango and lychee grafts.

Messrs. Veitch and Sons, of Chelsea, for a Wardian case of rare plants.

The Society is also indebted to its late President, Mr. Crawford, for a handsome parting donation of one thousand rupees for garden purposes.

The seeds imported last year have altogether proved successful, especially the flower seeds from Messrs. Haagge and Schmidt of Erfurt. Arrangements will be made to secure the arrival of the consignments earlier next season.

Another Number of the Journal has been published, Part 2, completing Vol. IV. N. S. Part 1 of Vol. V is now in the press, and will be shortly issued.

Statement of Receipts and Disbursements of the AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA, *from 1st January to 31st December,* 1874.

RECEIPTS.

From Members—Subscriptions collected during the year				19,987	8	9
„ Accruings of Interest from Government Securities				707	8	0
„ Proceeds of country vegetable and other seeds ...	289	12	0			
„ Proceeds of surplus stock of American and French vegetable and German & French flower seeds ...	1,674	1	0			
Proceeds of fruit grafts and plants purchased to orders	1,135	5	6			
Proceeds of copies of publication of the Society ...	624	0	0			
Members—Amount for packing and forwarding charges for seeds, plants, &c., &c....	4,200	4	6			
Proceeds of seed cabinets sold	30	0	0			
Amount of freight re-paid ...	547	2	0			
Amount of suspense account in deposit for appropriation on various accounts ...	397	6	2			
Sale proceeds of Araucarias ...	50	0	0			
Proceeds of sale of old beams, &c.	211	0	6			
Dividend realized on estate of Messrs. Alexander & Co., Insolvent	9	10	9			
Proceeds of sale of a chair and some old cart wheels, &c., &c.	18	11	3			
Proceeds of sale of grass, rare plants, &c. at the Garden at Alipore	297	4	6			
				9,484	10	2
Ordinary Annual Receipts ...				30,179	10	11

EXTRAORDINARY RECEIPTS.

From Mr. J. A. Crawford gratuity to the Garden ...	1,000	0	0			
„ Proceeds of sale of Government Securities ...	11,635	11	4			
„ Government of Bengal donation towards repairs to the Metcalfe Hall ...	2,500	0	0			
				15,135	11	4
TOTAL RECEIPTS, Rupees ...				45,315	6	3
Balance in the Bank of Bengal on 31st December, 1873 ...	3,466	4	6			
Balance in hand of Secretary on 31st December, 1873 ...	3	13	9			
				3,470	2	3
GRAND TOTAL, Rupees ...				48,785	8	6

DISBURSEMENTS.

Purchase of Seeds.

By Messrs. D. Landreth & Sons, on account consignments of seeds received in 1872, and in part for 1873 ...	6,508	7	9			
„ Messrs. Vilmorin, Andrieux, and Co., for consignment of seeds received in 1873 ...	3,525	6	9			
„ Sundry parties for country vegetable seeds, potatos, &c. ...	130	0	0			
				10,163	14	6

Library Account.

„ Messrs. H. S. King & Co., for sundry publications ...	481	3	3			
„ Sundry parties for books, &c., purchased	47	0	0			
„ Duftry for binding books ...	26	6	0			
				554	9	3

Printing Account.

„ Messrs. T. Black & Co., for printing letters of calls, money receipts, annual reports, &c., &c.				315	4	0

Journal Account.

„ Messrs. T. Black & Co., for printing 750 copies of Journal Vol. 4, Part II., New Series	632	8	9			
„ Messrs. T. Black & Co., for printing notes on the propagation of plants by leaves ...	11	0	0			
				643	8	9

Publication Account.

„ Messrs. T. Black & Co., for reprinting 300 copies of Col. Money, and Mr. Watson's essays on the cultivation and manufacture of Tea				700	0	0

Royal Botanical Garden,—Society's Nursery.

„ Establishment from December, 1873, to February, 1874				372	3	9

Establishment Account.

„ Office Establishment for December 1873, to November, 1874 ...				11,586	8	6

Advertisement Account.

„ Advertising notices of meeting, seeds for distribution, and sale of tea essays, &c., &c. ...				189	0	0
Carried over ...				24,525	0	9

				Brought forward		24,525	0 9
			FREIGHT ACCOUNT.				
By Freight paid on Australian field seeds		28	0 0				
And on packages of seeds, plants, &c., sent to members ...		597	10 0				
					625	10	0
			METCALFE HALL ACCOUNT.				
„ Proportion of house, police, and lighting rates from October, 1873, to September, 1874, and water rate to December, 1874		628	3 6				
„ Messrs. Burn & Co. in part for repairs to the building ...		2,500	0 0				
„ New mats, &c., &c. ...		187	1 0				
					3,315	4	6
			STATIONERY ACCOUNT.				
„ Sundry parties for stationery					46	0	6
			REFUND ACCOUNT.				
„ Sundry parties for balance of accounts refunded					65	0	0
			FURNITURE ACCOUNT.				
„ Sundry parties for purchase of furniture					168	3	0
			SEED CABINET ACCOUNT.				
„ Payments on this account					30	0	0
			PURCHASE OF PLANTS.				
„ Sundry parties for fruit grafts and ornamental shrubs to meet orders					174	15	0
			PETTY CHARGES ACCOUNT.				
Postage on letters, copies of Journals, &c., sent and received ..	153	3	6				
Extraordinary expenditure for postage, &c., sending flower seeds to members in the Mofussil ...	94	2	0				
				247	5	6	
„ Bank of Bengal Commission on Interest drawn and brokerage for Government Securities sold				45	11	9	
„ Punkawallahs, pensions, hackery, boat and cooly hire, extra packerman, landing and forwarding charges, cost of wax-cloth, sealing wax, &c., &c. ...				491	10	9	
					784	12	0
			Carried over	...	29,734	13	9

					Brought forward		... 29,734	13 9

NEW GARDEN ACCOUNT.

By Cost of sundry building materials, &c., for making wells, propagating sheds, bottom-heat arrangements, enlarging tank, erecting gates, &c., &c.	...			3,658	14	3		
„ Cost of tools, implements, and contingencies, &c.	...			1,112	10	0		
„ Printing catalogues, advertizing, &c., &c.	...	...		731	0	0		
„ Purchase of new rare and other plants, seeds, &c.	...			1,426	0	0		
				6,928	8	3		
„ Salary of European Head Gardener from December, 1873, to November, 1874		1,900	0 0					
„ Wages of native establishment, mollies, coolies, &c.	...	3,471	1 0					
				5,371	1	0		
							12,299	9 3
Total Expenditure, Rupees						...	... 42,034	7 0
Balance in the Bank of Bengal on 31st December, 1874	...	...				...	6,751	1 6
GRAND TOTAL, Rupees							... 48,785	8 6

MEMORANDUM.

DISBURSEMENTS.

To amount of ordinary disbursements during the year 1874, as per statement	29,734	13	9
,, amount of garden expenditure during the year 1874, as per statement	12,299	9	3
	42,034	7	0
,, Balance in the Bank of Bengal on 31st December, 1874	6,751	1	6
Total, Rupees ..	48,785	8	6

LIABILITIES.

Messrs. D. Landreth & Son, for balance 1873, and seeds supplied in 1874 .. .. .. £	537	16	9
,, Vilmorin, Andrieux, & Co., for balance 1873, and seeds supplied in 1874 .. .. ,,	365	4	8
,, Law, Somner, & Co, for field seeds supplied in 1873 and 1874 .. .. .. ,,	74	10	5
,, Dick, Radcliffe, & Co., for seeds supplied in 1874 .. .. ,,	45	1	6
,, Haage and Schmidt, for seeds supplied in 1874 .. .. ,,	89	17	0
,, Jas. Carter & Co., for potatos for 1873 .. .. ,,	24	0	0
W. Bull & Co., for rare plants ,,	13	5	2
Total .. £	1,149	15	6 or say in
Rs.	12,472	0	0
Messrs. Grindlay & Co.	95	8	0
,, Burn & Co., balance repairs to Metcalfe Hall	5,860	8	0
Total, Rupees	18,428	0	0

RECEIPTS.

By amount of ordinary receipts during the year 1874, as per statement	30,179	10	11
,, amount of extraordinary receipts during the year 1874, as per statement	15,135	11	4
	45,315	6	3
,, Balance in the Bank of Bengal on 31st December, 1873	3,466	4	6
,, Balance in hand of Secretary on 31st December, 1873	3	13	9
	3,470	2	3
Total, Rupees ..	48,785	8	6

ASSETS.

Invested Capital in Government Securities lodged in the Bank of Bengal	8,000	0	0
Society's proportion cost of erecting the Metcalfe Hall .. .. Rs.	23,557	15	9
In landed property including building at Alipore .. .. .. ,,	20,646	6	0
	44,204	5	9
Amount cash balance	6,751	1	6
	58,955	7	3
Balance of subscription, &c., due from Members for 1871 .. Rs. 279 5 0			
1872 .. ,, 102 5 0			
1873 .. ,, 247 6 3			
1874 .. ,, 1,390 11 10			
Total, Rupees .. 2,019 12 1 as follows:			
Balance of subscription	1,271	11	1
Balance of seeds, grafts, journal, freight, &c. ..	748	1	0
	2,019	12	1
Total, Rupees ..	60,975	3	4

LIST OF MEMBERS

OF THE

Agricultural and Horticultural Society

OF

INDIA.

DECEMBER 31st, 1874.

ALPHABETICALLY ARRANGED

AND

DISTINGUISHING THE YEAR OF ADMISSION.

Office Bearers.

President:

DR. GEO. KING.

Vice President:

RAJAH RAMANATH TAGORE.
WM. STALKARTT, ESQ.
W. H. COGSWELL, ESQ.
M. HENDERSON, ESQ.

Secretary and Treasurer.

A. H. BLECHYNDEN, ESQ.

Members of Council:

R. BLECHYNDEN, ESQ.
BABOO PRATAPA CHANDRA GHOSA.
BABOO PEARY CHAND MITTRA.
DR. C. FABRE TONNERRE.
E. BROUGHTON, ESQ.
RAJAH SATTYA NUND GHOSAL BAHADOOR.
BABOO GONENDRO NATH TAGORE.
W. SWINHOE, ESQ.
W. PIGOTT, ESQ.
S. H. ROBINSON, ESQ.
JOHN MARTIN, ESQ.
L. BERKELEY, ESQ.

Patron:

HIS EXCELLENCY THE RIGHT HON'BLE THOMAS GEORGE BARING BARON NORTHBROOK OF STRATTON, G. M. S. I.

List of Members.

* This mark denotes Members who have compounded for their Annual Subscriptions.

† This mark denotes Members who are absent from India, and therefore non-contributors.

‡ This mark denotes Members who, though absent, are desirous of continuing their subscriptions.

HONORARY MEMBERS.

The Right Honorable Sir Edward Ryan, A. M., F. A. S., London	1828	1841
J. Mackay, Esq.		
Don Ramon de la Sagra, Island of Cuba ...		
The Right Honorable Sir Lawrence Peel, London	1842	1856
R. Fortune, Esq.		1856
A. Grote, Esq., London	1837	1868
The Revd. T. A. C. Firminger, London ...	1851	1868
Baboo Peary Chand Mittra, Calcutta... ...		1871
John Scott, Esq.		1871

CORRESPONDING MEMBERS.

D. J. MacGowan, Esq., M. D., Ningpo ...	1851
Mons. Natalis Rondot, Paris	1858
Lieut.-Col. W. H. Lowther, Jubbulpore ...	1864
James Cowell, Esq., London	1864
Dr. H. Cleghorn, Edinburgh	1867
Vause Fretwell, Esq., Supdt. of Model Farms at Bhurgaums, Kandeish	1869
C. Brownlow, Esq., Cachar	1870
Dr. George King, Supdt., Royal Botanical Garden, Seebpore	1870
Samuel Jennings, Esq., London	1874

ASSOCIATE MEMBERS.

Capt. E. P. Nisbet, London	1842
Geo. Bartlett, Esq., Calcutta	1870

ORDINARY MEMBERS.

A.

	Admitted.
ABBOTT, Horace, Esq., Rajapore via Koosteah ...	1858
Abbott, A. E. Esq., Tikala Factory, Tirhoot ...	1874
Abbott, H. E., Esq., Manager, Jauntpore Factory, Tirhoot	1874
Abdool, Gunny, Kajee, Zemindar, Dacca	1860
Abdool Jubbur, Moulavi, Calcutta	1874
Ady, Charles, Esq., Merchant, Moulmein ...	1864
Ahmed Alim, Nawub, Russapugla	1874
Ainslie, Hon'ble W., Civil Service, Calcutta ...	1847
Aitchison, W. Esq., Manager, Doloo Tea Garden, Cachar	1869
Alexander, N. Stuart, Esq., C. S., Tipperah	1864
Alexander,† W. Esq., Merchant	1865
Alexander,† Lieut.-Col. W. R. E., 1st Bengal Cavalry	1867
Ameer, Allee Khan, Moonshie, Bahadoor, Calcutta ...	1869
Anund Rao Puar,* His Highness, the Rajah of Dhar, Dhar, via Indore, Central India	1872
Anderson,† Lieut.-Col. W. W.	1859
Angelo, E. Esq., Cassipore	1873
Anley, George, Esq., Civil Engineer, Purneah ...	1861
Anthony, Adam, Esq., 1st Assistant Accountant-General, Allahabad	1870
Archer, Revd. J. B., Parsonage, Purneah	1869
Armstrong, C. M., Esq., Opium Dept., Bareilly ...	1858
Armstrong, T. W., Esq., Supdg. Engineer, Takly, Nagpore, Central Provinces	1862
Armstrong, Joseph Samuel, Esq., C. S., Pooree ...	1865
Atkinson, W. S., Esq., Director, Public Instruction, Calcutta	1864

B.

BAILLIE, Dr. N. B., Civil Surgeon, Bhaugulpore ...	1872
Baird,‡ Lieut.-Col. A. F., Executive Engineer ...	1861
Banee Madhub Roy Chowdry, Zemindar, Allahabad ...	1873
Barclay, Dr. Chas....	1873
Barker, Dr. R. A., Civil Surgeon, Beerbhoom ...	1870
Barlow, G. N., Esq., Civil Service, Bhaugulpore ...	1864
Barnfather, W. Esq., Ex. Eng., Bhaugulpore ..	1873
Barron, Capt. W., Dy. Supdt., Revenue Survey, 4th or Moradabad District, Nynee Tal	1871
Barstow, H. C., Esq., Civil Service, Sehore	1868

B.—(*Continued.*)

	Admitted.
Bartlett,† Col, H. T., Bengal Staff Corps	1865
Barton, E. J. Esq., C. S., Bogra...	1874
Bayley, The Hon'ble E. C., Civil Service, Calcutta ...	1863
Bayley, Stuart Colvin, Esq., Civil Service, Calcutta ...	1859
Beadon, Henry, Esq., Civil Service, Hazareebaugh ...	1867
Beames, John Esq., Civil Service, Balasore	1871
Beaufort, Francis L., Esq., Civil Service, Calcutta ...	1838
Beaumont, Dr. Thomas, Residency Surgeon, Indore ...	1870
Becher, J. M., Esq., Indigo Planter, Palee Factory, Oonao Oudh	1862
Becher,† Colonel S.	1870
Beckett, W. O. A., Esq., Dy. Commr., Cooch Behar ...	1871
Beeby, G. O., Esq., Solicitor, Calcutta	1866
Beer Chunder Manick, Bahadoor, Maharajah of Tipperah	1870
Bejoy Kesub Roy, Bahadoor, Rajah of Andool ...	1870
Bennett, T. B., Esq., Lallpore Factory, Purneah ...	1871
Bennett, Walter, H. Esq., Supt., New Tea Concern, Assam	1873
Benode Beharee Mullick, Baboo, Calcutta	1873
Benson, George, Esq., Pleader, High Court, N. W. P., Bareilly	1868
Bentall,*† Edward, Esq., Civil Service	1837
Berkeley, L. Esq., Commissioner, Paper Currency, Calcutta	1855
Berkeley, Vilters, Esq., Judge, Small Cause Court, Nynee Tal	1869
Beveridge, H. Esq., C. S., Backergunge	1865
Bhoojender Bhoosun Chatterjee, Zemindar, Calcutta ...	1873
Bhopal,* H. H. the Begum of	1870
Bhowany Sing,* Maharajah, Duttea	1864
Bhugwan Sing, Sirdar, Umritsur	1871
Bhugeruttee Mohendra, Bahadoor, Maharajah of Killoh, Dewkonull	1871
Bignell, R. A. D'O. Esq., Assistant Superintendent of Police, Tirhoot	1867
Bimala Churn Bhuttacharjea, Deputy Collector and Magistrate, Nowada via Behar	1870
Birch, Capt. R. G., Fort William	1867
Bishop,*† Major H. P., (Artillery)	1853
Blacker, G. M. Esq., Merchant, Calcutta	1856
Blathwayt,† Capt. L.	1871
Blechynden, R. Esq., Merchant, Calcutta	1858
Blechynden, A. H. Esq., Secretary, Agri-Hort. Society of India, Calcutta...	1851
Blissett, T. Esq., Govt. Tel. Department, Calcutta ...	1874

B.—(*Continued.*)

	Admitted.
Boddam,† Col., Hungerford	1871
Boileau, G. W. K., Esq., Silk Concern, Furreedpore ...	1874
Bond, T. T., Govt. Engineer, Steam Mills, Cawnpore ...	1873
Bonnaud, Arthur, Merchant, Calcutta	1873
Bourne, Walter, Esq., Resident Engineer, E. I. Railway, Asseasole	1855
Boulderson, A., Esq., C. S., Bijnore	1872
Bowers, Mrs., Bhuptnai, Protaubgunge, Bhaugulpore ...	1872
Boxwell, J., Esq., C. S., Nya Doomka	1874
Brae, T. Esq., Dabracole, Commercolly, E. B. Railway ...	1854
Brander, James, Esq., E. B. Railway, Sealdah ...	1865
Brandis, Dr. D., Inspector General of Forests ...	1874
Branson, J. H. Esq., Barrister-at-Law, Calcutta ...	1874
Bridgman, J. H. Esq., Goruckpore	1868
Brock,† Charles Esq., Merchant	1867
Brodhurst,† M. Esq., Civil Service	1859
Brodie,*† Major T.	1836
Brooke, R. P. Esq., Bubnowly, Goruckpore ...	1871
Broucke, W. J. Esq., Indigo Planter, Bhugha Factory via Chumparun	1859
Broughton, E. Esq., Merchant, Calcutta	1865
Brown, Col. D., Commissioner, Tenasserim Provinces, Moulmein	1856
Brown, Dr. Robert, Political Agent, Munipore ...	1868
Brown, Forbes, Scott, Esq., Merchant, Penang ...	1840
Brown, J. A. Esq., Superintendent of Roads, Cachar ...	1870
Brown, T. Allan, Esq., Deputy Collector, Allahabad ...	1873
Brown, Walter, R. Esq., Merchant, Calcutta ...	1869
Brown, Lord Ulick, Civil Service, Calcutta ...	1867
Browning,† C. G. Esq., Director, Public Instruction ...	1872
Buck, E. C. Esq., C. S., Nainee Tal	1870
Buckley, Major F. A., 37th N. I., Landour	1874
Buller,*† Frederic Pole, Esq., Civil Service	1837
Bury, Percival, Esq., Tea Planter, Cachar	1869
Buskin, E. G. Esq., Calcutta	1864
Buskin, M. Esq., Serepore Factory, Chuprah ...	1870
Butt,† Geo. Esq., Civil Service	1866
Byrne, William A., Esq., Opium Department, Ghazeepore	1870

CADELL,† Alan, Esq., Civil Service ... 1872

C.—*(Continued.)*

	Admitted.
Calder, G. L. Esq., E. B. Railway, Kanchraparah ...	1871
Cameron, J. T. D. Esq., Head Master, Calcutta Boys' School, Calcutta	1869
Campbell,† Hon'ble Geo.	1865
Campbell,† Major A. E.	
Campbell, D. W. Esq., Locomotive Supdt., E. I. Railway, Jamalpore	1870
Campbell, A. Esq., Tea Planter, Selim Tea Estate, Kurseong	1872
Campbell, W. Esq., Landholder, Sonakhan Belaspore, C. P.	1872
Campbell, W. A. Esq., Manager, Sungoo River Tea Plantation, Chittagong	1874
Cantonment Magistrate, Cawnpore	1873
Carew, R. H. Esq., Tea Planter, Cachar	1874
Carew,* R. R. Esq., Shajehanpore	1846
Cargill, T. U. Esq., Gowhatty	1871
Carleton, C. F. Esq., Indigo Planter, Meerpore, Moteeharry, Chumparun	1868
Carlisle, E. S. Esq., Punsah Factory, Chumparun ...	1874
Carnac, C. F. Esq., Civil Service. Ghazeepore ...	1865
Carnac, H. Rivett, Esq., Cotton Commissioner ...	1869
Carter,† J. H. Esq., Civil Service	1870
Carnegy,‡ P. T. Esq., Asst. Commr., Jorehaut, Assam ...	1872
Carritt, Alfred Esq., Merchant, Calcutta	1873
Castle, C. T., Esq., Supdt. of Police, Jaunpore ...	1865
Chamarett, A. Esq., Surveyor, Genl's Dept., Calcutta ...	1874
Chambers, Charles, Esq., Civil Engineer, E. I. Railway, Jamalpore	1868
Chardon, A. Esq., Bimayram Factory, Dhoolian ...	1874
Chardon, W. B. Esq., Seepah Factory, via Arrah ...	1864
Chauntrell,† F. D. Esq., Solicitor	1870
Cheetham, W. H. Esq., Merchant	1870
Chennell, Thos. Esq., Dewen Tea Estate, Debrooghur, Upper Assam	1870
Chester, Capt. H. D. E. W., Offg. S. A. C. G., Mooltan...	1869
Christian, A. Esq., Putterghat Fy., Madheepoorah, Bhaugulpore	1872
Chunder Kaunt Mookerjee, Baboo, Calcutta ...	1866
Chunder Kirtee Singh, Maharajah of Munnipore ...	1874
Clarke, H. P. Esq., Cinnatoliah, North Lackimpore, via Jorehaut, Assam	1870
Clark, Major E. G., Settlement Officer, Kheree ...	1872
Cogswell, W. H. Esq., Calcutta, Vice President ...	1866

C.—(*Continued.*)

	Admitted.
Cole, Conductor Thos., Secunderabad, Deccan ...	1873
Cole, Revd. J. Supdt., Lawrence Asylum, Sanawur ...	1865
Collins, Capt. W. B., Fort William, Calcutta ...	1873
Collins, S. Esq., Broker, Calcutta	1874
Collis, F. S., Esq., Barrister-at-Law, Calcutta ...	1871
Colvile,*† Sir J. W....	1849
Colvin, B. D. Esq., Merchant, Calcutta	1868
Comley, J. M. Esq., Calcutta	1871
Commandant of the Deolee Irregular Force, Deolee via Jeypore	1871
Connell, T. Esq., Darjeeling	1870
Cooke, F. C. Esq., Taleah Factory, via Burhuj, Gorucknpore	1866
Corbyn, the Revd. H. Abbottabad, Hazara, Punjab ...	1865
Corbyn,† Capt. E. C., Dy. Commr.	1871
Corbett,† Lt.-Col. A. F.	1871
Cornell, W. Esq., Civil Service, Bancoorah	1861
Cosserat, Lewis Esq., Indigo Planter, Bhurogah via Chupra	1859
Courjon, Alfred, Esq., Zemindar, Chandernagore ...	1863
Cowie, E. H. Esq., Merchant, Calcutta	1874
Cowley, F. W. R. Esq, Civil Service, Buxar ...	1867
Craigie, H. W. Esq., Luckipore Tea Estate, Cachar ...	1872
Craster, E. C. Esq., Civil Service, Bankipore ...	1858
Crawford,† J. A. Esq., Civil Service	1857
Craven, James, Esq., Monghyr	1871
Creswell, W. S. Esq., Merchant, Calcutta	1874
Cresswell, H. T. Esq., Shahpore Oondee Factory, Barrh Tirhoot	1874
Crosthwaite, R. J. Esq., B. A., C. S., Dehra ...	1869
Cumming, W. Esq., Indigo Planter, Muniharee Factory, Sahebgunge	1851
Cunningham, Dr. David Douglas, B. M. S., Calcutta ...	1872
Currie, G. M. Esq., Civil Service, Monghyr	1868
Curtis,† J. F. Esq., Indigo Planter	1860

D.

DaCosta, Joseph, Esq., Pleader. Civil Court, Bhaugulpore	1865
Dalbusset, E. Esq., Merchant, Calcutta	1871
Dalgliesh, E. W. Esq., Tea Planter, Dulsing Serae, Tirhoot	1873

D.—(*Continued.*)

	Admitted.
Dalton, Lieut.-Colonel E. T., Commissioner of Chota Nagpore	1848
Dalton, G. B. T., Esq., Civil Service	1870
Daly, F. D. Esq., Manager, Simla Bank, Umballa ...	1867
Daly, R. M. Esq., H. M., Bengal Marine, Calcutta ...	1869
Dando, Capt. A. Cunningham, Calcutta	1872
Dashwood, H. W. Esq., Civil Service, Benares, ...	1860
Daunt,† W. Esq.	1857
Davies, Lieut.-Col. J. S., Judicial Commissioner, Chota Nagpore	1857
Davies, Lieut.-Col. F. J., Barrackpore	1869
Davies, A. Esq., Calcutta	1874
Davis, H. H. Esq., Asst. Conservator of Forests, Chittagong	1873
Davis, C. T. Esq., Solicitor, Calcutta	1874
Davis, W. P., Esq., Bengal Police, Hazareebagh ...	1870
Davison,† Lt. T., 15th King's Hussars	1872
Davidson, James, Esq., Debrooghur, Assam	1870
Dhaj Nursing Bahadoor, Col., Nepaul	1873
Dear, Herschel, Esq., Monghyr	1860
Deas, C. Esq., Ramkistopore, Howrah	1874
Debendra Nath Mullick, Baboo, Calcutta	1870
Delauney, J. P. Esq., Indigo Planter, Commillah ...	1862
Denham, C. H. Esq., C. E., Howrah	1874
Dennison, W. T. M. Esq., Kurian Estate, Baitenzerg, Java	1873
Deputy Commissioner of Sumbulpore	1866
Deputy Commissioner of Oomraottee	1869
Deputy Commissioner of Ellichpore	1869
Deputy Commissioner of Woon	1869
Deputy Commissioner of Bassim, West Berar ...	1871
Deputy Bheel Agent, Maunpore, Mhow, Indore ...	1872
Derraj Luchminarian, Broker, Calcutta	1873
DeSaran, Edwd. Dubois, Esq., Dariapore Factory, Purneah	1874
Determes, T. Esq., Merchant, Chittagong	1873
Deverell, H. Esq., Indigo Planter, Ackrigunge Factory via Berhampore	1854
Deverell, F. R. Esq., Merchant, Calcutta	1871
Dias,† T. C. Esq., Advocate	1866
Dickens, Lieut.-Col. C. H., Artillery, Calcutta ...	1856
Ditmas, J. Esq., Tea Planter, Balleeparah Garden, Assam	1874
D'Oyly, W. H. Esq., Civil Service, Rampore Boileauh ...	1872
Dodgson, W. Esq., Kallygunge Factory, Rungpore ...	1864

D.—(*Continued.*)

	Admitted.
Dods, Jas. Esq., Merchant, Calcutta	1873
Dombal, Rchd, De, Esq., Katchee Katta, via Chooadanga	1872
Drigbijeo Sing, K. C. S. I., Maharajah of Bulrampore, Oudh	1873
D'Silva, E. A. Esq., Asst. Dispensing Chemist, Calcutta...	1873
Duff,† W. P. Esq., Merchant	1867
Dunn, Lt. T. D. W., 62nd Regt., Dum-Dum ...	1873
Dunne, M. P., Esq., Zemindar, Sumshabad, Azimgurh ...	1872
Duthoit, W. Esq., C. S., Mirzapore	1873
Dwarka Nath Dutt, Baboo, Calcutta	1874

E.

Eddy, H. C. Esq., Dacca	1865
Eden, Hon'ble A., Civil Service, Rangoon	1873
Edgar, J. W. Esq., Civil Service, Darjeeling... ...	1869
Edwards, Anthony, Esq., Meerpore Factory, Motteeharree, Chumparun	1866
Edgar, E. L. Esq., Tea Planter, Cossipore Factory, Cachar	1871
Egerton, R. E. Esq., C. S., Simla	1864
Eisenlohr, F. Esq., Merchant, Calcutta	1870
Eldridge, F. G. Esq., Merchant, Calcutta	1867
Erskine, H. C. Esq., Indigo Planter, Elambazar, via Bhulpore	1855

F.

Fairley, W. C. Esq., Merchant, Rangoon	1866
Falcon,† A. B. Esq., Civil Service, Maldah	1858
Farquharson, J. F. Esq., Nunmatti Garden, Gowhatty ...	1874
Fergusson, Hugh, D. Esq., Indigo Planter, Allyghur ...	1867
Ferris, Dr. G. R., Calcutta	1865
Firth, H. A., Esq., Emigration Agent, Calcutta ...	1873
Fisher, Lieut.-Col., G. B., District Supdt. of Police ...	1865
Fisher,† J. H., Esq., Civil Service	1871
Foley, E. G. Esq., Cullecherra Garden, Sylhet ...	1873
Forbes, Capt. W. E., Settlement Officer, Gonda, Oudh ...	1873
Forbes, Major, H. T., Assam	1856
Forbes, A. Esq., Civil Service, Tajpore, Tirhoot	1869
Forbes, L. R. Esq., Offg. Assistant Commissioner, Palamow	1871
Forlong,† Lieut.-Col. J. G. R.	1870
Fox, Michael, Esq., Beheea	1873

F.—(*Continued.*)

	Admitted.
Fox, Mrs. Annie, Singhesur, Bhaugulpore	1871
Francis, T. M. Esq., Solicitor, Muzufferpore, Tirhoot ...	1871
Freck, Deitch, F. Dlen, Esq., Merchant, Calcutta ...	1872
Freeman, H. Esq., Lall Serriah Factory, Seegowly, Chumparun	1866
Fukeerooddeen, Prince Mahomed, Calcutta... ...	1868
Fuller Daniel, Esq., Tea Planter, Chittagong ...	1874
Fyz Alee Khan, Nawab, Bahadoor, Jeypore... ...	1871

G.

Gale, M. H. L. Pundoul Concern, Tirhoot	1873
Galiffe, J. F. Esq., Collector of Canal Tolls, Calcutta ...	1856
Gamble, J. Sykes, Esq., Asst. Conservator of Forests, Darjeeling	1872
Garbett, Lieut. C. H., Asst. Commr., Maunbhoom ...	1868
Gardner, D. M. Esq., Civil Service, Jaunpore ...	1872
Gibbon, T. M. Esq., Indigo Planter, Betteah Factory, Tirhoot	1860
Gibbon, W. F. Esq, Senr., Doolha Factory, Goruckpore ...	1870
Gibbon, W. F. Esq., Turcoleah, Chumparun... ...	1874
Gilbert, Edwin, Esq, Ex.-Engineer, C. I. Administration, Morar	1871
Gillam, F. A. Esq., Agent, Bank of Bengal, Calcutta ...	1870
Gilman, J. H. S. Esq., Sonapore Tea Factory, Gowhatty...	1874
Glass, † J. Esq., Ex.-Engineer, D. P. W.	1866
Gocool Nath Chatterjee, Calcutta	1874
Gokul Chunder Dutt, Calcutta	1874
Goluck Chunder Bose, Baboo, Zemindar, Cuttack ...	1871
Gomess, A. D'B. Esq., Commr. of Soonderbunds Calcutta	1874
Goonendra Nath Tagore, zemindar, Calcutta ...	1872
Gopaul Sing, Rajah of Jabooah...	1874
Gopeenath Roy, Baboo, Calcutta	1871
Gordon, † John Esq., Bank of Bengal	1865
Gouldhawke, J. Esq., Lallpore Concern, Purneah ...	1851
Gowan, Lieut.-Col. J. Y., Bengal Staff Corps ...	1865
Grace, Geo. Esq., Tezepore, Assam	1665
Graf, C. Esq., Merchant, Calcutta	1869
Graham, W. F. Esq., Indigo Planter, Colgong ...	1862
Graham, W. Forbes, Esq.	1867
Graham, Wm. Francis, Esq., M. C. S., Chicacole ...	1871
Grant, Thomas, Esq., Indigo Planter, Bhagulpore ...	1848

G.—(*Continued.*)

	Admitted.
Grant, G. H. Esq., Indigo Planter, Bhagulpore ...	1859
Grant, C. Esq.	1864
Grant, Lieut.-Col., C. D. W. S., Madras Retired List, Secundrabad	1874
Gray, J. S. Esq., Messrs. Smeal & Co., Cachar ...	1874
Greetham, R. T. Esq., Clerk of Works, S. P. and D. Railway, Shaharunpore	1873
Grey, Lieut. L. J. H., Asst. Commr., Ranchie ...	1871
Grees Chunder Sing, Coomar, Zemindar, Pikeparah, near Calcutta	1867
Grey, E. Esq., Civil Service, Bancoorah	1868
Griffith, Ralph, Esq., Principal, Queen's College, Benares	1870
Grote, A. G. Esq., Baraitch, Oude	1866
Guise, ‡ J. J. Esq., Merchant	1867
Gungapershad, Baboo, Deputy Collector, Moradabad ...	1871

H

Hadenfeldt, R. Esq., Merchant, Calcutta	1874
Halford, Chas. Esq., Bill Broker	1872
Halkett, D. C. Esq., Civil Service, Humeerpore, North-West Provinces	1870
Halsey, F. Esq., Madhopore, Punjaub	1863
Hall, R. W. Esq., Balladhun Garden, Cachar ...	1870
Hamilton, J. C. Esq, Indigo Planter, Nurhar Factory, Mudobarry, Tirhoot	1867
Hamilton, T. F. Esq., Merchant, Calcutta	1870
Hankin, Lieut.-Col., G. C., Segowlie	1864
Harlow, Wm, Esq., Manager, Eastern Cachar Tea Company, Cachar	1871
Harrison, Augustus S. Esq., Principal of the Minor College, Allahabad	1873
Harris, G. L. Esq., C. S., Gya	1863
Harrison, H. A Esq., Civil Service, Futteghur ...	1863
Harrison, Revd. H. J., Tollygunge	1872
Harrold, † H. M. Esq., Tea Planter	1863
Hart, Robert Esq., Manager, Loobacherra Garden, Cachar	1872
Hawkins,*† John Abraham Francis, Esq.	1837
Hawkins, Capt. E. L., R. A., Morar	1871
Hay, P. J. Esq., Manager, Sildoobie Tea Garden, Massempore, Cachar	1870
Hazlett,† Dr. H. I.	1873
Health Officer, Calcutta	1865
Heely, W. L. Esq., C. S., Inspr. Genl. of Jails, Calcutta	1864

H.—(*Continued.*)

	Admitted.
Hem Chunder Gossain, Baboo, Serampore	1874
Henderson, Dr. G., Civil Surgeon, Lahore	1863
Henderson, M. Esq., Merchant, Calcutta	1864
Heralall Seal * Baboo, Calcutta	1852
Herklots, D. G. Esq., Agriculturist, Calcutta ...	1870
Herschell, Sir W. J., Bart., Civil Service, Cooch Behar	1870
Hill, Edgar Esq., Indigo Planter, Beylah Concern, Benares	1874
Hill, Dr. J. H. G., Turcooleah Factory, Motecharee, Chumparun	1865
Hill, R. H. Esq., Seraba, Tirhoot	1865
Hills, *† James, Esq., Senior, Indigo Planter ...	1837
Hindmarsh, Thomas Esq., Eastern Bengal Railway, Kancharapara	1866
Hittoll Messer, Baboo, Zemindar, Mauncoor...	1864
Hobhouse, Hon'ble Arthur, Legal Member of the Supreme Council, Calcutta	1872
Hogg, Capt. T. W. Assistant Commissioner, Jubbulpore	1868
Holl, F. W. Esq, Nundeekotee, Hope Town ...	1874
Hollingberry, R. H. Esq., Asst. Secy., Financial Dept., Calcutta	1874
Hollway, F. H. Esq., Indigo Planter, Monghyr ...	1863
Holroyd, Col. Charles, Barrackpore	1866
Home, Major, R. Supdg. Engineer, Umballa Cantonment, Umballa	1873
Homfray, J. N. Esq., Bengal Marine Service, Port Blair	1863
Hoskins, Dr. E. J., Civil Surgeon, Ranchee	1870
Hotson,† A. Esq., Merchant	1872
Howard, Dr. J. S., Civil Surgeon, Oomraotee ...	1870
Hudson, C. K., Esq., Dacca	1874
Hurrendhur Kishore Singh, Baboo, Betteah, Tirhoot ...	1870
Hurst, J. Esq., Mussoorie	1870
Hutchinson† Col. A. R. E.	1862
Hutchinson,‡ J. H. Esq., Merchant	1870
Hynde, Hy. Turnbull, Esq., Manager, Raneegunge Coal Association, Raneegunge	1873
Hyslop,† Archibald, Esq., Merchant	1867

I.

Ingels, Lionel, Esq., Manager, Namdang Estate, Seebsagur, Upper Assam	1872
Inglis, A. B. Esq., Merchant, Calcutta	1873
Ingram, T. L. Esq., Barrister at Law, Lucknow ...	1874

I.—(*Continued.*)

	Admitted.
Inskip,† C. T. Esq.	1870
Imthurn, Dr. A., M. D., Civil Medical Officer, Tezpore, Assam	1873
Ireland, Wm. De Courcy, Esq., Dy. Commr., Akyab ...	1871
Irshad Ali Khan Kunwar, landowner, Sadabad, Muttra ...	1872
Irving, Dr. James, Civil Surgeon, Allahabad ...	1867
Irwin, Lieut.-Col. W., Stud. Dept., Saharunpore ...	1864
Isack, † Thos. S. Esq.	1869
Ishore Pershaud Narain Singh, Bahadoor, Rajah of Benares	1854

J.

Jack, E. A. Esq., Merchant, Calcutta	1863
Jackson, Hon'ble L. S., Civil Service, Calcutta ...	1852
Jackson, C. E. Esq., Manager, New Mutual Tea Co., Lallmookh, Hylakandy, Cachar	1873
James,† A. H. Esq.	1868
Jameson, W. Esq., M. D., Saharunpore	1852
Jarrett, Capt. H. S., Calcutta	1871
Jenkinson, E. G. Esq., C. S., Saharunpore	1874
Jennings F. Esq, Calcutta	1874
Jennings,† C. B. Esq.	1862
Jerdon, C. M. Esq., Sub-Deputy Opium Agent, Gya ...	1872
Johnson, H. Luttman, Esq., Civil Service, Shillong, Assam	1873
Johnstone, Capt. J., Assistant Commissioner, Assam ...	1871
Jones, Frederick, Esq., Civil Service, Midnapore ...	1870
Jones, H. Lloyd, Esq., Bengal Police, Dinagepore ...	1871
Jones, W. H. Esq., Calcutta	1863
Jotendro Mohun Tagore, the Hon'ble Rajah, Calcutta ...	1874
Joy Singh,* Deo Bahadoor, Maharajah of Chikari ...	1868
Joykissen Mookerjee, Baboo, Zemindar, Ooterparah ...	1852
Juggut Sing Koer, Tajpore via Bijnour	1874
Jung,* Bahadoor, Maharajah, G. C. B., Nepal ...	1860

K.

Kabiruddin Ahmed, Moulavi, Calcutta	1874
Kalee Kissen Tagore, Baboo, Calcutta	1869
Kally Prosono Roy, Baboo, Zemindar, Noral, via Jessore	1867
Kemp, Geo. Lucas, Esq., F. R. G. S., Secretary of the Standard Life Assurance Society, Calcutta ...	1871
Kemble, W. Esq., Civil Service, Purneah	1872

K.—(*Continued.*)

	Admitted.
Khettermohun Sing, Baboo, Dinagepore	1870
Kidd, Dr. H. A., Civil Surgeon, Mundla	1871
Kincaid, Lieut.-Col. W., Bheel Agent, Sirdaspore via Indore	1867
King, Dr. Geo. Supdt., Royal Botanical Garden, President	1872
Kirkpatrick, Clarence, Esq., Delhi	1874
Kishen Chunder Bhunge, Rajah of Killoh, Mohurbhunge, Cuttack	1874
Knight, Robt., Esq., Asst. Secy., Govt. of Bengal, Calcutta	1874
Knowles,† H. Esq., Merchant	1852
Knyvett, Major, W. L. N., District Supdt. of Police, Purneah	1864
Komul Krishna Deb Bahadoor, Rajah, Calcutta ...	1874
Krauss, Henry Esq., Rangoon	1865
Krishnadhun Ghose, Dr., Civil Surgeon, Rungpore ...	1874
Kristinder Roy, Rajah, Boliehar, Rajshahye... ...	1866

L.

Lamb, E. Esq., Buchour Factory, Durbangah, Tirhoot ...	1870
Lamouroux, F. Esq., Merchant, Calcutta	1863
Lance, C. E. Esq., Civil Service, Midnapore... ...	1858
Landale, Gec. A. Esq., Indigo Planter. Turtipore, Maldah	1868
Landale, Alex. Esq., Merchant, Calcutta	1869
Langlois, J. P. Esq., Durrung Tea Co., Tezpore, Assam...	1866
Langlois, P. L. F. C. Esq., Barrister-at-Law, Chittagong	1873
Larminie, W. R. Esq., Civil Service, Bancoorah ...	1862
Lawford, H. B. Esq., C. S., Jessore	1865
Lawrie,† T. H. Esq.	1872
Lazarus, F. A. Esq., Calcutta	1874
Lees, Major, W. M., Under Secretary, Government of India, Military Department	1871
Leibert, M. Esq., Tea Planter, Hazareebaugh ...	1868
Leitch, Henry, Joseph, Esq., Broker, Calcutta ...	1872
Lepper, Chas. H., Debrooghur, Assam	1873
Leslie, S. J. Esq., Solicitor, Calcutta	1873
Lethbridge, T. C. Esq., Moorlah Factory, Chumparun ...	1871
Levinge, H. C. Esq., C. E., Arrah	1863
Lewis, Hon'ble W. T., Resident Councillor. Penang ...	1840
Lindesay, H. G. Esq., Khobong Factory, Debrooghur, Assam...	1873
Livesay, C. E. Esq., Asst.-Engineer, Irrigation Dept., Baroon via Dehree	1868

L.—(*Continued.*)

	Admitted.
Llewhellin, W. Esq., Durbungah	1871
Lloyd, M. Esq., Indigo Planter, Shapore Oondee, Tirhoot	1863
Lloyd, W. Esq., Darjeeling	1869
Lockhart,† Capt. W. S. A.	1871
Lovell, Thos. Esq., Deputy Chief Engineer, Lucknow ...	1869
Lovell, Capt. H. P., Supdt. P. and O. Company, Calcutta	1870
Lowther,*† Robert, Esq., Civil Service	1836
Luchmeeput Sing, Roy Bahadoor, Banker, Calcutta ...	1864
Luchmessur Sing, Bahadoor, Zemindar, Mozufferpore, Tirhoot	1861
Lukin, Major F., 3rd Hussars, Mhow, Central India ...	1860
Lushington, H. Esq., C. S., Allyghur	1865
Lyall, D. R. Esq., Civil Service, Dacca	1869
Lynam, John Esq., Supdt., Reserve Police Force, Calcutta	1866
Lynch, Dr. Sydney, Supdt. of Jail, Allipore... ...	1872
Lyne, J. P. Hicks, Esq., Silchar, Cachar	1873
Lyons, A. Dr., Civil Surgeon, Bogra	1874

M.

Macallister, R. Esq., Merchant, Calcutta	1872
Macdonald, C. Esq., Dowlutpore Factory, via Roosa, Tirhoot	1867
MacDonald, M. N. Esq., Pertipore Factory, Sarun ...	1869
Macdonald, Æneas, J. Esq., Lohurreah Factory, Chumparun	1872
Macdonald, James Esq., C. E., Allyghur	1874
Mackenzie, W. S. Esq., Belsund, Tirhoot	1873
Mackillican, J. Esq., Merchant, Calcutta	1865
Mackinnon, Mrs. J. Mussoorie	1874
Mackinnon, D. Esq., Merchant, Calcutta	1874
Maclachlan, J. E. Esq., Calcutta...	1861
Maclean, A. T. Esq., Civil Service, Burdwan ...	1858
Macmillan, J. Esq., C. E., Cuttack	1865
Macnaghten, Chester Esq., Principal, Rajkumar College, Rajkote, Kattywur	1869
Maconochie, G. B. Esq., Offg. Depy. Commr., Gonda, Oudh	1873
Macpherson, Hon'ble A. G., Judge of the High Court, Calcutta	1867
MacTier, Capt. Stewart C., Bengal Staff Corps, Allahabad	1873
Milne, Dr. R. M., Supdt., Central Prison, Benares	1873

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	Admitted.
Macpherson,† W. Esq., Civil Service	1861
Macpherson,*† George G., Esq.	1836
Macdonald, Lt.-Col. John, Survey Department ...	1871
Macdonell, Brigadier Genl. A., C. B., Rawul Pindee ...	1871
Mackenzie, Dr. S. C., Superintendent, Presidency Jail, Calcutta	1871
McIntosh, A. R. Esq., Merchant, Calcutta	1872
Maharaj* Dheraj Matabchunder Bahadoor, Rajah of Burdwan	1836
Maharajah* of Jehore	1868
Maharajah of Betteah, Tirhoot	1870
Maharajah of Cooch Behar	1864
Maharajah of Cashmere	1872
Mahomed Ali Khan, Moonshee, Government Pleader, Dinagepore	1866
Mahony, H. C. Esq., Jokai Assam Tea Co., Debrooghur Assam	1869
Manager, Champdanee, Jute Mills Company	1874
Manager, Kallian Tea Garden, Cachar	1874
Manager, Heron Cherra Tea Garden, Cachar ...	1874
Manager, Panicherra Tea Garden, Cachar	1874
Manager, Burmah Company, Limited, Rangoon ...	1874
Manager, Public Garden, Etawah	1874
Manager, Local Funds, Betul	1874
Manager, New Golaghat Assam Tea Compauy, Assam ...	1874
Manager, Hunwall Tea Estate, Jorehaut, Assam ...	1874
Manager, Dessai and Purbuttea Tea Company, Jorehaut, Assam...	1874
Manager, Teendarea Tea Company, Darjeeling ...	1874
Manager, Singell Tea Company, Darjeeling	1874
Manager, Government Garden, Fyzabad, Oudh ...	1871
Manager, Tarrapore Tea Garden, Cachar	1871
Manager, Chundypore Tea Company, Cachar ...	1862
Manager, Doomra and Rajapattee Indigo Concern, Tirhoot	1873
Manager, Kanchunpore Tea Company, Cachar ...	1862
Manager. Victoria Tea Company, Cachar	1862
Manager, Bengal Tea Company, Cachar	1864
Manager, East India Tea Company, Assam	1865
Manager, Dahingeapore Factory, Assam	1865
Manager of the Halmara Tea Estate, Assam ...	1870
Manager, Koeyah Factory, Cachar	1865
Manager, Goomrah Factory, Tirhoot	1865
Manager, Narainpore Garden, Cachar	1865
Manager, Joypore Garden, Cachar	1865

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	Admitted.
Manager, Cutlee Cherra Garden, Cachar	1865
Manager, Noakacharee Tea Company, Assam ...	1865
Manager, Public Garden, Bareilly	1868
Manager, East India Tea Company, Cachar	1866
Manager, Koomtar Tea Garden, Assam	1869
Manager, Shillong Tea Estate, Shillong	1867
Mandelli, L. Esq., Tea Planter, Darjeeling	1868
Manikjee,* Rustomjee, Esq.. Merchant, Calcutta ...	1837
Manook, Dr. S. J., Civil Surgeon, Chyebassa ...	1866
Markby, Hon'ble W., Judge of High Court, Calcutta ...	1866
Martin, John, Esq., Calcutta	1874
Martin, W. R. Esq., Tea Planter, Punkabaree, Darjeeling	1868
Maseyk, J. W. Esq., Indigo Planter, Jungypore ...	1858
McAlpine, Robert, Esq., Futtickcherry Estate, Chittagong	1865
McDonell, W. F. Esq., Civil Service, Bankipore ...	1866
McFarlane, A. C. Esq., Merchant, Calcutta	1870
Mercer,† Lieut.-Col. T. W.	1866
Meres,† W. F. Esq., Civil Service	1870
Meer Mahomed Ali, Zemindar, Furreedpore ...	1872
Meugens, J. G. Esq., Merchant, Calcutta	1865
Mewburn, G. F. Esq., Merchant, Calcutta	1874
Millar,† Major F. J.	1869
Mills,*† Andrew John Moffat, Esq.	1836
Mills,† Lieut.-Col. H.	1871
Minchin, F. J. V. Esq., Aska, Ganjam	1862
Moir, Dr. W., Civil Surgeon, Meerut	1872
Mohesh Chunder Banerjee, Baboo, Cuttack... ...	1869
Mohima Rungun Roy Chowdry, Zemindar, Kakinia, Rungpore	1865
Mohendrolall Khan, Koomar, Narajole. Midnapore ...	1871
Money,*† W. James Henry, Esq., Civil Service ...	1837
Money, Capt. R. C., Deputy Commissioner, Julpigori ...	1860
Mooney, L. H. Esq., Manager, Kangra Valley Tea Company, Gopaulpore	1874
Moore, C. W. Esq., C. S., Azimghur	1865
Moran, F. C. Esq., Manager, Rungorah Factory, Debroghur	1870
Moran,† J. Kenneth, Esq.. Merchant	1872
Morris, E. Esq., Manager, Hong-Kong and Shanghai Banking Corporation, Calcutta	1874
Morris, G. C. Esq., Civil Service, Burrisaul	1872
Mosely, T. H. Esq., Merchant, Calcutta	1862
Mowbray,† Arthur H. Esq., Merchant	1866

M.—(*Continued.*)

	Admitted
Muir,† Hon'ble Sir W, K. C. S. I.	1869
Mullen, Dr. T. Ffrench, Residency Asst. Surgeon, Ulwar, Rajpootana	1871
Munsier Ali, H. H., The Nawab Nazim of Bengal ...	1874
Murdoch, A. W., Esq., C. E., Serajgunge	1870
Murray,† Col. J. J.	1867
Murray, Capt. J., Asst. Conservator of Forests, Mussoorie	1870

N.

Narayan Rao, Maharajah of Dewass, Indore ...	1874
Narendra Krishna Deb Bahadoor, Rajah, Calcutta ...	1874
Nawab of Maler Kutla, Loodhiana	1873
Nickels, C. Esq., Indigo Planter, Pusewa Factory, Jounpore...	1866
Nilladhur Sing Deo, Bahadoor, Feudatory Chief of Killa, Sonepore	1874
Nobin Chand Bural, Baboo, Solicitor, Calcutta ...	1874
Nobin Chunder Nag, Baboo, Zemindar, Midnapore ...	1866
Noble,† Capt. C. S....	1870
Nolan Phillip, Esq., Civil Service, Serajgunge ...	1873
Notobur Sing, Rajah, Murdraj Bromobur Roy of Killoh-Khand Padda	1873
Noor Khan, Huzrut, Minister of Jowrah	1871

O.

Obhoychurn Goho, Baboo, Merchant, Calcutta ...	1856
O'Connor, J. E. Esq., Dept. of Agriculture, Revenue, and Commerce, Calcutta	1874
Odling, C. W., Esq., C. E., D. P. W., Bhuddruck ...	1871
Ogbourne, C. H. Esq., Calcutta...	1867
Ogilvy,† J. F., Esq., Merchant	1865
O'Keef,† J. W., Esq., Merchant...	1871
Oldham, Wilton, Esq., L.L.D., Civil Service, Ghazeepore	1867
Omesh Chunder Dutt, Esq., Calcutta	1874
Onasch, Revd. H., Ranchee, Chota Nagpore ...	1869
Orchard,† Major W. A. D., B. S. C.	1871
Orr, J. Cave, Esq., Solicitor, Calcutta	1868
Orr, Major Alexander P., Roy Bareilly, Oudh ...	1868
Osborne, Col. Willoughby, F. R. G. S., F. G. S., Political Agent, Bhopal, Sehore	1862
Osborne,† Captain J. H. Willoughby	1870
Ouseley, Gore, Esq., Commissioner, Kussowli ...	1872
Owen, Lieut.-Col. W. G., (12th Madras N. I.,) Nagpore	1846

P.

	Admitted.
Padday,† Capt., A. C., Royal Engineers	1871
Palmer,† Charles, Esq., Medical Service	1848
Palmer,†* T. A. G., Esq.	1861
Parcel, W. G. Esq., Manager, Kewanly Garden, Cachar...	1874
Peal, S. E., Esq., Tea Planter, Sapakatee, Seebsaugor, Assam	1867
Pearl, J. Esq., Tea Planter, Rajmore Tea Estate, Seebsaugor, Upper Assam	1870
Peel,† Fredk., Esq., Merchant	1871
Pellew, F. H. Esq., Civil Service, Hooghly	1863
Pemberton, W. B. Esq., Indigo Planter, Ruttenpore Factory, Kishnaghur	1874
Penny, Dr., C. J., Umballa	1874
Peppe, G. T. Esq., Manager, Dunwar Estate, Pachamba	1872
Peppe, T. F. Esq., Chota Nagpore	1868
Perkins, Dr. R. H., Benares	1859
Perrin, Monsieur, J., Silk Filatures, Berhampore ...	1859
Peter, James Esq., Lydiacherra Garden, Cachar ...	1872
Peterson, Frederick, Esq., Secy., Simla Bank, Simla ...	1862
Phear, the Hon'ble J. B., Calcutta	1867
Phipps, S. U. Esq., Custom House, Calcutta ...	1874
Pickance, Lieut. W. John, Madras Staff Corps, Chutterpore, Ganjam District	1867
Pigott, William Esq., Broker, Calcutta	1864
Pinney, G. F., Esq., Jorehaut Tea Company, Assam ...	1871
Pirthee Sing, Rajah of Awah, Agra	1874
Pogose, J. G. N. Esq., Zemindar, Dacca	1856
Political Assistant, in charge Gondal Estate. Kattywur ...	1873
Political Agent of Morar, Gwalior	1873
Pollok, Major F. T., (Madras Army) Executive Engineer, Gowhatti	1860
Ponder, W. F. Esq., Barrykandy, Cachar	1874
Pope, C. H. Esq., Planter, Singhia Factory, Hadjapore, Tirhoot	1872
Porter, G. E. Esq., Civil Service, Bankipore ...	1863
Pott,† A. C. Esq., Merchant	1870
Poorna Chunder Roy, Zemindar, Sarapoolly ...	1870
Poulton,† Major H B. A., Bengal Staff Corps ...	1865
Powell, Alfred, Esq., Saharunpore	1871
Powell, G. E. Esq., Saharunpore	1873
Prataba Chandra Ghosa, Baboo, Calcutta	1869
Principal, Raj Kumar College, Rajkote, Kattywur ...	1873
Pringle, R. B. Esq., Badalipar Tea Garden, Assam ...	1870

P.—(*Continued.*)

	Admitted.
Prinsep, H. T. Esq., Civil Service, Patna	1870
Proprietors, Jugdispore Estate, Beeheea, Shahabad ...	1869
Protheroe, Capt. Montague, Port Blair	1869
Prosono Coomar Banerjee, Baboo, Calcutta	1871
Pyne, R. Esq., Neelgunge, Purneah	1867

Q.

QUINTON, J. W. Esq., Civil Service, Lucknow ...	1865

R.

RABAN, Col. H., Shillong	1858
Radcliffe, John Esq., Merchant, Calcutta	1871
Rajah of Kuntil, Mirzapore	1871
Rajkissen Mookerjea,* Baboo, Landholder, Ooterparah ...	1836
Ramdass Sen, Baboo, Zemindar, Berhampore ...	1869
Ram Rungun Chuckerbutty, Zemindar of Heetapore, Beerbhoom	1869
Ramanath Tagore, Rajah Bahadoor, Calcutta, *Vice President*	1842
Ramanymohun Chowdry, Baboo, Zemindar, Rungpore ...	1861
Rattray, Haldane, Esq., Arraria, Purneah	1871
Ravenshaw, T. E. Esq., Civil Service, Cuttack ...	1865
Reay, Lieut.-Col. Chs., Benares	1871
Redpath, R. Esq., Assistant Superintendent of Police, Myanoung District, Henzada, Burmah	1868
Reid, J. R. Esq., C. S., Azimgurh	1866
Reilly, Herbert, Esq., Dy. Magte., Maldah	1872
Remfry, H. Esq., Solicitor, Calcutta	1874
Reuss, John Leonard, Esq., Merchant, Calcutta ...	1873
Riach, F. S. M., Esq., Rungagora, Debrooghur, Assam...	1870
Rice, F. T. Esq., Bailpabarree Factory, Midnapore ...	1874
Richards,*† J. Esq., Merchant	1834
Richardson, H. Esq., C. S., Kishnaghur	1872
Richardson, R. J. Esq., Civil Service, Ghazeepore ...	1871
Ridge, W. Esq., Tumlook	1866
Ritchie, D. W. Esq., Offg. District Supdt. of Police, Chyebassa	1871
Roberts, A. V. Esq., Asst. Engineer, Irrigation Works, Kurruckpore	1874
Robertson, J. C. Esq., Civil Service, Allahabad ...	1870
Robinson, S. H. Esq., Merchant, Calcutta	1854
Robinson, W. A. Esq., Umballa...	1871
Robinson,† Revd. Julian	1869

R.—(*Continued.*)

	Admitted.
Rochfort, M. B. Esq, District Supdt. of Police, Rampore Beauleah	1869
Rodrigues, F. Esq., Merchant	1871
Rogers,† Arcbd. Esq., Solicitor	1858
Romesh Chunder Mittra, the Hon'ble, Calcutta ...	1874
Romanath Law, Baboo, Solicitor, Calcutta	1872
Roodurpurshaud, Chowdry,* Nanpore, Tirhoot ...	1867
Rooke, H. A. Lt.-Col., Bengal Army, Cawnpore ..	1874
Roop Deo,* Rajah of Ali-Rajpore, via Sirdarpore, C. I....	1874
Roordur Purtab Sing,* Rajah Bahadoor, Dewan of Punna	1868
Roquet, V. Esq, Indigo Planter, Moharagunge Factory, Azimghur	1860
Ross, R. M. Esq., Merchant, Calcutta	1874
Row,† Col. W. S., (33rd N. I.)	1854
Row,† G. L. Narsing, Esq.	1871
Rowett, J. T. Esq., Merchant, Rangoon	1871
Ruddock, E. H. Esq., B. C. S., Burdwan	1868
Russeed Khan Chowdry, Moulvee, Mahomed, Zemindar, Nattore	1871
Russell, T. M. Esq., Calcutta	1868

S.

Sagore Dutt, Baboo, Merchant, Calcutta	1850
Samachurn Law, Baboo, Merchant, Calcutta ...	1855
Sandys, Mrs. Annie, Bhaugulpore	1870
Saunders, F. W. Esq., Lullutpore	1871
Savi,† J. R. Esq., Indigo Planter	1862
Savi, Thomas, Esq., Indigo Planter	1851
Sceales, Jaffray O'Brien. Esq., Bancoorah	1869
Schlich, Dr. W., Conservator of Forests, Bengal ...	1874
Scott, J. M. Esq., Professor, Civil Engineering College, Calcutta	1873
Secretary, Local Funds, Raepore	1874
Secretary, Agricultural Society, Satkhira	1871
Secretary, Public Garden, Azimghur	1871
Secretary, Local Fund Committee, Umritsur ...	1859
Secretary, Local Fund Committee, Ferozepore ...	1861
Secretary, Public Garden, Banda	1855
Secretary, Cantonment Public Garden, Agra ...	1865
Secretary, Assam Company, Calcutta	1865
Secretary, Public Garden, Jaloun, Oorai	1866
Secretary, Government Garden, Muttra	1866
Secretary, Local Committee, Jhansie	1867

S.—(*Continued.*)

	Admitted.
Secretary, Municipal Committee, Mirzapore... ...	1869
Secretary, Road Fund Committee, Jaunpore ...	1867
Secretary, Local Committee, Chanda	1870
Secretary, Municipal Committee, Jhung	1870
Secretary, Local Fund Committee, Belaspore ...	1871
Secretary, Local Committee, Hoshungabad	1872
Secretary, Government Botanical Garden, Monghyr ...	1873
Secretary, Local Fund, Nimar, Khundwa	1873
Secretary, Recreation Grounds and Gardens, Jamalpore	1874
Secretary, Queen's Garden, Delhi	1873
Sells, A. Esq., C. S., Ghazeepore	1874
Shahamut Allee Khan, Meer Bahadoor, Superintendent of Rutteeana, Indore...	1870
Shamloll Dutt, Baboo, Calcutta	1871
Sharp, H. G. Esq., C. S., Raneegunge	1872
Shaw, J. Esq., Sub-Deputy Opium Agent, Burhurwah, Chumparun	1871
Shaw, Dr. John Cardy, Civil Surgeon, Mymensing ...	1873
Shearin, E. Esq., Merchant, Calcutta	1856
Sheodial Sing,* H. H. Mohakhan, Rajah of Alwar ...	1863
Sherer, J. W.† Esq., Civil Service	1869
Sherriff, W. Esq., Jorrada, Jessore	1859
Shillingford, G. W. Esq., Holassy Factory, Purneah ...	1867
Shipp, W. Esq., C. E., G. I. P. Railway, Hurdah ...	1873
Sibley, George Esq., Civil Engineer, E. I. Railway, Calcutta	1869
Simons, C. J. Esq., Tea Planter, Borsella Factory, Morar Bazaar Post Office, Upper Assam	1863
Simson, James, Esq., Civil Service, Agra	1856
Simmonds, F. W Esq., Larsinga Tea Garden, Cachar ...	1873
Skinner, E. Esq., Tea Planter, Cachar	1872
Skinner, A. Esq., Delhie	1854
Slater, E. M. Esq., Bank of Bengal, Calcutta ...	1870
Smalley,† R. B., Esq., ...	1867
Smith, G. M. Esq., Joyhinga Tea Estate, Lukimpore, Assam	1871
Smith, H. Glas, Esq., Calcutta	1874
Smith, R. H. Esq., Principal Sudder Ameen, Meerut ...	1860
Smith, James Esq., Shahpore, Tirhoot	1863
Smith Maxwell, Esq., Hursingpore, Tirhoot	1869
Smith W. Esq., Dorundah Factory. Chota Nagpore ...	1872
Smyth, Captn. R. G., Hazareebaugh	1872
Spencer Harrison, Esq., Tea Planter, Darjeeling ...	1874
Spencer C. J. Esq., C. E., E. I. Railway, Ucharah ...	1863

§.—(*Continued.*)

	Admitted.
Spicer, A. Esq., Tea Planter, Cachar	1869
Stalkartt, William Esq., Merchant, Calcutta, *Vice-President*	1845
Stalkartt, J. Esq., Darjeeling	1863
Steel Octavius, Esq., Merchant, Calcutta	1874
Steel, Donald, Esq., Eastern Cachar Tea Company, Cachar	1861
Stephen, J. Esq., Dacca	1855
Stephenson, Cecil, Esq., Agent, E. I. Railway, Calcutta...	1866
Stevens, H. W. Esq., Supdg. Engr., Durbangah ...	1867
Stevenson,*† William, Esq., Junior, M. D.	1834
Stevenson, Geo. Esq., Civil Service, Pooree	1873
Stewart, A. N. Esq., Collector of Tolls, Jungypore ...	1862
Stewart, A. Esq., Manager, Oornabund Garden, Cachar...	1870
Stewart, James Esq., Civil Engineer, Umballa ...	1873
Stewart,† Robert Esq., Merchant	1873
Stirling, Lieut. P. Burnbrae Bowerneh, Kangra Valley ...	1873
Stokes, Allen Esq., E. I. Railway, Jamalpore ...	1867
Stoney, R. V. Esq., Civil Engineer, Ungool via Cuttack...	1866
Stoney, T. Butler, Esq., C. E. Dehree, Shahabad ...	1869
Story, Lieut.-Genl. P. F., Dehra Doon	1873
Stratton, J. P. Esq., Pol. Agent, Nowgong, Bundelkhund	1873
Stuart,† Alex. Esq.	1863
Stuart, Dr. Kenneth, B. Calcutta	1872
Stubbs,† Lieut.-Col. W. H., 4th Regt. N. I. ...	1868
Sturmer, Edwin Esq., Assistant Engineer, Orissa ...	1863
Sturmer, A. J. Esq., Talooka Kojha, via Gazeepore ...	1866
Sturmer, John, Civil Engineer, Calcutta	1864
Sukharam Martund, Esq., Indore	1872
Sumbhoo Narayana, Rajah Bahadoor, Benares ...	1872
Superintendent, Public Garden, Dehra Ghazee Khan ...	1874
Superintendent of Surat Jail, Surat	1874
Superintendent, Taj Garden, Agra	1874
Superintendent, Model Farm, Cawnpore	1860
Superintendent of the Patna Lunatic Asylum, Patna ...	1871
Superintendent, Central Prison, Benares	1872
Supdt. of Jorehaut Tea Company, Assam	1865
Supdt., Serajgunge Jute Company, Serajgunge ...	1868
Surdharee Lall, Baboo, Zemindar, Bhaugulpore ...	1874
Sutcliffe, James Esq., Principal of the Presidency College, Calcutta	1871
Sutherland, Charles J. Esq., Merchant, Calcutta ...	1838
Sutherland,† H. H. Esq., Merchant	1870
Sutherland, A. B. Esq., Merchant, Calcutta ...	1870
Suttyanund Ghosal, Rajah,* Bhookoyelas (*Vice-President*)	1869

S.—(*Continued.*)

	Admitted.
Swinden, T. G. Esq., Calcutta	1855
Swinhoe, William Esq., Attorney, Calcutta	1859
Syed Wellayet Ali Khan, Patna	1871

T.

TAKILE SEDENATH SING, Zemindar of Kerabally ...	1874
Taylor, V. T. Esq., Civil Service, Bhaugulpore ...	1860
Taylor, W. C. Esq., Cuttack	1858
Taylor, Frank, Esq., Executive Engineer, E. I. Irrigation and Canal Company, Hidgelee	1868
Taylor, S. H. C. Esq., C. S., Beerbhoom	1873
Taylor, Geo. Esq., Barrister, Bombay	1874
Temple, the Hon'ble Sir R., K. C. S. I., Calcutta ...	1869
Templer,† Lieut.-Col. H. J., Staff Corps	1871
Tenant,† Major T. E.	1868
Tennant, Col. J., R. E., Roorkee...	1874
Thakore Sahib, Rajkote, Kattywur	1873
Thelwall, Col. J. B., C. B., Mean Meer	1851
Thomas, J. Esq., Merchant, Calcutta	1867
Thomson, H. E. Esq., Supdt., Govt. Tel. Dept., Calcutta	1874
Thomson, John Esq., Merchant, Calcutta	1872
Thompson, Lieut.-Col. E., Political Agent, Moorshedabad	1864
Thompson, Rivers Esq., Civil Service, Calcutta ...	1864
Thompson,* Dr. R. F., Hooghly...	1865
Thompson, J. A. Esq., Chandeeghat Tea Garden, Cachar	1871
Thompson, Henry, Esq., Manager, Moran Tea Company, Seebsaugor, Assam	1870
Thompson,† Ninian, Esq.	1862
Thorpe, J. Esq., Lucknow	1867
Thurburn,† E. A. Esq., Merchant	1871
Tonnerre, Dr. C. Fabre, Health Officer, Calcutta ...	1862
Toogood, H. W. Capt., Supt., Salt Golah, Sulkea ...	1874
Toomey, Geo. Esq., Indigo Planter, Contai, Tirhoot ...	1870
Tottenham, L. R. Esq., Civil Service, Burrisal ...	1873
Trafford,† Revd. John	1863
Tresham, W. C. Esq., Nujeebabad via Bijnour ...	1874
Tucker,† W. T. Esq., Civil Service	1855
Tucker, Robert Esq., Tea Planter, Seebsaugor ...	1867
Tulloch, Hugh, W. Esq., Merchant, Calcutta, ...	1872
Turnbull, C. S. Esq., Silk Manufacturer, Burroghurcah, Turtipore	1853
Turner, H. B. H. Esq., Merchant, Calcutta	1868
Turner,† H. G. Esq., Madras Civil Service	1869

T.—(*Continued.*)

Admitted.

Twyford, C. Esq., Tea Planter, Adelabannie Garden, Assam 1874
Twynam, Capt. E. J. L., Executive Officer 1856
Tytler,† Major Genl. Fraser, C. B. 1872

U

Unwin, Howard Esq., C. E. Cuttack 1869

V.

Venayk Rao Gunput Kibia Sahaib, Indore 1872
Vernon, John Esq., Executive Engineer, Debrooghur ... 1871
Vertannes, J. C. Esq., Civil Engineer, Contai ... 1865
Vizianagram,* His Highness the Rajah of 1847
Voigt, S. E. Esq., Merchant, Calcutta 1870
Voss, C. W. Esq., Ganjam 1874

W.

Wagentrieber, W. J. H. Esq., Sonarie, Seebsaugor, Upper Assam 1868
Walker, William, Esq., Tea Planter, Seebsaugor, Upper Assam 1870
Walker, Richd. Chs. Esq., Bohorah Factory, Purneah ... 1872
Wallace, Adolphus Esq., Rungajaun Factory, Golaghaut, Assam 1866
Ward, Lieut.-Col. W J., 8th Bengal Cavalry, Meerut ... 1870
Ward, W. E. Esq., Civil Service, Dinagepore ... 1873
Waterfield,† E. Esq. Civil Service 1846
Waterfield, William Esq., Civil Service 1870
Watling, R. G. Esq., Manager, E. I. Railway Co.'s Oil Factory, Manowrie, near Allahabad 1873
Watson, A. G. Esq., Tea Planter, Chittagong ... 1874
Wauchope,† S. Esq., Civil Service 1848
Webster, Alex. L. Esq., Chittagong 1867
Wemyss, Sir John, Bart., Mirzapore 1859
Weston, John Esq., Judge, S. C. Court, Magoorah ... 1863
Whishaw, Dr. J. C., M. D., Supdt., Central Jail, Lucknow 1873
White, Robert Esq., Tea Planter, Silcoorie Tea Estate, Cachar 1869
White, Dr. J. B., 42nd Assam Light Infantry, Debrooghur 1872
Whitty, Irwin J. Esq., Civil Engr., E. I. Railway Chord Line, Kurmaton, Assensole 1867
Whitwell, Dr. Henry, 17th N. I. Mean Meer, Punjab ... 1874
Wigram,* Percy Esq., Civil Service, Bustee ... 1871
Wilcox, Frederick, Esq., Bengal Police, Poorolia ... 1867

W.—(*Continued.*)

	Admitted.
Wilkinson,† Major A. E.	1862
Wilkinson, C. J. Esq., Barrister-at-Law, Rangoon	1870
Wilkinson, Capt. A. R., Asst. Supdt. of Police, Calcutta...	1873
Wilkinson, Revd. W. Arrah, Shahabad	1873
Williams, G. R. C. Esq., Civil Service, Dehra Doon ...	1872
Williamson, Lieut. W. J., Deputy Commr., Garrow Hills, Assam	1867
Wilson, Lieut.-Col. H. M. 31st Regiment P. I., Kulu via Kangra	1860
Wilson, H. F. Esq., Serajgunge	1870
Windle,† J. A. Esq., C. E.	1865
Wingrove, Clement Esq., Gowhatty, Assam... ...	1871
Wintle, Col. E. H. C., Cantonment Magte., Dum-Dum...	1860
Wise, Dr. James, Civil Surgeon, Dacca	1871
Wollen, H. W. Esq., Assistant Indigo Planter, Bulleah Factory, via Arrah	1873
Wood, James M. Esq., Debrooghur, Assam	1865
Woodford, Dr. C. O., Calcutta	1863
Wordie,† T. H. Esq., Merchant	1863
Wright, W. R. C. Esq., Dehree Indigo Concern, Shahabad	1874
Wright, A. C., Deputy Magistrate, Jehanabad, Gya	1865
Wright, Dr. Daniel, Katmandoo, Nepaul ...	1866
Wright, W. Esq., Judge, Small Cause Court, Cuttack	1866
Wuzeer Ally Syud, Gya ...	1874
Wuzeer Ally, Nawab, Gya ...	1872
Wyllie, H. S. Esq., Soeburbund Tea Garden, Cachar	1873

Y.

Yate, B. J., Esq., Howrah	1874
Young, Capt. Charles, Meywar Bheel Corps, Kherwarrah	1872
Young, W. Esq., C. S.	1868
Young, Major Siddons, Commanding at Chunar ...	1871

Z.

Zander, Leo, Esq., Merchant, Calcutta	1872

BYE-LAWS.

CHAPTER I.

OBJECT.

THE promotion and improvement of the Agriculture and Horticulture of India constitute the object of the Society.

CHAPTER II.

CONSTITUTION.

The Society consist of Members, Honorary and Corresponding Members, and Associates.

CHAPTER III.

PROPOSAL AND ELECTION OF MEMBERS.

Section 1.—Persons of every nation shall be eligible as Members of the Society.

Section 2.—Candidates for admission as Ordinary Members shall be proposed by two Members at a General Meeting, and ballotted for at the succeeding Meeting, when a majority of votes shall determine the election.

Section 3.—Persons so elected shall have immediate notice thereof transmitted to them by the Secretary, accompanied by a copy of the Bye-laws, and a printed letter to be duly signed and returned, acknowledging the receipt of their election as Members, and agreeing to consider themselves bound by the Bye-laws.

Section 4.—Ordinary Members shall pay an Entrance Fee of 8 Rupees. They shall be liable for the full subscription for the quarter in which they may have been elected.* The subscription of Ordinary Members shall be 32 Rupees per annum, payable quarterly in advance, in sums of 8 Rupees. It shall be optional

* Or if desirous to avail of the full privileges of the year, may elect to pay the full year's subscription, without reference to date or period of election.—See Privileges of Members, Chapter 5, Section 5.

for any Member to compound for the quarterly contributions by the payment of Rupees 320 to the funds of the Society.

Section 5.—A Member retiring from the Society shall be exempted from the payment of a second admission fee on re-admission.

Section 6.—Members whose absence from India shall not extend beyond three years, shall continue to be borne on the list of Members, but shall be exempt from the payment of subscriptions until their return to the country.

Section 7.—When any Member shall be six months in arrear of his subscription, or otherwise indebted to the Society, he shall receive the usual ordinary notice of the same; and in the event of his not remitting the amount within one month if a Town Member, and two months if a Non-resident Member, he shall be apprised by letter, addressed to his last known place of residence, that unless the amount due by him be paid within fifteen days from the date of notice if a Town Member, and one month if a Non-resident Member, he will be liable to be sued, or his name published as a defaulter. He shall, moreover, be debarred from all the privileges of a Member if six months in arrear, until the amount due by him is paid. Persons not paying after such notice, shall cease to be Members.

Section 8.—Ladies may be admitted as Members upon the same terms, and under the same regulations in all respects, as Gentlemen.

CHAPTER IV.

Withdrawal of Members.

Section 1.—Any Member may withdraw from the Society by intimating his wish to do so by letter addressed to the Secretary, without continuing his subscription beyond the quarter of the year in which his resignation is sent in; subject, nevertheless, to his being sued, or his name being published among the Defaulters (as per section 7 of Chapter III.) if his arrears of subscription, or other debts to the Society, are not paid.

Section 2.—A resigning Member shall be at liberty to withdraw his letter of resignation, on payment of arrears, without going through the form of re-admission; provided such notice of with-

drawal be given during the year in which the resignation has been notified.

Section 3.—Retiring Members and Members, whose names have been removed from the list owing to long absence from India, desiring to rejoin can do so without any formal re-election; their desire to rejoin being notified for the information and consideration of the Monthly General Meeting, and to be agreed to, or otherwise, at such meeting.

CHAPTER V.

Privileges of Members.

Section 1.—The Members have the right to be present and to vote at all General Meetings; to propose Candidates for admission into the Society as Members, also to have personal access to the Museum, Library, and Garden of the Society, and to introduce visitors at the Ordinary Meetings.

Section 2.—Members shall be entitled to a share of all seeds purchased by, or presented to, the Society; they can indent, at least once a year, on the Society's Garden for plants;* they shall also be entitled to a copy of the Society's *Journal*, published subsequently to their election, and to previously published volumes on payment of the cost charges.

Section 3.—Members in the Country applying for seeds shall distinctly state to whose care such seeds are to be delivered in Calcutta, or how otherwise they are to be forwarded: the Society cannot despatch them at its own expense; but, if the agency of the Society be desired by Members in the Mofussil, the charge for packing the vegetable and flower seeds of the season in tin and wax cloth, and forwarding the same (exclusive of the cost of

* Members shall be entitled on and after the 15th June, 1875, to select from the Society's garden as per revised priced catalogue, an assortment of rooted, ornamental shrubs and rose plants to the value of Rs. 20 free of charge; in no case however, shall they have in any one assortment more than one plant of any one variety which exceeds (12) Twelve Annas in price, and their indents shall be strictly restricted to once only in each year, the prescribed allowance of plants being drawn at one time in one lot, and not in instalments during any one year.

freight per Steamer, Railway hire, or other mode of conveyance, for which separate provision will have to be made by Members) will be Rs. (5) five annually, payable in advance.

Section 4.—Only Members actually resident in India shall have claims upon the Society's Garden, or seeds imported by the Society, or copies of the *Journal*, unless they continue their subscription while abroad.

Section 5.—The privileges of newly-elected Members, and Members rejoining the Society shall be regulated as follows, according to date of election and re-admission, in order to equalize such privileges with those enjoyed by Members paying subscription for the full year:

Members elected in the months of January, February, and March, in each year, paying the full year's subscription, shall be entitled to full privileges.

Members elected in the months of April, May, and June, paying only three quarters' subscription, shall receive one packet less of vegetable seeds than Members paying the full year's subscription, but be entitled to all other privileges, together with the right to purchase the extra packet of vegetable seeds at Members' rates.

Members elected in the months of July, August, and September, paying only two quarters' subscription, shall have one packet less each of vegetable and flower seeds, than Members paying the full year's subscription, but be entitled to all other privileges, and be allowed to purchase the extra packets of vegetable and flower seeds at Members' rates.

Members elected in the months of October, November, and December, paying only one quarter's subscription, will be entitled simply to one packet of flower seeds with the right, however, to purchase two packets of vegetable seeds at Members' rates; or Members may, in lieu of quarterly subscriptions, elect to pay a consolidated amount equal to a full year's subscription, and claim all the privileges under the Rules of the Society.

CHAPTER VI.

Of Honorary Members.

Section 1.—Honorary Members shall be persons eminent for

their knowledge of, or encouragement given to, Agriculture or Horticulture, or for services rendered to the Society.

Section 2.—Persons proposed as Honorary Members shall be recommended by the Council, they shall be ballotted for like Ordinary Members, but three-fourths of the votes shall be required to determine their election.

Section 3.—Honorary Members shall be exempted from the payment of fees and contributions; and they shall be entitled to all the privileges of Ordinary Members.

Section 4.—No Office-Bearer of the Society shall, in future, be eligible as an Honorary Member during his tenure of office.

CHAPTER VII.

Of Corresponding Members.

Section 1.—The Corresponding Members of the Society shall be constituted of such persons, not resident in Calcutta, or within one hundred miles thereof, as may show a willingness to promote the objects of the Society.

Section 2.—Corresponding Members shall not be limited as to numbers; they shall have the privilege of attending at Meetings of the Society, but shall have no voice in the business; they shall receive such copies of the Society's *Journal* as may contain their contributions, but shall not be entitled to receive seeds, plants, &c.

Section 3.—Persons proposed as Corresponding Members shall be recommended by the Council, they shall be ballotted for like Ordinary Members, but three-fourths of the votes shall be required to determine their election.

CHAPTER VIII.

Of Associates.

Section 1.—Associates shall be persons well known for their practical knowledge of, or encouragement given to, Agriculture or Horticulture, or for services rendered to the Society, but who are not likely to apply to become Ordinary Members.

Section 2.—Persons proposed as Associates shall be recommended by the Council, they shall be ballotted for like Ordinary Mem-

bers, but three-fourths of the votes shall be required to determine their election.

Section 3.—Associates shall be exempted from the payment of fees and contributions; they shall have all the privileges of Ordinary Members, except that of voting at Meetings of the Society.

CHAPTER IX.

General Meetings.

The General Meetings to be held by the Society shall be of three kinds: 1st, annual—2nd, Ordinary—3rd, Special.

CHAPTER X.

Anniversary General Meeting, Election of Officers, Council, Committees, and Annual Report.

Section 1.—An Anniversary General Meeting shall be held in January of each year, for the election of Officers and Council for the ensuing year, for the nomination of the several Standing Committees, and to receive and hear read the Annual Report on the financial and general concerns of the Society.

Section 2.—The Officers shall consist of—

1 President.
4 Vice-Presidents.
1 Secretary.
1 Deputy-Secretary and Treasurer.

Section 3.—The President and Council shall, previous to the Meeting, nominate the persons whom they recommend for election as Office-Bearers and Council; and balloting lists containing the names of the Members recommended, leaving a blank column opposite for such alterations as Members may wish to make, shall be prepared one week before the day of election. A copy of the list shall be handed to each Member present at the Meeting, and should he disapprove of any name or names, or be desirous of inserting some other name or names, he shall erase or insert accordingly.

Section 4.—The Chairman shall appoint two Scrutineers, not Members of the Council, to examine the lists and report the result to the Meeting.

Section 5.—In the event of a vacancy during the year, in the list of Officers or Council of the Society, such vacancy shall be filled up for the remainder of he year on the recommendation of the Council, at the second Monthly Meeting after the occurrence of such vacancy.

Section 6.—With the exception of the President, Secretaries, and Treasurer, the Office-Bearers of the Society, after a tenure of office during two years, shall not be eligible for re-election till the expiry of twelve months.

Section 7.—The revision of the various Standing Committees shall also take place at each Anniversary Meeting, consisting of the following :

Sugar Committee.
Cotton Committee.
Silk, Hemp, and Flax Committee.
Coffee and Tobacco Committee.
Oil and Oil-seed Committee.
Grain Committee.
Implements of Husbandry & Machinery Committee.
Nursery Garden Committee.
Fruit and Kitchen Garden Committee.
Floricultural Committee.
Translation Committee.

Section 8.—The Council shall consist of the Office-Bearers and twelve Members.

Section 9.—No person shall hold at the same time more than one of the following offices; *viz.*, President, Vice-President, or Secretary.

Section 10.—The Council shall elect from their own body Sub-Committees of Finance, Papers and correspondence, whose reports, on all matters referred to them, shall be submitted to the Council.

CHAPTER XI.

Ordinary and Special General Meetings.

Section 1.—Ordinary General Meetings shall be held at the Society's apartments, Metcalfe Hall, on the second Wednesday of

every month, throughout the year, at the hours of 4 P. M., from October to March, and 4½ P. M., from April to September, unless circumstances should render it expedient in the opinion of the Council, or any General Meeting, to alter the next General Meeting.

Section 2.—Strangers may be present at the Ordinary General Meetings, if introduced by Members, and their names given to the President for record.

Section 3.—The ordinary course of procedure at the General Meetings shall be as follows:

1. The proceedings of the preceding General Meeting shall be read and submitted for confirmation.
2. The names of the gentlemen proposed as Members at the last Meeting shall be announced for ballot.
3. Motions, of which notice was given at the last Meeting, shall be brought forward and disposed of.
4. Notice of Motions shall be given for entry in the proceedings of the Meeting.
5. The names of gentlemen proposed as Members shall be announced.
6. The various reports, &c., on questions referred to the Council, shall be submitted for consideration.
7. Papers and communications received since the last Meeting, together with their respective presentations, shall be brought to notice.

Section 4.—Special General Meetings may be convened at any time, on a requisition to that effect to the President, signed by at least six Members, who thereupon will call the same, through the Secretary or Deputy-Secretary, by public advertisement in three of the newspapers of the Presidency. No Special Meeting shall take place without a month's previous notice being given, unless the case be urgent.

Section 5.—No stranger shall be permitted to be present at Special Meetings of the Society.

Section 6.—Notice of motion on questions of Finance, or other matters of importance, shall be given at a General Meeting preced-

ing that on which the subject is to be disposed of, in order that Members, who take an interest in the question, may have an opportunity of expressing their assent or dissent; and no motion, of which notice has not been given, shall be carried at the Meeting at which it is proposed, if any three Members present vote for its postponement.

Section 7.—Motions of which previous notice has been given, shall take precedence of all others.

Section 8.—Mofussil Members shall have the privilege of voting on questions of which one month's notice is given, sending their votes, post-paid, to the Secretary for record.

CHAPTER XII.

Council.—Powers and Duties.

Section 1.—The government of the Society and the management of its concerns are intrusted to the Council, subject to no other restrictions than are imposed by the Bye-Laws, and to no other interference than may arise from the decisions of the Members assembled in General Meetings.

Section 2.—The Council shall meet once at least in every calendar month throughout the year, on such day or days as they shall deem expedient.

Section 3.—No Meeting of the Council shall be competent to enter on, or decide any business, unless three or more Members be present.

Section 4.—The Council may appoint persons, not Members of it, to be salaried Clerks or Servants, for carrying on the necessary concerns of the Society, and may define the duties to be performed by them respectively, and may suspend any Clerk or Servant from office whenever it shall appear to them necessary; provided always that such appointment or suspension shall be reported to the next General Meeting of the Members, to be confirmed or annulled as may be decided by such Meeting.

Section 5.—The Council shall present and cause to be read to the Anniversary General Meeting, a report on the general concerns of

the Society for the preceding year. The report shall state the income and expenditure, the receipts and disbursements, and the increase or the decrease of the Society during that year; and give an estimate in detail of the probable income and expenditure of the succeeding year.

Section 6.—The Council shall distribute seeds and plants to all public gardens, reporting their proceedings to the next Meeting of the Society. No other resolution of the Council for disposing of, or pledging the funds or property of the Society to any amount beyond the current expenses of the establishment, shall be acted upon, or be of any validity, until confirmed by the Society.

Section 7.—The President, or, in his absence, one of the Vice-Presidents, or in their absence, the senior Member, shall preside at every Meeting of the Council.

Section 8.—All questions shall be decided by ballot, on the demand of any member present; and the decision of the majority shall be considered the decision of the Meeting.

CHAPTER XIII.

The Duties of the President and Vice-Presidents.

Section 1.—The business of the President shall be to preside at all the Meetings of the Society, and regulate all the proceedings therein; and generally to execute, or see to the execution of the Bye-laws and Orders of the Society.

Section 2.—In case of the absence of the President from any of the Meetings, his place shall be filled by the senior Vice-President then present, and, in the absence of the Vice-President, by the senior Member present, who shall, for the time being, have all the authority, privilege, and power of the President.

CHAPTER XIV.

Of the Secretary and Deputy-Secretary.

Section 1.—The Secretary, or, in his absence, the Deputy-Secretary,* shall exercise a general inspection over the servants

* There is no Deputy-Secretary now.

and the affairs of the Society, and shall see that the Bye-laws and Orders of the Society are executed; he shall also attend the Meetings of the Society, and read such papers as may be submitted.

Section 2.—The Secretary, or, in his absence, the Deputy Secretary, shall sign all letters and papers emanating from the Society.

Section 3.—The Deputy-Secretary shall draw up the correspondence of the Society, and be in daily attendance at the Society's apartments during the usual office hours.

CHAPTER XV.

Of the Treasurer and the Accounts.

Section 1.—The Treasurer shall demand and receive, for the use of the Society, all moneys due by or payable to the Society, and shall keep full and particular accounts of all sums so received and paid.

Section 2.—The moneys as received shall be deposited in the Bank of Bengal; and when the surplus shall exceed Rupees 1,000, it shall be invested in Company's Securities, on behalf of the Society, in the name of the Secretary of the Bank of Bengal for the time being.

CHAPTER XVI.

Of Committees.

Section 1.—Besides the Standing Committees, (Section 7, Chapter X.) the Members assembled in General Meetings may appoint Committees to report on any special matter relating to the object or concerns of the Society.

Section 2.—Every Committee shall cause Minutes to be taken of its proceedings.

Section 3.—Every Committee may appoint its own Chairman and Secretary.

Section 4.—Any Member of any Committee, who shall be personally interested in any question before that Committee, shall withdraw during the consideration of and vote upon the

same, and shall not take part in any Report that may be drawn, up upon the matter for submission to the Secretary.

Section 5.—The Secretary shall be, *ex-officio*, a Member of all Committees.

CHAPTER XVII.

Of the Publications of the Society.

Section 1.—The *Journal* and other publications of the Society shall be under the superintendence of the Council, and shall be printed from time to time, whenever a sufficient number of such papers as may be deemed of public utility has been collected to form part of a volume.

Section 2.—Contributors to the *Journal*, &c., shall be entitled to twenty-five copies of their papers.

CHAPTER XVIII.

Distribution of Prizes.

Section 1.—The distribution of Prizes at the Periodical Vegetable and Flower Shows of the Society shall be undertaken by the President or senior Vice-President. In the absence of such Officer or Officers, the senior Member of the Committee, to whom the arrangements of the Show are intrusted, shall perform that duty.

Section 2.—The Council shall have the power of adopting from time to time any regulations for the management of the Shows that may seem to them expedient.

CHAPTER XIX.

Amendments of the Bye-Laws.

Amendments for alterations of the Bye-Laws may be proposed at any ordinary Meeting of the Society; they shall, with the assent of the majority of the Members present, be entered on the Minutes, and if ordered by the said majority to lie over for consideration, the President shall direct them to be read by the Secretary, and stated for discussion at the next General Meeting; and if three-fourths of the Members, provided that not less that eleven Members be present, shall vote in favor of adopting them, they shall be recorded as a part of the Bye-laws.

Register of the result of Vegetable Seeds sown at *in the year* 187 .

Distinguishing mark or No.	Names of Seeds of Vegetables, allowing three spaces or lines to each variety for noting, when required, results of 2 or more sowings, at intervals, during the year.		Months and dates of Sowings. No. of Seeds sown. Dates of appearance of germination. Total No. of Seeds germinated. Dates of maturity and columns to fill up. Names of Seedsmen.															
			SEEDS FROM									SEEDS FROM						
			Sown.			Germinated			Matured.			Sown.			Germinated.			Matured.	
	Kinds.	Varieties.	Mo.	Date.	No. of seeds.	Mo.	Date.	No. of seeds.	Mo.	Date.		Mo.	Date.	No. of seeds.	Mo.	Date.	No. of seeds.	Mo.	Date.
1	ARTICHOKE ...																		
2	ASPARAGUS ...	Large purple top...																	
3	BASIL SWEET ...																		
4	BEANS ...																		
5	BEET ...	Red ... White ...																	
6	BORAGE ...																		
7	BRINGALL, Egg plant ...																		
8	BROCCOLI ...																		

9	BRUSSELS SPROUTS ...		
10	CABBAGE ...	Early York ...	
		Sugar Loaf ...	
		Drum Head ...	
		Red Dutch ...	
11	CARROT ...	Long Orange ...	
		Early Horn ...	
12	CAULIFLOWER ...	Early ...	
		Late	
13	CELERY ...	Red ...	
		White ...	
14	CHILLI OR Capsicum ..		
15	CRESS ...	Curled ...	
16	CRESS ...	Common ...	
17	CUCUMBER ...		
18	ENDIVE ...		
19	KNOL KOHL ...		
20	LEEK ...		
21	LETTUCE ...	Cabbage ...	
		Cos ...	
22	MARJORAM ...		
23	MUSTARD ...		
24	ONIONS ...		

25	PARSLEY ...	
26	PARSNIP ...	
27	PEAS ...	
28	POTATOS ...	
29	POTATOS, Sweet ...	
30	PUMPKIN ...	White ... Red ...
31	RADISH ...	
32	RAM'S HORN ...	
33	RHUBARB ...	
34	SAGE ...	
35	SAVORY ...	Summer ... Winter ...
36	SPINACH ...	
37	SQUASH ...	
38	THYME ...	
39	TOMATA ...	
40	TURNIP ...	

N. B.—Copies of this form of register may be had printed on large size paper, and spaced out, to admit of the blank columns being used for filling up results of sowings.

List of Varieties of Mango grafts in the Society's Garden at Alipore.

Price @ 1-8 ₱ graft. Half price to Members.

Gen.	Sp.		Gen.	Sp.	
228	1	Agabeg.		23	Kistapal bura.
	2	Alphonso.		24	Kistapal chota.
	3	Arbuthnot.		25	Lamba budra.
*	4	Bangalore.	*	26	Langera.
*	5	Bengal, No. 1.		27	Madam.
*	6	Bengal, ,,	*	28	Madras.
	7	Bhandoorea.		29	Malda, large.
	8	Bindabonnee.		30	Malda, Singapore.
	9	Bombay, No. 1.		31	Malda, small.
	10	Bombay ,, 2.		32	Mazagon.
*	11	China.		33	Moorshedabad.
	12	Chuckchukeea.	*	34	Peters.
	13	Dalhuguy.	*	35	Pyasee.
	14	Davies's favorite.		36	Saleebunda.
	15	DeCruze's favorite.		37	Soondershaw.
	16	Feroghabonnee.		38	Stalkartt's, No. 1.
*	17	Fuzree.		39	Stalkartt's, ,, 2.
	18	Goa.		40	Strawberry.
	19	Gopál Bhog.		41	Society's Alipore No. 1
	20	Khahapureeah.		42	Ditto. ,, 2.
*	21	Kachchaée Meethea.		43	Ditto. ,, 3.
	22	Kysapatee.			

N. B.—Sps. 4, 5, 6, 11, 17, 21, 26, 28, 34 and 35 marked * will not be available in the year 1876.

JOURNAL

OF THE

Agricultural and Horticultural Society

OF

INDIA.

Remarks on a Disease affecting the Tea Plant called "Roest" (Rust), By Dr. C. Aleyboom.

Having read the treatise on the tea-bug of Assam, by S. E. Peal, Esqr, I beg to offer a translation of what I published on the subject a few years ago.

I should feel obliged if you would offer this to public notice through the pages of your journal.

I have read the treatise of Mr. Peal, with much interest, as his researches have led to the same results, which I obtained, as my publication proves.

Up to the present period the calamities met with in tea culture, have not yet been made a topic of serious research, and though this culture has been several years in existence on the island of Java, the causes thereof are not known.

The severest losses suffered by the manufacturer are caused by the rust. Opinions differ as to what the rust may be.

Some will account for it by causes, to be found in the ground or in the atmosphere.

By stating what has been done to oppose and prevent the disease during a period of ten years, and what experience

has learnt, as to the causes, I hope to prove their opinion is not the just one.

To elucidate the following, it may be found of use to consider the qualities of the soil, made use of to plant tea shrubs.

The grounds are derivates from trachytes and analogous rocks, and are to be divided in two groups, *i e.*, grounds containing humus and red clay grounds. The ground containing humus is a mechanical mixture of humus, clay, and grains of sand; it has a black hue, sometimes to eight feet of depth; when heated it becomes red by oxide of iron, and smells of ammonia. There are varieties of these grounds due to the different proportions of the composing elements.

Usually, they are composed of mineral substances and 8 to 20 per cent. humus. They have the property to absorb moisture, and preserve it a long time even in the dry season. The old shrubs prosper on these grounds, and produce a rich foliage, but young plants fade and perish. As to the seeds, they do not develope, but rot: this may be caused by the moistness and coldness of the grounds, that are void of the humus, which originally covered them.

The clay grounds have a brown hue; they are most times composed of fine clay and 10 to 15 per cent. oxide of iron, with some proportion of sand.

These grounds are arid; during the rains they absorb a great quantity of water, but become dry again immediately afterwards to a depth from two to three feet, and also become very warm.

The tea shrubs do not thrive in these grounds; by heavy rains they produce tolerably well, but in dry seasons very little.

During a period of several years the rust reigned in the plantation, but only for the last four years has it attained to an alarming extent.

The shrubs in the grounds, containing humus, were always affected by the blight, which attacked first the leaves and

best developed shrubs on the best parts of the grounds: this is also the case on the grounds fertilized by alluvium at the base of, or in the valleys between, the hills. The shrubs on the red grounds at first are exempt from the blight, but they are attacked also when the fine leaves from other shrubs are consumed.

At first I sought the cause of the disease in the exhaustion of the grounds, and in the fading state of the shrubs. The grounds were void of humus, and the roots from the shrubs laid bare. The grounds were top-dressed with good earth, and the roots covered therewith.

The shrubs developed again, and produced good leaves, which were also consumed by the rust.

Experiments were made by the following means:

A very fertile part of the plantation was dug to a depth of 1½ feet during all the year, so as to root out the weeds.

The shrubs developed very well, but the rust increased.

A portion of the same grounds was treated in the following way:

Between the rows of shrubs were digged furrows 1½ feet of depth and 1 feet broad, filled for two-third part with branches of sundry trees.

At first the result appeared to be good, the shrubs developed and produced better leaves; but in a period of six months the former bad state returned.

An attempt was made to drain the grounds. The pipes were laid to a depth varying from 2½ to 3 feet at a distance of 24 feet.

In the month of October the work was finished. At the end of three months the shrubs had attained a height of three feet, produced much and well developed leaves, greater than before, but the success was ephemeral.

In the month of January 1872, the rust attacked the shrubs so extensively, as to cause them all to perish in a short time.

Nearly 2000 sticks besmeared with tar and *Oleum cornu cervi foetidum* were put in the shrubs, surpassing them two

feet in height; but no success was attained.

Tar put in the ground was found unsuccessful.

Manuring the grounds with green leaves and weeds, also with dung from the cattle, proved fruitless.

Hundreds of pounds of *Calcium sulfuratum* were brought on the grounds, hoping that the exhalation of fly-dragon-sulphur, might relieve the disease: but the experiment was a failure.

To an extent of 100 bouws (one bouw=72,000 square feet) the grounds were covered with fresh phosphates made on the spot.

The shrubs developed by it, but the rust did not diminish.

On a windless day I burned a great quantity of squibs between the shrubs, by which they were thoroughly fumigated. The leaves fell off, and the shrubs remained leafless till the falling in of the rains.

Also an attempt was made by fumigation with sulphur.

The effect was the same, but caused a disadvantage; the branches died to a height of one foot. By searching the cause thereof, I found that the branches perished by the influence of *sulphuric* acid.

A fumigation of the shrubs with sundry sorts of woods and leaves, smelling very loathsome, when burning, had no influence at all. During the period that the rust reigned only in parts of the plantation and was less intense, the pruning of the shrubs often arrested the blight. The shrubs were pruned so as to make them leafless, and the crop burnt. The shrubs developed good leaves, and could be plucked three times before the rust intervened. In the latter years the rust was very intense, and pruning proved of no use.

In order to know, how the rust may act on the leaves of potatos, I planted them in parts of the plantation, where the blight reigned.

The leaves were blackened and dried just the same as the tea leaves.

On searching I found the effect was the same, and that the blight had another cause than that of ruining potatos in Europe. By examining the leaves with the help of a microscope, I found that the soft parts of the leaves were ruined, but I did not observe any parasites or insects on the leaves.

I had the conviction that the cause of this blight was not to be found on the ground or in the atmosphere, especially as the best developed shrub suffered most by it.

On visiting Mr. Band, my opinion as to the cause of the blight was strengthened, as he showed me leaves of fuschia-plants, and on a visit to Mr. H. T. Coster on the plantation Bolang. Although the gardens are there under quite different conditions with regard to the climate and grounds, the rust reigned the same.

Mr. Coster also supposed that the rust was caused by insects. We agreed to make a full research on the matter. I caught sundry insects and set them under a bell-glass with young shoots from tea shrubs, put in water. By so doing, I saw the rust develope. Mr. Coster mentions five species of insects that cause the rust. I found but one species, but do not know the name. It is a black flying insect, half the size of a walang-sangit, with a long beak.

When magnified, the wings and eyes are glittering in sundry hues of rainbow. Set under a bell-glass, it is easy to observe how the insects work. During the day they are in repose, but at night very busy. They attack the underside of the leaf, put in the long beak, and remain a long time on the same spot. Some hours afterwards the leaf shews a brown puncture, that slowly turns to black on the very spot, where the insects have been feeding.

If the leaf is punctured closely, it becomes black and so dry that it can be pulverised by rubbing it between the fingers.

When magnified, the punctures show that the soft part from the leaf are sucked dry to the epidermis.

The fore-mentioned ruin of the foliage not only causes severe losses, but suffices to ruin a whole plantation, when increasing several years. If the insects are few in number, the loss is less severe; from the punctured leaves can be made tea; but when steadily increasing, all the crop is lost. The damage also would be less, if the old and hard leaves only were consumed; but, the insects attack the top leaves first, and afterwards the young still tender leaves. When these are consumed, the old leaves are attacked also, they become black and dry till falling off and leave the shrub leafless. In this condition it remains till the falling in of the rains. To prune the shrubs, when leafless, is of no use at all, and often proves hurtful to it. The shrubs make no shoots at all, for the insects, after having destroyed all the foliage, search the part of the twigs, where the juices are gathering to develope a bud, and by sucking the juices, thwart all development.

The consequences are fatal. By remaining leafless, the shrubs are exposed to the heat of the sun, by which the bark is whitened, and the wood becomes dry, which impedes the circulation of the juice. When brought to this sad condition two years successively, the branches are covered with mosses, and die, after having been inactive a long time. The plant suffers severely. It produces no healthy shoots at all, and few bad developed leaves near to the ground.

If the rust is of an intense character, a regular pluck becomes impossible. The best way is to pluck ripe and very young leaves at once. By so doing the loss is reduced as much as possible, for by not plucking the young leaves, the insects feed thereon, and the crop becomes very uncertain. The producing power of the shrubs also diminish. It is also fruitless to plant young shrubs, for they perish as soon as the top leaves are blackened. I know very little with regard to the manner of living of these insects; also as to their development; what I have observed, is as follows:

The insects remain by day near streams and moist ground, and feed by night. In the plantation a few insects are found by day in the shrubs, which protect them from the sun by their rich foliage. In the ground, under the shrubs, they are not to be found. I remarked this in the gardens. The part of the plantation, most injured by the rust, is girt by sawahs (paddy grounds) and a river. From the year 1867 the sawahs surrounded the whole plantation, and the rust was very heavy. Cold and wet seasons are favorable to the development of the insect. After a fortnight, with heavy rains and low temperature, they begin to ravage the shrubs.

In the year 1868, on the 7th of January, the rust fell in so intensely as to destroy two-thirds of the crop; also on the 8th of February 1870, and on the 1st of February this year. On the said periods there fell heavy rains with a low temperature.

The annexed table shows the mean monthly temperature, the number of rainy days, thunderstorms, and the extent of the rust during the years 1864 to 1872.

PREANGER, JAVA. *March*, 1873.

Middling monthly temperature, rainy days, thunderstorms, and the extent of the rust during the years 1864=1872.

	1864. temperat.	rainy days.	1865. temperat.	rainy days	1866. temperat.	rainy days.	1867. temperat.	rainy days.	1868. temperat.	rainy days.	1869 temperat.	rainy days.	1870. temperat.	rainy days.	1871. temperat.	rainy days.	1872. temperat.	rainy days.	1873. temperat.	rainy days.
January ..	73,79	22	73.47	16	74,09	20	73,15	16	71,83	22	73,03	18	70,01	2	72,78	25	71,30	19	73,11	17
February ..	73,89	22	72,83	12	71,60	22	72,84	19	73,86	14	73,09	23	72,90	6	74,32	14	71,49	20	71,69	22
March	73.22	16	72.65	26	75,09	15	74,87	3	73,25	18	73,19	21	75.54	8	72,93	16	76,31	13		
April .. .	74.06	23	73,15	22	74,64	20	73,71	15	74,73	12	74,36	25	73,87	16	74,44	17	73,03	17		
May	73,25	20	74,09	9	73,82	6	76,09	3	75,72	4	74,48	19	73,92	6	74,63	13	73,00	14		
June ..	74,26	5	71,56	13	74,42	4	75,53	4	76,26	2	72,89	15	74,88	2	74,84	11	73,70	12		
July	73,35	5	75,00	0	74,01	0	75,33	10	75,40	5	75,48	14	73,22	10	73,62	6	73,67	6		
August ...	73,36	0	75,04	0	75,10	0	74,87	10	75,42	1	75,35	3	72,01	15	74,00	5	74,29	5		
September ...	74,46	0	74,55	0	74,48	0	73,47	11	75,55	5	75,77	0	73,33	12	75,00	6	74,33	7		
October ...	73,89	0	75,54	6	74,81	0	73,35	22	75,09	13	76,42	1	72,51	18	74,01	18	74,67	18		
November ...	73,85	14	73,44	15	74,02	6	73,35	22	73,26	22	74,81	8	70,59	15	69,87	25	72,52			
December ...	71,24	30	73,48	19	72,13	3	70,65	17	73,39	28	72,27	13	73,74	19	72,40	26	72,71	26		
Grand total, temper.	73,55	155	73,98	138	73,99	97	73,93	152	74,84	146	74,19	163	73,04	129	73,57	180	73,42	178		

Thunderstorms.

Every day and violent.

Violent in January and February.

Single ones.

Great number above the mountains.

Very single ones.

Single ones.

Single ones.

Single ones.

Single ones.

Rust.

Vehement rust.

The rust destroys the crop at certain times on single places of the garden.

Vehement rust.

Vehement rust.

A little rust.

Vehement rust.

Rust, but not vehement.

Vehement rust.

Prondoe.

With good result.

Without good result.

With good result.

Without good result.

TJICEMBOELOEIT, 25*th March*, 1873. } C. ALEYBOOM.
(PREANGER, JAVA.)

Note on Dr. Aleyboom's paper on "Roest;" By S. E. Peal, Esq.

I have much pleasure in acknowledging your letter of the 18th ultimo, and enclosure of pamphlet from Dr. Aleyboom on "Roest."

I should hesitate to apply such a term to the ravages of the Tea Bug.

"Rust" was originally applied to the attacks of fungoid growths on corn, causing a red or rusty appearance; the growths also were microscopic, and purely vegetative in character, parasites in fact. The "bug" on the contrary is, as its name implies, an insect, and analogous to the "fly" in turnips—and the name describes the cause, and not the appearance—which varies at different stages. However, the unpleasant fact remains, as a cause of serious damage, with prospect of increase.

Considering that it is equally destructive on different soils and kinds of plant, I fancy "soil" has not much to do with it, and external conditions of shade, temperature, and rain, may have more influence, though the insect can stand great variations in each.

If sun is hot it lies under the leaves, and in the early dawns of cold season, I have often seen them on the shoots, benumbed and stiff, and covered with white powdering of fine dew, unable to move till the sun had driven the latter off. They can stand temperatures of 150° to 10° Fahr.

So far I cannot prove that it attacks or feeds on, any other plant or tree, but confines itself to the *young* tea shoots, as they are more easily punctured than old leaf. Being a bug it necessarily feeds on juice, having no jaws, and is, as I say, a direct competitor with us for tea liquor.

They do not leave the bushes on which they are hatched out from the egg, until they are full grown and fledged, or winged, and so they do not migrate to or fro for any distance.

See p. 7.

I cannot so far conceive any cure or prevention; we might as well try to trap, catch or poison mosquitos, whose nourishment (naturally) is vegetable juice. It is partly on this account that I consider the plague so likely to be serious, and can understand it to be quite as bad as Dr. Aleyboom has stated.

I consider it our special enemy, and that steps might well be taken to investigate the entire matter, with a view of adopting our future *systems of planting* to the exigencies of such a case.

At present we seem quite at the mercy of this pest, and it can injure us to a far greater extent than is generally supposed.

Any queries relating to this subject, I shall always be ready to answer.

It is evident that the bug was common in Java, ere the cause of the blighted appearance was known, or questions of soil need hardly have been so carefully investigated. Where the tea tree grows *at all*, there the bug can do likewise.

The better the soil is for tea, the better for this enemy of ours; the better land is for pasture, the better for the cattle feeding on it, and soil is related to the bug or to cattle, in the same manner, and is hardly a *cause* of either. I note one difference in Dr. A.'s remarks as to the habit of the insect, *i. e.*, it punctures the under-side of the leaf there, and the upper-side here, perhaps due to the greater effect of sun there, and necessity to keep in shade more.

SIBSAGUR, ASSAM; *October 5th*, 1875.

THE GARDENER'S NOTE BOOK, No. 16.

Experimental cultivation of the Tea Plant by cuttings;

BY W. FOLEY, ESQ., *of Sylhet.*

IN your monthly general meeting held on the 18th March last, I see that Mr. G. F. Pinney, of Rangajan Factory, Assam, asks you for information regarding tea cuttings.

Although not a member of your Society, I send you the following notes of the experiments which were tried in this garden, and which turned out very satisfactory.

Land.—Choose a piece of flat land above the reach of inundations, in which make beds, 4 feet broad and as long as the ground will admit of; prepare the ground as if for a nursery, and make a ridge of earth, 6 inches high, all round, to keep in the manure.

Cuttings.—These are branches, selected from the prunings, from 2 to 7 and 8 inches in circumference. They are cut into bits, about 16 inches long and placed in a slanting position in lines. Each slip to be buried half its length and 6 inches apart. The lines to be 6 inches apart too. After all are put down, the beds must be thoroughly saturated with water; the next evening fresh cow-dung and water (liquid manure) of the consistency of thin jelly is poured over the land until it is one inch in depth all over. This should be repeated the third day, after which every 3 or 4 days the land is to be only watered, for if the crust which the cow-dung forms is allowed to dry, myriads of white-ants will collect under it. When the leaf buds appear, watering should be lessened and the cuttings will be ready to be planted out in the cold weather, when if taken up with the ball of earth unbroken, hardly a plant will die. I forgot to mention before, that artificial shade ought to be put over the nurseries, and when the slips have taken properly, remove gradually.

A plant reared on the above system cannot be distinguished from a seedling; it forms just as good a bush and gives the same yield, but it does not bear so much seed. Indigenous and hybrid strike better than China, and the growth of cuttings is stronger, the latter does not throw out a tap root and is therefore better for flat lands, where a seedling if put down sends its tap root deep, which, on coming in contact with water, dies; besides, surface roots take manure more readily. Plants on the slopes of teelahs, under which there

is a spring, are always observed to be sickly, this is owing to the tap-root touching water.

Since January, 1870, I yearly make cuttings from all the best kinds of plants in my gardens.

I would like to hear of any experiment that may be tried, and if successful.

The Gardener's Note Book, No. 17.

Note on the propagation of Magnolia grandiflora;

By C. Nickels, Esq.

From all accounts the *Magnolia grandiflora* seems to thrive with difficulty in Lower Bengal. With me here no plant does better, the only fault I find with it is, that it is such a slow grower. In 1872, I brought out with me from England two small plants of the Exmouth variety, one was planted in the full sunshine, and the other one in a shady spot, that is, to the north side of a mango tree, but clear over-head; the former is now two feet high, and the latter over three feet. Although both the trees are as healthy as possible, the one in the shade seems to grow the fastest. As far as my experience goes, no plant is more easily propagated. Firminger says:—"Propagated by *gootie*, but with extreme difficulty." No doubt such may be the case in Bengal, but I never resort to *gootie*, my plan is *layering*. On the 1st July, 1873, I put down a layer, and in fourteen months, that is, about the 1st September, 1874, it was rooted, when it was separated from the parent, and planted out. Again on the 7th July, 1874, I put down another layer, it has already thrown out roots, and I expect it will be thoroughly rooted by September next. In Europe it is said the Magnolia generally takes two years before it is fit for removal. With me, under favorable circumstances, fifteen months is about the time. *Layering* should always be done at the commencement of the rainy season, and a rainy day must be chosen for the planting out.

The reason why many people fail in *layering* is that they do not sufficiently wound the branch. I always split up the branch just underneath a bud for about a couple of inches or more, and the wound is kept open with a piece of potsherd. Of course I always layer in a pot, and the bottom of the pot is kept closed to prevent the roots from striking into the ground. It is also a good plan wherever a plant is layered, to place a piece of brick just on the top of the soil in the pot, by so doing it is easy to ascertain whether the layer is rooted or not, by merely lifting the brick. The roots overspread the soil just underneath the brick. If the brick was not there, the roots would not be visible; and the *mulcs* generally dig into the soil to find out whether the layer is rooted, which practice is, I think, very objectionable.

In layering, the pots should always be buried in the ground, or when that is not possible, earth must be banked up round it. This prevents undue evaporation and keeps the soil moist.

THE GARDENER'S NOTE BOOK, No. 18.

Note on the culture of Clianthus Dampierii; BY S. GOWAN, ESQ.

You sent Mr. Murdoch some seeds of Clianthus Dampierii, or Australian Desert Pea, last cold season, which he sowed in different places in his garden, but only one of these germinated. After being for a very long time in the ground, it was sown in a pot, and transplanted into the open bed, early last month. It has been there ever since, and exposed to scorching heat and drenching showers of rain, it now stands about two feet in height, and is flowering beautifully. It looks fresh and healthy, and promises to be a much finer plant than it now is. I mention this to you, as you were interested in a plant Mr. Murdoch reared before, and for which he was awarded a prize at one of your flower shows; I think this was in 1871. I see also that Firminger is very positive in saying

that the plant is killed by the hot weather of this country; but this specimen has, as I have mentioned, been exposed both to very great heat and heavy rains, and now looks very healthy. Have you heard of others being successful elsewhere this year in getting plants that have flowered?

In a subsequent letter of 12th June, Mr. Gowan adds: The plant of *Clianthus Dampierii*, I wrote you of, is still very healthy, and has at present eight fine bunches of flowers on it. We have had very heavy rain during the week, some of the flowers got rather spoilt by it, but I am now having the plant protected by mats from the rain. It stands about 2½ feet in height, and so far does not seem to have suffered from the rain.

THE GARDENER'S NOTE BOOK, No. 19.

Mode of preserving Seeds; BY C. NICKELS, ESQ.

HITHERTO I have found great difficulty in preserving the seeds of *China Asters* and *Heartsease*—in fact I never could get them to germinate, till I hit upon the plan of preserving them in dry earth; this refers to home-grown seed. Formerly I used to put the seeds by in bottles year after year with great care, but not a single seed came to any thing. In the Benares Public Gardens they are also unsuccessful with asters, and the only place where they can manage to raise a few plants, is in the Maharajah's garden at Benares; how they manage to preserve their seeds I am unable to say. My present plan is, directly the seeds are ripe, to dry them thoroughly in the sun for two or three days; at the same time some earth from the garden is reduced to a fine powder and exposed to the sun; the seed and the earth whilst still hot are mixed in about equal proportions and put into dry bottles, when the bottles are at once tightly corked. I have already made two sowings of the asters, and it has come up beautifully. I have much pleasure in sending you a small quantity of the seed (China Asters) for trial.

in the Society's garden. I hope you will let me know the result. [Have germinated most freely.] Some French Aster seeds (acclimatized) which were subjected to the same treatment are coming up splendidly.

From the success which has attended my experiment, I have an idea that all seeds might be packed in dry earth with advantage.

List of Timber Trees and useful Plants of the Hazareebaug Zillah Forest: communicated by M. Claude J. Dumaine.

(Continued from Vol. II., Page 235.)

No. 27. Lagerstromia parviflora (*Kawah, Kowah, Arjoon, Dauri, Bakti*).—This tree resembles very much the *Conocarpus latifolia* (Dhow, Dhouta), No. 9 tree, already described in my preceding list of trees, &c., in Volume II., Part II., new series, page 230, and is apt to be mistaken for it by many who are not well acquainted with trees. Its timber is white, close, straight grain, fibre tough and elastic, a six feet bar, two inches square only breaking with 1030 lbs., used in all purposes where strength and rough usage and durability is required; used as buggy shafts, cart axles, cart wheel naves, coach-building; for boat-building it will answer admirably as it does not decay under water. The trees growing always in damp places near the edges of rivers and small ravines. I am given to understand, it is extensively used in the N. W. Provinces, Bombay, and Calcutta for boat and coach-building.

The Antheræa Paphia (tussur) worm feeds on its leaves, which are also used by junglees to make plates and dishes. The tussur worm is said to thrive better on its leaves than on those of the *Conocarpus latifolia*, or the *Shorea robusta*. The lac insect, *Coccus lacca*, as well as the wax-producing insect of Hazareebaug and Chotanagpore (*Coccus* ————) feed on it. The bark is used by tanners and dyers. The decoction

of the roots are said to be used medicinally in cases of strong diarrhœa. I have never seen any gum from it, although it might produce some by incision being made on the tree.

No. 28. *Tetranthera apelata Rox,* (*Ratoon, Garur, Meeda, Lackri*).—A very common tree found all over the jungles on rocky and well-drained places. Whitish wood passable, and seldom used but for ordinary building purposes and for fuel. Light grey, close grain bark; when fresh is grounded and applied to deep cuts and wounds, putting almost an immediate stop to profuse bleeding. I have had occasion to use it on one of my servants, who had accidentally cut his feet with an axe: also it is said to relieve from pain and counteract the venemous effects of bites and scratches from wild animals. Handsome wavery foliage which has a disagreeable smell when broken and rubbed in the hand. The cattle or wild animals do not eat its leaves, as they do of other trees, as it is said to be venemous. The red roots are used as a paper material and strong string.

No. 29. *Syzygium Jamholanum D. C.* (*Jamun*).—This well-known tree is found in beds of rivers. Its timber is tolerably good for general purposes, especially when exposed to the rain or under water; answers capitally for frames of wells; smooth light coloured bark; is used by dyers and tanners, giving a brown colour. The gum which is extracted from it resembles the gum kino. No use is made of its leaves or roots. Fruit collected and sold in the bazar about March.

No. 30. *Bauhinia variegata L.* (*Konar, Kuchnar, Gurrial*).—This tree is found in all the villages, transplanted from the jungles; it cannot be considered as a timber tree; seldom or never cut for any use. Light grey bark; is used for tanning; the buds, or young green leaves, are boiled and used medicinally in profuse and obstinate cases of purging, and eaten also as *sag*. I had several times occasion to test its medicinal properties when English medicines had no effect; this had an almost immediate effect; it had been plucked just.

before the rains when no other vegetable greens are procurable, which it replaces. Flowers white and handsome, the leaves are roundish and parted in the centre, of a pretty light green, and are sold in the market about 1 anna per seer.

No. 31. *Bauhinia racemosa Lam.*—This is a small useless tree found on the borders of rivers and damp places. It resembles very much the *Bauhinia variegata*, but its leaves are smaller and of no use. From its bark string is made and might be used as paper material. Its leaves are not eaten; generally cut down for fuel.

No. 32. *Bauhinia Vahlii W. & A.* (*Mowlan, Malu, Maljan*).—This well-known common enormous climber is found all over the jungles. Its bark is used for making ropes and string, and does not decay if exposed to the rain; is generally used for houses and strong ropes for cattle. Its seed is eaten by the natives; might be tried as paper material; sold in the bazar at about 1-8 per maund when made into string. Same shaped leaves, but larger than No. 30 tree.

No. 33. *Bauhinia purpurea? L.* (*tor*).—This is a well-known tree resembling very much in every way the No. 30 tree. The leaves are also of the same shape, but the split in the centre is much more marked and deeper, but are not eaten or made use of in any way that I know of. It produces a large quantity of gum by making deep incision in the tree, and is sold in great quantity at about Rs. 2 per maund. I am not aware the wood is used for any purposes worth mentioning. Always found on the edges and sides of water-courses.

No. 34. *Cedrela Toona, Rox. (tun, toon).*—This well-known light fine grained mahogany coloured tree is used for making furniture. Very few of these trees are to be found in the jungles. Light grey bark, leaves and roots are in no way used.

No. 35. *Dalbergia Sissoo, Rox. (Sissu, Sissoo, Shisham).*—This well-known tree is extensively used for furniture, building gun-carriages, and for dock-yard purposes. It is heavy,

strong, and durable. It is obnoxious to the attacks of white ants. I am not aware of either its bark, leaves or roots being made use of in any way.

No. 36. *Ægle Mermelos. Corr. (bel).*—This well-known common tree is a handsome tough small tree with light grey smooth bark, and when old a columnar (fluted) trunk. The timber is hard, strong, and of light colour; used for oil and sugar-mill crushers, but does not last more than one year. The fruit is used medicinally as well as in cooling drinks; the rind is used for dyeing yellow, and perfume is made out of it as well as out of its delicious honey smelling flowers.

No. 37. *Grewia elastica, (Dhamun, Phalsa, Pharsia).*—Seldom attains a great size, common on the hills. Its timber is elastic, close grained, and is used for carriage shafts and naves oil and sugar crushers; in fact in any way where strong durable wood is required. Fruit considered cooling. Bark, leaves and roots are of no use that I know of.

No. 38. *Phœnix sylvestris Rox.* (*Rajur*).—This tree is seldom found in the forest, but in or near the villages are plentiful in soms places. If used in any way it must be kept off from the rain as it will decay. The leaves are made into mats. The juice (teri) is obtained by tapping it by means of incision below the tuft of leaves, and use as beverage and for making sugar. The fruit is never or seldom eaten.

No. 39. *Zizyphus Jujuba, Lam.* (*baeer*).—Timber tolerably hard and strong, would answer for railway sleepers; used for oil and sugar-mills. The bark is used by dyers and tanners; the lac insect, *Coccus lacca,* is found on its branches. The leaves are used for rearing the *Antheræa Paphia* (ússur) worm, and the cocoons they produce by being on this tree are far superior in every way to those produced on any other tree.

No. 40. *Zizyphus nummularia, W. & A.* (*Jarberri*).—Small bushy shrub, very abundant in all parts of the country. Never grows large enough to be used as fuel. Temporary hedges are made out of its branches; its small red fruit are eaten, but

warranted to give one sore-throat and dysentery, if eaten in even small quantity.

No. 41. *Moringa pterygosperma,* (*Soojna, Sayjoona, Senja.*)—This is the horse-radish tree found in the villages, and seldom in the hills. The wood is perfectly useless, and never even used for burning. By making incision in its bark gum exudes plentifully; used in medicine.

No. 42. *Phœnix humilis,* (*Chota Khajur, Khajuri*).—These, whose stem grows 5 to 6 feet, is very common in Hazareebaug. It is perfectly useless, and its fruits and flowers are seldom even taken notice of.

No. 43. *Spondias magnifera,* (*Amra*).—Seldom found but in deep jungles; wood is worthless, the fruit is eaten by natives. I hear some parts of it are used as medicine.

No. 44. *Diospyras montana,* (*Khainl*).—This tree does not produce ebony, is of the same family as No. 11 tree described in Volume 11, part 11 Journal. The timber is also inferior, and does not stand exposure to rain. Is used for building purposes. The leaves are larger than the No. 11 tree. Its fruit is also eaten and sold in the bazar.

No. 45. *Bambusa stricta.* (*Bans*).—The bamboos found in the hills are of various kinds. Some called the male bamboo, that is, thin long, and solid, and are used for building purposes and for walking-stick or clubs. The other kinds are thicker and more hollow; are used by domes and toorees for making mats and baskets, &c.

During the rains the natives go on the hills and cut the green shoot in slices, string them and dry them in the sun; this must be done at once, and if brought away and kept turns hard. They use it in cases of chronic dysentery and bowel complaint, and is pounded and taken with mustard oil as a chutney with their meals. When in slices, it is called *Hunrooa,* sold at about 2 annas per seer. The walking sticks or clubs are sold on the Grand Trunk Road at 1 anna each.

No. 46. *Mangifera Indica, (Mango, Am.)*—This tree is too

well-known to need description ; cannot be considered wild; seldom or never cut down. They are to be found plentifully in the villages and sometimes on the hills ; supposed to have grown from seeds thrown by herdsmen. Planks are made of its wood. The fruit of the jungly kind is exceedingly sweet; it is about the size of an ordinary fowl's egg, very pink and pretty green. The seed generally small, and flat, sold in the bazar at 1 Rupee to 8 annas per hundred.

No. 47. *Cochlospermum ?* (*Koonjee*).—This is a pretty common well-known tree found almost every where. The wood when made into planks are light and often mistaken for toon No. 34 tree, Credela toona ; but it is not so durable and will not bear exposure to the rain as the toon does. By making deep incisions the well-known tragacanth gum comes out called *Katteela*; used medicinally and given to horses. I believe it is the identical Bassooreen gum. I am not aware if either the bark, leaves, or roots are of any use.

No. 48. *Strychnos nux-vomica, L.* (*Kootcheela*).–Seldom found in the jungles. The principal use is the round button shape seed called *Kootcheela* or *Nux-vomica* used for medicine. It is a handsome tree to look at and very shady. I am not aware if either the bark, leaves, or roots are made use of.

No. 49. *Ehretia serrata,* (*Punun, Punden*).—Found on hills, only pretty common. Its wood is much valued being tough light easily worked, and durable furniture is made of it at Hazareebaug. I believe this is called the *rose wood.* Bark, leaves, and roots of no use.

No. 50. *Odina Wodier (Jingan, Kurrum*).—A common quick growing tree; attains a large size, whose bark splits off in thin scales. Wood reddish in the heart ; is tolerably good, and made into planks. Large quantity of gum exudes from the bark, and is collected for export for making ink-dyers, cloth-printers, and medicines. This gum is divided into two parts, the black or refuse of it which comes out naturally and falls on the ground ; and the white which comes out afterwards and adheres to the tree, is the one used medicinally.

(*To be continued.*)

Notes and Reports on a Wax-yielding Insect from Chota Nagpore.

In December 1869, Mr. T. F. Peppé, a Member of the Society, forwarded specimens of a wax-producing insect and wax from Chota Nagpore, with the following particulars :—

I send you a specimen of a wax-producing cocoon found by myself in the jungle. I have not had time to ascertain whether it is known or not; at all events it is curious in itself. I also send you a specimen of the wax made from it; I found it in large quantities on a fine tree called by the natives "Kowa" or "Arjoon," I do not know its scientific name; it is a common tree along water-courses, and grows to a large size. The lac insect does not take on it, so that the wax insect and lac might be simultaneously cultivated in the same jungles. I have not had any leisure to ascertain what properties this particular wax may have; it would be worth trying. It requires to be re-melted and cleaned before it will form without spluttering. The insect was treated in the same manner as the lac insect in making shell lac, but the specimen I now send was made, not from the mature insects, but from the comparatively young insects.

Most of the insects were just beginning to secrete the wax, and the tree in question was covered with a white powder, which, on examination, proved to be minute insects, which were attached to the trees much in the same manner as the lac insect, but more scattered and not so much in clusters. I have an indistinct recollection of having heard of a similar insect found in China, but have no books to refer to. I first met with this insect on another tree on a small isolated hill called "Mondee" in the Hazareebaugh district, and I have, since coming into this district (Ranchee), been on the look out for it, and at length succeeded in finding it on a large tree from which I collected about a couple of seers from one of the lower branches. By allowing the insect to come to maturity, nearly a maund could be collected from the same tree. I failed to observe what tree it occurred on when I first saw it at "Mondee," but I am certain it was not the

"Kowa" so that it may be found to propagate on several different trees. The natives make no use of it, and seem never to have observed it until I called their attention to it.

I would be obliged if you would give me any information regarding it, and whether the wax has ever been used, and if the Society requires it, I could collect a larger quantity and send it for analysis and report.

In February, 1874, Mr. H. Beadon, another Member, sent from an adjoining locality, specimens of the same insect, &c., with the following note :—

I send you herewith a small box, by favour of C. B. Clarke, Esq., containing a spray of a jungle tree called locally "Ruttongadura" (the *d* is the palatal *d* pronounced generally like the letter *r*). I found it at a place called Chandowrie in Pergunnah Khurkdha of this district, and observed a curious wax-like substance on the leaves caused by the insect which will be seen on the stem and leaves. As I do not remember to have seen the insect before except in these parts, and am curious to know if the substance has any economic value, I should be glad if you could let me know what it is. If it be of any value, I should be glad to know how the insect could best be cultivated. The piece in the paper was one piece which surrounded the stem like a crust, and when rolled between the fingers it seems to be wax.

The above specimens were transmitted to Mr. F. Moore, of the India Museum, London.

In March, 1875, Mr. Peppè sent further specimens with the following note :—

I send you herewith some specimens of the wax insect. I have found it on many of the most common trees Mango, Peepul, besides the Arjoon, so that its value is increased as it can be propagated on so many different kinds of trees. I hope this year to be able to propagate it artificially, in the same way as the lac insect is propagated, and if I succeed, I will send you a note on it.

Mr. J. Wood Mason, of the India Museum, Calcutta, to whom the above were referred, offered the following remarks thereon :—

The waxy excrescences on the peepul twigs submitted to me have been secreted by females of a species of *Coccidae*— in all probability the *Coccus ceriferus* of Fabricius, which has been so long well-known to entomologists, and to which Gray's generic name *Ceroplastes* is all but certainly applicable.

The secreted substance is no doubt identical with the wax secretion of bees, and is collected by the Chinese and probably also by the natives of this country for manufacture into white wax, as is also that of several species belonging to other groups of *Homoptera*, in which order of insects the secretion of such a white powdery, cottony, or waxy substance is very general, constituting one of its most remarkable peculiarities. Sometimes, as in this case, the integument generally secretes it—at others special apertures or pores emit it. The wax of this coccus contains a very large amount of water, which can be easily driven off by heat, the residue being melted wax.

The Society has recently received from Mr. Moore, in a letter, dated December, 1875, a report on the above insect and its product, which completes our present information on the subject :—

The wax insect referred to in your recent reports as having been forwarded from Chota Nagpore by Mr. F. Peppè, and of which you kindly transmitted specimens for examination, is doubtless the same as that observed in Madras by the late Dr. J. Anderson. In the Philosophical Transactions of the Royal Society for 1794, pp. 383 to 401, Dr. Pearson has given an elaborate account of an analysis he made of the wax produced by this insect. ' Its occurrence in the Chota Nagpore district is an interesting discovery, and if collected in large quantities in the same manner as is done with stick lac, the wax obtained from it would prove a useful and profitable article of commerce. The insect, of which the wax-covered female

only is known at present, is named *Ceroplastes ceriferus*, and is allied to the *Pela* of the Chinese, who have long made use of it for commercial purposes, and propagate it in much the same manner as is done in certain parts of India and Burmah with the lac insect. The wax of the *Pela* is there a considerable article of trade; in 1869 its re-export from Hankow to Shanghai and lower ports which pass through the Custom House, was estimated to be 4,000 piculs per annum. The price in Chungking was quoted in that year at 110 taels per 100 catties, and in the year before it was as high as 170 taels. The Chinese make use of the wax for the manufacture of the large candles which are burnt in the Buddhistic shrines. Of the sample of Mr. Peppé's insect wax which you recently forwarded to Dr. Forbes Watson, the accompanying analysis has been made.

Analysis of insect-wax from Ranchee, Chota Nagpore.— Of a dull opaque pale brown colour. The outer shell, darker and somewhat translucent. Moderately hard and brittle. Of somewhat pleasant smell.

On crushing in a mortar minute drops of water made their appearance. On heating, it spluttered much owing to the disengagement of steam. At 55° C(131° F) it melted to a clear liquid with a slight flaky deposit.

O. 5868 grm. burnt left an unweighable trace of ash.

Absolute alcohol dissolves 34 per cent. Boiling absolute alcohol leaves 1·02 per cent. of the wax undissolved.

Therefore we conclude that all is soluble in boiling alcohol except 1·02 per cent. As regards alcohol, therefore, the wax behaves as follows :—

Soluble in cold alcohol	...	34·00
Soluble in boiling alcohol	...	64·98
Insoluble in alcohol	...	1·02
		100·00

In Benzine, the wax is very easily soluble, with the exception of a little brownish matter.

In ether, it dissolves freely, but not entirely. In essence of turpentine it is very sparingly soluble. Carbonic sulphide also dissolves it only partially.

It was impossible to obtain two specimens of the wax, such as would yield quantities of moisture that agree analytically. In one specimen I found 13·16 per cent., and in another 11·02 per cent. of water. We have only to look at the sample carefully to see how much more water there is in some parts than in others.

Sp. gr. of the wax 1·04

Organic analysis gave the following results:

	I	II
Carbon ...	... 78·57	78·79
Hydrogen...	... 13·46	13·08
Oxygen ...	... 7·97	8·13
	100·00	100·00

A compound having the composition C. H. O. would consist of 13 26.

Carbon	... 78·79
Hydrogen	... 13·13
Oxygen	... 8·08
	100·00

Comparing this analysis with my analysis No. II. the correspondence I considered, sufficiently close to justify the conclusion that this wax is a compound of 13 atoms of carbon, 26 atoms of the hydrogen, and 1 atom of oxygen.

Reports on the result of sowings of Cuzco maize.

In January, 1875, the Government of India, Department of Agriculture, presented the Society with 30 pounds of Cuzco maize for careful experiments on its cultivation and a

report of the results. The seed was distributed to upwards of sixty applicants over many parts of India, in the Punjab, N. W. Provinces, Central Provinces, Tirhoot, and other parts of Behar, lower and upper Bengal, &c. Reports were received from several of the recipients, (and submitted at monthly General Meeting of 24th September) all to the same effect, that the seeds germinated readily, grew well, but yielded no fruit. From Tirhoot, which is considered a good locality for trial, seeing that maize is so largely grown there, Mr. H. W. Stevens of Durbungah writes, "the Cuzco corn has been a failure; it germinated and grew to a great height, but developed very small cobs, quite barren of grain." Mr. T. M. Francis of Mozufferpore, who obtained a good quantity for himself and several intelligent zemindars, remarks—"the Cuzco maize, I am sorry to say, has completely failed. At first it grew vigorously, and in my garden it formed a number of cobs, but every plant died off before these had time to ripen. I have received similar reports from all those among whom I distributed the seed. It might succeed better if sown in the cold weather, or about October, but I do not think the climate admits of its being grown as a crop for the rains. If you can let me have a few seeds I will try sowing them in October, and let you know the result." Mr. List, District Engineer, Bustee, observes, "the Cuzco maize germinated freely, and grew to an enormous height, the plant flowering, but no pods ever forming; they have now died down without producing any seed from which to renew experiment." Lieut. Pogson, writing from Simla, remarks, "my Cuzco maize is more or less in flower, but as yet only two plants have put forth cobs. I have several plants fully [illegible] feet in height. I strongly suspect that this maize requires a calcareous soil to flourish, and if I succeed in ripening the cobs, the acclimatized seed shall (D. V.) be sown in richly *limed* soil next year." Dr. Lynch reports that the results of his sowings in the Alipore Jail gardens proved fruitless, and so with the trials in the

Society's garden. Several other Members have similarly reported. Referring to the remarks of Mr. Francis, the Secretary mentioned that he had sown some seed out of season, immediately on receipt in January, and that the plants became stunted, did not exceed four feet, and died down without flowering; whereas those sown at the commencement of the rainy season attained a height of 12 feet, flowered, but formed no cobs. (Specimen placed on table.)

At the Meeting of 16th December the Secretary called attention to the various reports submitted at the September meeting, on the failure of this maize. He then referred to the following letters of a more favourable nature. Looking to the fact that the original habitat of this variety of maize is at so great an elevation above the sea, from eight to ten thousand feet, we can readily understand the cause of failure in every instance where its culture has been attempted in the plains of India:

Coll. T. H. Chamberlain, writes as follows, from Ranikhet, in Kumaon, under date the 7th November:—

Some time since I noticed in the *Pioneer* newspaper report of the proceedings of the Agricultural and Horticultural Society, that the maize which had been distributed was being reported upon. Dr. King kindly sent me up some, which I divided with my brother who commands the Oudh Division.

Here is the result of mine. I sowed in all 150 pips, of these 50 were of the red seed. Out of these 150 all germinated and grew to fine healthy plants; 10 to 12 feet high; 32 only have borne *no* fruit; 118 have borne exceedingly fine, well formed, heads.

I have never tasted anything better at table of the kind, and I am letting the whole nearly (having gathered some 10 heads in all to try) ripen, in order to distribute it among the villages, and also to get it into cultivation for bazar sale.

I planted mine in well prepared holes about 4 feet apart,

with good old manure, leaf mould and sand, mixed together. I sowed in the middle of June, and they made immense growth. I dare say in another 15 or 20 days' time they will be fit to pick as fully ripe; and I shall then do myself the pleasure of sending you down a couple of heads of both kinds that you may see how the seed has answered in this climate. My garden is about 5,950 feet above the sea, faces S. E., and no special pains have been taken with these plants, which grew near other kinds—American and hill.

Mr. Francis Halsey, Madhopore, Punjab, 8th December:—

I have never furnished you with any account of the Cuzco maize seed. It was sown on the 15th July, when the ordinary Indian Corn of the country is sown and germinated freely. By the 15th September it had reached the height of 15 feet when the male flowers appeared,—at the same time the female flowers commenced forming, and I was in hopes I was going to have a large crop. About a fortnight went by, and seeing no signs of increase in the cobs, I slit up the sheath of the leaf containing it and found the flower was so constricted that the pollen from the male flower could not pass down to the seed bearing portion of the plant. I waited another fortnight to observe the result of my operation, when I had the pleasure of seeing a few seeds form. I then slit open all the remainder, and they all commenced to form seed, but unfortunately the season was too advanced for the seed to come to maturity. But on the cob I have saved, I have some dozen seeds which have arrived at full maturity. These seeds, I have little doubt, will bear plentifully next year.

I cannot say, I quite understand the cause of this, except that I have often had trouble, the first year, with exotic seed of all sorts, in fact I may say the produce of imported seed rarely comes to perfection in any quantity during the first season of its introduction. If the Cuzco maize comes from the country its name indicates, I fancy it comes from a high and almost rainless table land of the Andes, and consequently

it is not astonishing that it should find a difficulty in succeeding here. But at the same time, it seemed to thrive most extraordinarily during the rains, which this year amounted to 75 inches, between the time it was sown and the commencement of October. It has a strong tendency to send out adventitious roots, and if these are earthed up to the height of three feet, notwithstanding its inclination to grow so very tall, it is quite capable of sustaining its own weight.

I am doubtful whether it is likely to turn out a satisfactory description for this country; the village mills are not fitted to grind it, and it does not appear to be of a prolific nature or as inclined to return its seeds as rapidly as many of the native kinds. An English farmer prefers the small round native seed of this country to the horse tooth American varieties. I fancy because they can get a greater weight per bushel from the former

I should like to have some more seed of " next year, if you have any to spare.

Lieut. J. F. Pogson, who had previously communicated in the earlier stages of his experiments, adds as follows :—

September 22nd.—You will be glad to hear that the Cuzco maize is getting on famously. The cobs have set on 12 plants; on 5 highly manured plants they as yet range from 2 to 5. Now as one single grain of the Cuzco maize seed weighed five seeds or grains of the Hill seed, an average of three cobs of Cuzco equals 15 cobs of Hill or common maize. I will look to this when the seeds get ripe any how. I have been successful, and as zemindars gape at maize plants now ranging fram 12 to 15 feet and beg for the seed, for next year, some good has come from the introduction of the new maize.

In 1862, you sent me some cobs of American maize, and in 1863 and 1864, I gave numerous zemindars the acclimatized seed, which is now well established. In the bazar three cobs of Hill maize are sold for one pice, (¼ anna) and only

one cob of the American for the same price. Thus 12 of the common represent one anna, and 4 of the American give the same price. I do not think the Cuzco will answer in the plains, but it will thrive in the Hilly districts of the Punjab. It will grow in Sylhet, on the Orange soil, and any where else where the soil is calcareous.

October 16th.—I have just been through my three patches of Cuzco maize, and find that there are thirty-seven plants with cobs now on them. One plant with cobs was destroyed a few days ago by a monkey, thus making 38 plants in bearing out of the one hundred seeds put down. Three seeds were accidentally destroyed after sprouting; but all the others came up, so no fault can be found with the seed. In my last report I mentioned that one to five cobs per plant had been produced, (please read 1 to 1 cobs in place of 5.)

The half eaten cob, left by the monkey, was examined by me, good sized grains had formed. They were cream colored, and very sweet to the taste.

I have now every hope of being able to acclimatize the seed as six cobs are ripening fast, and others are changing colour, whilst some are quite green, and I suspect will not come to any thing.

I will in due course report further on this maize, and send you some of the seed.

November 19th.—The Cuzco maize is steadily ripening its cobs, and (D. V.) next year will be fairly started in these hills. I will, when ripe, send you some of the seed, and I think to acclimatize it so as to suit your climate. The seed should be sent to Sylhet being sown and grown on the best Orange tree soil, which, as you know, is highly calcareous. The seed so raised in 1876, will in 1877, grow in all parts of India, provided the best Sugar-cane land be selected for the purpose. The change from Peru to India was very great, hence I am not surprised at the general failure of the maize. My success is due to a good climate and suitable manuring.

The thermometer, placed in the sun to-day, marked 112° Farenheit at 12 o'clock. It being 74° Farenheit in my open verandah facing the south. This heat is quite sufficient to ripen maize or any thing else.

At the meeting in January, 1876, the following letters were submitted in continuation of those from the same gentlemen read at the meeting in December.

Colonel T. H. Chamberlain, Cantonment Magistrate, Ranikhet, 10th January, 1876.—A few days ago I posted to your address a parcel "prepaid" containing four "average" specimens of the Cuzco maize grown here by me.

Unfortunately they were *not* the best, for the rats had clambered up the stems of the plants and selected the largest heads for their depredations. I shall repeat the experiment this year on better soil; and with more carefully prepared beds, so as, if possible, to produce better in every way. I send you in a bag some loose seeds taken off much smaller cones, which seem to have attained finer growth in smaller heads than they do with those like I sent you.

I shall be glad to know what your committee of arbitrators say to these; and whether there is much, and if so what, difference as to quality compared with what Lieutenant Pogson was to send from Simla.

I shall this year distribute seeds of both kinds to some of the cultivators in the neighbouring valleys and table lands, round me, to see what they can do with them. I think they should do well, for the Kumaon farmers are generous in manuring their lands, and I will give those who try these full instructions, as I am anxious to see them get into the market, assured they will answer.

If you care to have more of the seed pray let me know. I will reserve some for you, as perhaps you would like to experimentalize with this partly acclimatized seed. It strikes me that Mount Aboo, Puchmurree, Ootacamund, and the Kangra Valley would be good places to try them at.

I will send Mr. Halsey some of these to try. I notice the same thing he remarked about the flower and the roots of these plants. I rectified both, cutting the cane to help it, and earthing up round the rooty portion of the stem to prevent the monsoon and winds throwing them down.

Lieutenant J. F. Pogson, Simla, 18th December, 1875.—On the 16th instant, I despatched to your address, a small dak bangy parcel, containing—

1*st*—An entire cob of Cuzco maize.

2*nd*.—Seven small envelopes, each containing twelve Cuzco maize seeds, of which 12 weigh ten grains; 12 eleven grains; 12 thirteen grains; 12 fourteen grains, and 12 fifteen grains. These six are the produce of two small sized cobs matured on one plant. The seventh envelope contains 12 seeds taken from two cobs borne on one plant. They are striped and heart shaped. The eighth envelope contains local maize seed sent for comparison.

In reference to the maize seed the increase in weight of the seed is very remarkable.

You sent me 100 seeds; of these—one weighed six grains; one under six grains but over five, and four weighed five grains each. The remainder 94 weighed under five grains, and over four; none were less than four grains in weight.

I have now some very fine cobs not yet ripe, and as they promise to yield monster seed, the heaviest seeds sent may be thrown into the shade.

We have had one fall of snow on the 4th and several sharp frosty nights. But the Cuzco maize seems to defy frost and snow. I have yet to find out . w to shorten the period of arrival at maturity, for unless the maize can be trained to ripen by the end of October, it will obstruct the sowing of the wheat and winter crops; such as *grain*, which is not affected by snow or the severest frost. In due time a full report of the acclimatization and present experimental

cultivation of the Cuzco maize will be submitted for consideration.

In a subsequent letter of 22nd January, Lieutenant Pogson adds as follows:—

On the 19th instant I had the pleasure to receive your letter and also the parcel of seeds from Sylhet, and for which I am very much obliged; and hope in due time to astonish Simla, with the 2½ inch sword beans. The new kind sent will have my best attention. I hope my letter descriptive of the various parcels of Cuzco maize duly reached you. On the 6th January I gathered all the cobs; but until they are thoroughly dry my further investigations will have to be postponed; judging from size of seed I think they must be heavier than those already sent you: what surprises me is, the small size of the cone on which the grains are developed. I can let you have 100 more seed if you want them. The Revd. Mr. Rebst, of Kotegurh, intends trying the maize as soon as he returns.

It will no doubt interest the Society to know that the stalk of the Cuzco maize is exceedingly rich in sweet juice, which in the plants which have not borne cobs, is as sweet and as abundant as in the best sugar-cane; and the odd part of the affair is the aroma of the juice, and cut stalk, is just the same as the aroma of the sugar-cane. In fact it was this aroma which led to this discovery, and if I am not very much mistaken will lead to further discoveries. I think it is quite possible that if the second or third set of "*adventitious roots**" were bled, or tapped at or after sunset, and an earthern pot placed under (toddy pot fashion) that, by next morning, a good supply of sweet juice would be the result. I have kept all the stalks, and as the saccharine matter must still be present in the dry cellular tissues, it might be feasible for your chemist, Dr. Waldie, to determine the quantity of sugar present. If this can be done, I will cut up

* I have plants with five such sets, 3 and 4 are common.

the stalks into suitable lengths, sew them up in gunny, and send them to you for chemical analysis. I have allowed 16 plants to remain where grown, under the impression that fresh stalks may be thrown up from the true roots which are not dead, otherwise the standing stalks would not be green for several feet of their height.

I may here mention, that I peeled, cut up into morsels and ate, or chewed, some three feet of Cuzco maize stalks, and being a good judge of sugar-cane, the comparison made by me may be fully relied upon.

If it can be managed, I would wish some member of the A. & H. Society, who is a sugar planter, to grow the Cuzco maize, (I will supply seed and instructions) for the express purpose of making sugar. In this experiment the male flowers should be removed, so that all the carbon taken up by the cob and seed may remain in the sweet juice.

In connection with the above, the following letter, dated 24th December, from the Superintendent Central Prison, Lucknow, was likewise submitted:—

A small packet of seed was given to me by the Inspector General of Prisons. It was sown early in the rains on rich soil—soil which had been trenched for latrine refuse. All the seed germinated, the plants grew to a height of 7' or 8', cobs formed in nearly all of them, but the rains injured the plants, they rotted a few inches above the ground though the latter was well drained. The plants which survived the rains did not thrive; the whole produce proved abortive as if the seeds had not been fertilized. I have preserved only one good cob. There are two or three yet on the plants, but it is doubtful if they will come to perfection. The stalks of the plants are very succulent and would prove excellent food for cattle. The seeds preserved shall be tried next year.

Note.—The seeds furnished by Colonel Chamberlain and Lieutenant Pogson are about equal in size, though the former appear to be in rather better condition. They are consider-

ably larger than American maize. The cobs in both cases are small as compared to the North American kinds of maize; but whether they are naturally small or whether they have deteriorated from those raised in their own country, we have no means of judging, as the seed from which this produce has been raised, was sent to the Society in a shelled state. It would be interesting to learn whether each stalk of this maize yields in Cuzco more than two cobs. The varieties raised in the United States give only two as a rule, whereas our country maize yields three and sometimes four cobs. Col. Chamberlain's best cobs, as he states, were devoured by rats, so that those sent by him are not the largest.

At the meeting of March, 1876, letters of 1st and 17th March, from Lieut. J. F. Pogson, were read, giving further particulars regarding his plantation of Cuzco maize, of which the following are extracts:—

In reply to your last letter I have been examining the cut Cuzco maize stalks stored by me in winter, and find the pith has in drying contracted very considerably leaving the centre hollow, and adhering to the sides, resembling, when cut, a joint of one inch in diameter bamboo, with a softish inside: the adherent pith smells strongly of sugar-cane, and has a decided saccharine taste. Under these conditions, it would be incurring needless expense subjecting the dried stalks to analysis for sugar, inasmuch as there is no doubt whatever on that point; and the richness in sugar can only be determined by operating on the fresh juice. My idea is that all experiments on the Cuzco maize should be devoted to its capabilities as a sugar-yielding plant as contradistinguished from a food grain producer. Therefore to throw all the sweet juices into the stalk, the cobs, as soon as formed, should be cut off, or wrenched off. The quantity of carbon contained in the numerous envelopes which cover the grain spike, is very considerable, and if by removal, at an early stage of growth, the carbon is economised, increase of sweet juice should be the result.

This morning I pulled up one of four Cuzco maize plants which were left *in situ*, to enable me to ascertain whether new shoots would be thrown out by the old roots. On examination I found that whilst the old roots springing from the first joint, were partly alive and partly decayed, the second joint was alive and sound, and of the thirteen adventitious roots thrown out by this joint three were alive, as well as the rootlets connected with them: the other ten were decayed. Hence our use of these first set of adventitious roots has been traced, and if sprouts appear as the season advances, the Cuzco will very much resemble the sugar-cane. I have sent Carter & Co., of London, one hundred seeds, each weighing ten grains, with instructions as to culture, and to determine its value as a British sugar-yielding plant. I think it will answer as such, and be found far more remunerative than the sugar beet.

I have had several applications for Cuzco maize seed to grow on trial as a sugar producer, so this idea is now fairly taken up.

By yesterday's post I sent you 107 seeds of Cuzco maize, 50 seeds of nine grains each in one parcel, and two smaller parcels containing seeds taken off the third and fourth row of a single cob of Cuzco maize, which bore eight rows of grain. This particular plant was manured with mineral manure applied in smaller quantity, and when the plant was five feet in height, an opening was made at the roots, and some fresh fowl's dung, a lump of the size of an unskinned walnut was placed therein and earthed up. This cob was very imposing to look at, on the plant, and I expected that a good many seeds (from outward appearance) would have exceeded 15 grains in weight. However, on weighing seed by seed, belonging to each row, only one seed of fourteen grains was found, being the fourth seed on the fourth row counting from the base to the apex.

The cob produced 212 seeds, of which two seeds only

weighed seven grains each. On the sixth row the third seed got compressed between a 12 grain seed and a 10½ grain seed, and it weighed 5½ grains. The third seed, on each of the rows from one to eight weighed as follows:—

No. of Row ...	1.	2.	3.	4.	5.	6.	7.	8.
Weight of 1st seed	11½	11.	12.	11½	11½	12.	10.	10.
Seed in grains	12.	12.	12½	12½	11½	5½	11½	13.
The 3rd seed.								
The 6th seed ...	9.	13.	13½	12.	10½	11.	9.	11.
The 9th seed ...	10½	12½	11½	11½	11.	10.	11.	10.
The 12th seed ...	11.	11½	12.	12.	10.	10½	10½	9½.
The 15th seed ...	10.	10½	11.	10.	10½	10.	10½	10.
The 18th seed ...	9½	11.	11.	9½	8½	9½	9½	7.
The 21st seed ...	10.	9.	10.	10½	9.	8½	9½	9½
The 23rd seed ...	9.	10.	10.	8.	8.	8.	9½	9½
The 24th seed ...	9	9½	9½	9.	7.	Nil.	9½	9.
The 27th seed ...	8.	8.	8.	7.	0.	0.	0.	9.
The 30th seed ...	0.	0.	7½	0.	0.	0.	0.	0.

This table is very curious, as the change in grain developement commences with the 24th seed, one to twenty-three being perfect. You will see that the compressed seed being excepted, 7 grains is the weight of the lightest seed, and as original stock weighed only *four* grains, the increase is considerable, whilst, with all the others, it is very remarkable, showing that the Cuzco maize under proper culture will thrive in the Himalayas and as a sequiter in England. I have kept a dozen 15 grain seeds for experimental sowing; also 14 and 13, and it will be interesting to see if the 15 grain limit will be passed. The plant whose seeds are sent bore three other cobs, of which two were blind, and the third though of good size, bore only 12 seed, developed here and there on the spike. The 4th cob and highest on the plant was perfect. I enclose a letter from Mr. Macgregor, and you will find a parcel of 75 seeds addressed to him. If you would give Mr.

Macgregor some of Col. T. H. Chamberlain's seed, his experiment would be made on a large scale; only ask him to sow Chamberlain's seed separately from mine so that degeneration or otherwise of both may be noted.

The following is Mr. Macgregor's letter referred to by Mr. Pogson:—

I read with much interest your letters of the 18th December and 22nd January to the Agricultural and Horticultural Society of India, on the subject of Cuzco maize, relative to its sugar-producing qualities.

Having a large experience in sugar growing in several of the best sugar-producing countries, namely, Java and the Spanish Phillipine Islands, and as I am about trying it on a large scale here, as the soil and the climate seem to be particularly adapted for it, therefore from the foregoing you may note the interest I would take in the success of the Cuzco maize being profitably sugar-producing, and would feel obliged if you would forward me a few seeds per banghy post "bearing" to experiment upon, and in return I will give you a full report of the success or non-success thereof.

The Secretary mentioned that he had sent Mr. Macgregor (Kurhurballie, Ranneegunge) some of Colonel Chamberlain's seed, and requested him to favor the Society with the result of his experiments.

In his last letter on the subject (April 1876) Mr. Pogson adds:—

The Cuzco maize seed, raised by me, will be under experimental cultivation in the following places, *viz:*

1. England, 100 seeds, Essex.
2. Cashmere, 212 seeds or one cob.
3. Simla, 140 seeds, 4 growers, 2 being zemindars.
4. Kotegurh, 100 seeds, Revd. Rebsch.
5. Kussowlee, 70 seeds, Mr. C. Chetwynd.
6. Dehra Doon, 15 seeds, Mr. D. McMurphy.
7. Assensole, E. I. R., 55 seeds, Mr. Floyd.

8. Coal District, 75 seeds, Mr. McGregor.

9. , Myounsoung, 150 seeds, or more.

The most interesting experiments will be those carried on in England and Cashmere, for if the Cuzco answers in Cashmere of course it will succeed in England and Europe. In the calcareous soil of the Coal District, it will answer as a sugar-producer, as also in the Dhoon.

Correspondence and Selections.

Sericulture, and Silk, in Japan and in Europe.

[The following interesting article on this subject is from the pen of Mr. Isidoro Dell'Oro, originally written in Italian, but translated from the French of the *Moniteur des Soies.*]

An Excursion to Schimamoura.—I left Yokohama on the 21st June, 1871, and three days after, arrived at Schimamoura, having traversed, on foot, a distance of 100 kilometres. I was accompanied only by Kamisawaja Josaburo, the son of a rich proprietor of Schimamoura, who is very popular on account of the excellent quality of the cards of silk-worm eggs which he sells.

Immediately after a discussion at the Yokohama Chamber of Commerce, touching the export of silk-worm eggs and the diseases of the worms, I undertook an expedition into the interior, to assure myself personally as to whether or not the malady existed, as our opponents maintained.

The Italian authorities refused to obtain for me, from the Japanese Government, a passport and an escort, under the pretext, that in affording me these guarantees for the safety of my expedition, they could not refuse the same to other Italians, so that, had I been assassinated while in the interior, it would have been at my own risk and without remedy.

Thus, I am the first foreigner who, on his own authority, alone and without escort, has penetrated thus far into the interior of Japan. I cannot praise the Japanese too highly for the kindness and courtesies shown to me, and also for the facilities afforded to obtain my object by allowing me to visit, without hindrance, as many as seventy-two native magnaneries.

It is true that in those villages, till then unvisited by foreigners, a few children, with natural curiosity, followed me to the end of the road; but on hearing me speak their own language with fluency, they soon retired, doubting even whether I was a foreigner, a "Tojinsan," as they said, since so many Japanese have adopted European costume.

Schimamoura is situated in a plain at a distance of 100 kilometres from Yokohama. It is surrounded by the river Tonegawa and a large canal dug some 300 years ago, which now serves both for purposes of irrigation and navigation. Surrounding the town, but at a distance of twenty to twenty-five kilometres, are the picturesque mountains of Jioscin, Sincin, Myoback, &c., &c.

The silk-worm growers of Schimamoura have the reputation

of raising the worms better than in any other part of Japan; and so universally is this acknowledged that, during the present year, the Empress, having raised some worms at Tokei, sent for three of the daughters of the principal growers of Schimamoura, among the number being the daughter of Josaburo Tagima of whom I shall presently speak: the girls, it should be mentioned, were required to teach the Empress, and to aid her in raising the silk-worms.

Besides this, the daimio of Heso near the settlement of Nagasaki, being desirous of introducing the silk-worm trade into his own province, sent to Schimamoura seven of his most intelligent officers, in order to learn the best methods of sericulture, apprenticing two of these officers to each of the principal growers of the place. I myself saw these officers, notwithstanding their nobility, working like plain artisans, picking mulberry leaves, distributing the silk-worms, and changing their beds.

Having one day invited them to dine with me at the residence of my host Josaburo Tagima, they told me among other matters, that the daimio, their lord, had imported into his own province from Schimamoura the best species of mulberry trees, and that they expected to commence rearing silk-worms during the following year. "It is for that purpose," added they, "that the daimio, our master, in ordering us to study the cultivation of silk-worms in Schimamoura, caused us to travel a distance of 300 ri (ri is about three kilometres)."

After this preliminary statement of the motives of my visit to Schimamoura, I will divide my remarks into four articles, as follows:—

Firstly.—The rearing of the silk-worm.

Secondly.—That which is called in Japan uji, and the mulberry leaf.

Thirdly.—The eggs of the yellow cocoons.

Fourthly.—The winding of the silk: its increase of price in Japan, and the Italian stamp on the card.

The rearing of the Silk-worm.—It will be observed, on reference to the annexed wood-cut of the magnaneries of Josaburo Tagima Kamisawaja,* that the native magnaneries are light and well ventilated: and in order to secure this, they are built at a considerable distance from the plantations, in order that the air may circulate freely.

This magnanerie is one of the largest in Schimamoura. Here are reared five eggs of sixteen cards, which, on the fourth moulting, gives 700 tables of silk-worms, all reared in the same localities.

* The *Moniteur des Soies* publishes a small wood-cut of a Japanese two-storied house, standing in its own grounds. It is scarcely necessary for us to reproduce it.

Each table, in size about three metres by two, contains 900 silk-worms (the Japanese, after the fourth moulting, have sufficient patience to count each worm). Thirty-three persons are employed in rearing the produce of these sixteen cards, that is, two persons to each card—the same rate as with us in Italy.

These tables are made of bamboo pierced with large holes of about four centimetres square to allow the passage of the air. On these tables are placed mats made of rice-straw (instead of the paper in use with us,) in order that the air can circulate below as well as above.

By the use of these mats the Japanese obtain two essential advantages—

The *first* is that these mats, being made of rice-straw, prevent dampness.

The *second* is that it renders the task of changing the beds much easier. This changing of the beds is done much more rapidly than in European countries, since during the morning and after the first meal has been given to the silk-worms and again after the second meal given in the middle of the day, the Japanese spread over their tables a number of threads, upon which are placed mulberry leaves. An hour after, the tables, one after the other, are taken away, men being placed on each side of the table to assist in the work. During this time the worms have been able to pass to other threads stretched over a new mat which a woman holds ready, while yet another takes away the dirty one and throws away the litter. The mat is then exposed to the air or sun for twenty-four hours, in order that it may be dried and cleansed before being again used.

The magnanerie of Josaburo Tagima Kamaisawaga is 80 metres long by 25 broad, women only being employed in the careful and regular feeding of the worms, the men performing the heavier labour.

Instead of the method employed by the Japanese the Italians use paper on their silk-worm tables, which, however, prevents the slightest current of air traversing the tables.

Besides, a number of our growers are in the habit of having their silk-worms blessed, in order that the crop of cocoons may be large; themselves, however, neglecting to bestow the necessary care upon them. Should the crop prove deficient, some go so far as to say "I have done the will of God"—as if God could be made responsible for their own negligence

Every nation has its religious convictions more or less developed. Thus the Japanese do not fail to recommend themselves to their innumerable divinities (they are reckoned by millions.) They promise that if the gods obtain for them an abundant harvest, they will make them large presents, without forgetting to illuminate their shrines day and night. If the crop is plentiful, they always carry out their vow by paying what they have promised to their bonzes or priests; but if it fail, these poor gods

become the object of their curses—they break their images, and load them with calumny and abuse.

I have assisted at such a scene, and I have heard a Japanese family, deceived in its hopes of a large crop, say: "and what?" said they to these idols, "you treat us thus, who have worked day and night, we who have lavished upon you so much rice," (rice is the principal sustenance of the Japanese). Then followed thousands of curses.

A Japanese with better sense said to me, "If, instead of watching over silk-worms, we neglect them and employ our time in drinking saki (Japanese wine, an extract of rice), we act against the laws of nature and good sense, and in such a case, the fault being all on our side, the gods themselves can do nothing."

The wood-cut before alluded to shows an elevated roof placed above the ordinary roof, added in order that the air may find access on all sides, as well as by the top of the house, which is provided with a species of window, closed during high winds; but in order that the wind may not create a draught in the magnanerie, its exit is moderated by holes, 3 centimetres in size, placed one above the other, in three rows. It must be observed that, in consequence of the high roof, the magnanerie is better protected from excessive heat.

In my previous articles, I have always recommended the rearing of silk-worms in small quantities, because, being better taken care of, they yield a relatively better crop than a large number which have been neglected. Thus, last year, the Japanese through their cupidity, attempted, contrary to their usual habit, to raise a larger crop of eggs than ordinarily, in consequence of which the crop failed. During the present year, however, others who had mulberry-leaves for twenty-four cards only raised twenty; those again having leaves for twenty only raising sixteen, the result being all that could have been expected or desired.

In order to better prevent dampness, the Japanese take care, in changing the beds of the worms which are disposed to sleep, to spread on the mats, already prepared, as I have before related, the chaff of rice (it is that dust which is thrown aside in threshing). If the weather be dry, they make fresh beds every second day; but should it rain, it is changed every day, using for that purpose large and small for threads according to the moulting and always carefully prepared. After the fourth moulting, the bed is necessarily changed each morning as soon as the worms have had their first meal.

Until the fourth moulting, and in order to enable the worms to leave it easier, they give the worms chopped leaf, in small quantities seven or eight times a day: and two days after the fourth moulting they give the silk-worms an abundance of leaves, but only four times a day, or five times at most, if it is very hot.

In all the Japanese magnaneries I found the Fahrenheit thermometer, which they take care to keep below, 70° (about 16° Reaumur). When the temperature is very high, and the thermometer indicates a still further rise, they cool the air by pumping water on the roof of the magnaneries, having taken care to so arrange the windows, by means of a temporary shutter, allowing to enter the magnaneries dry and cool which prevents any stifling likely to cause sudden heat.

I have seen them employ these means equally when the day is very hot or when it rains.

When it rains heavily, if the wind does not blow and the temperature is moderate, the Japanese, to prevent that dampness so hurtful to the silk-worms, keep their magnaneries open on all sides. If the wind comes only from one side they open that opposite, at the same time burning on the floor of the magnanerie the wood of the mulberry-tree mixed with rice-straw, in order to prevent the rising of those vapours which produce dampness. The Japanese gather the leaves in the morning or in the evening — not as we do, but by dragging the branches to the ground. After carrying them in-doors, they do not shred the branches with the hand, but with a knife. If the day be rainy or threatening to rain, the Japanese make provision for two days, hanging the leaves on small strings, in which way they dry naturally and easier than if heaped up.

Leaving Tokei (the ancient Yedo, the capital of Japan) the island of Japan is traversed by four principal roads running in different directions. All distances are computed from the Nihon Bashi, that is the "bridge of Japan," which is in the centre of Tokei. One of these roads goes to Kioto; another traverses the province of Murashi, Jioshiu, Sinshiu, and goes to Nügata; the third leads to Oshiou, &c. All the other roads are very narrow, two horses being scarcely able to pass each other. It is for this reason, even during fine and dry weather, that no dust is to be found, as in our countries.

Always, but principally at the time of the fourth moulting, the Japanese wash the leaves intended for the worms with water, because, say they, the leaf is always impregnated with dust, most hurtful to this noble insect. And when we consider that with us the leaves which are used for food are almost covered with dust; when we reflect upon our own repugnance to eat, even by chance, dusty bread; when we think that the silk-worm is an insect as delicate as its product is valuable; and then compare the lavish care bestowed on the silk-worm by the Japanese with our own negligence, we are forced to the conclusion that we are the chief cause of the failure of our crops—that the first fault lies with us.

Last year, I left Europe on the 24th July, after having had plenty of time to visit and attentively examine the magnaneries of Italy and France, and while they are yet fresh in my memory, I conceive myself able to make some comparison between the mag-

naneries of France and Italy and those of Japan.

In the first place, I have recognized this great difference between the results of the Japanese and our systems of rearing the silk-worms. This difference is established on irrefutable facts.

In Japan I obtained, in nearly all the seventy-two magnaneries I visited, various silk-worms which had arrived at the fourth moulting, and these I preserved in three flasks of spirits of wine. Among these worms I found only two in each flask that came from yellow cocoons, a species which I had brought from the hills of Tuscany and raised with great success. I sent two of the three flasks to my brother Joseph, at Milan, in order that he might examine them, and the third I retained myself for the same purpose.

Competent persons can thus decide on those samples whether or not the silk-worm malady exists; and here I may observe that at all the magnaneries at which I obtained silk-worms the finest and most plentiful crops that could be desired, have been obtained.

I believe this is the first time that similar silk-worms have been sent to Europe since the year 1856, at which time the French Government deputed me to obtain silk-worms of the fourth moulting, to be submitted to a microscopical examination by Mr. Pasteur.

I may add that, in opposition to the opinions held by us in Europe, that the silk-worms which grow quickest ought, as being considered the most vigorous, to be chosen in preference for obtaining eggs, the Japanese consider these the weakest, and in consequence, so far from using the eggs obtained from them, they sell them for exportation.

Uji and the Mulberry-Leaf.—Silk-worms when in the chrysalides, are subject to various maladies. I will here give some few ideas upon the malady resulting in uji in the chrysalides.

The word uji signifies larva. The Chinese hold that the word means a worm in flesh which is in a state of decomposition. The uji is therefore a parasite, which bites and devours the chrysalides, and is thus called uji in the eastern provinces of Japan. In the eight provinces in the centre of this empire, the name of Horo is given. In Italy we have the Camola, which some believe to be the uji of Japan, though really they differ in several respects.

The uji has rings, and when it is fully developed is almost as big as the silk-worm chrysalide. Scarcely is the cocoon formed than it attacks and devours the chrysalide.

If, on opening the cocoon, one or more marks are discovered on the chrysalide, it may be considered certain that the germ of one or more uji will be found in the intestines.

If the rearers discover that the uji abound, it is necessary to immediately expose the cocoons to the sun and to use them for winding; or, if they are intended for eggs, to ascertain how many cocoons will be rendered unfit for reproduction and then take only those which appear the best.

The colour of the cocoon, after it has been abandoned by the uji, passes from a pale yellow to a brownish red, assuming gradually deeper tints, while its size diminishes by one-half.

Among the different species of mulberry-leaves, the Japanese consider three, specially suitable for feeding silk-worms to be used for reproduction; these are the leaves of the Corboré, the Schimacougori, and the Ieibé.

These three qualities of leaves possess an unequalled lightness, pliancy, and softness; but the Corboré is even better than the Schimacougori in lightness of leaf. As to the Ieibé, of which the leaves are very large, the Japanese only give it to the silk-worms until the third moulting.

Upon the quality of the leaf, as it may be younger and more tender, depends the number of the uji. The most industrious and attentive sericulturists obtained this year 95 per cent of moths. This is an enormous proportion, the average generally being 50 or 75 per cent of uji.

The other qualities of mulberry-leaves, bearing other names, are used exclusively for feeding silk-worms intended for winding; were these used for the production of eggs, as much as 90 per cent of uji would be found. It is evident, then, that it would be useless to use worms fed on these leaves for the production of eggs; and it proves, besides, how absurd was the statement made at the meeting of the Chamber of Commerce, that the best cocoons were used for seed, and that this was the cause of the depreciation in the quality of the silk.

It is a noticeable fact, that at a distance of three kilometers from Schimamoura, all the worms reared on the system explained above are used for the production of silk.

It is very difficult for any one living in Europe to judge accurately of events which transpire at a distance of several thousand leagues, if they do not take into consideration the difference of vegetation and climate, as well as the uji, which is scarcely known at all in Europe.

I may add, in support of what I have said above, that the mulberry-leaves called Corboré and Schimacougori were sold this year at the rate of five rio to five rio and a half per horse-load (a rio is nearly equivalent to six francs, and a horse-load is about 136 kilogrammes), while the leaves used for feeding the silk-worms used for winding only were sold at the most at three boos per horse-load (a boo equals about 1 fr. 65 cents.)

I have myself witnessed several purchases made at this price, having arrived at Schimamoura when the silk-worms entered upon their dormant condition previous to the fourth moulting, remaining there until their resuscitation, that is to say, during the most critical period.

Below I give the prices at which these cocoons are sold—

1*st.*—As to those reserved for the production of eggs, their price, determined by the quantity of uji they contain as it may

be greater or less, has been four to five rio per iccammé, a Japanese weight corresponding exactly to 3 kilos 75 gr.

An iccammé of cocoons, produces from five to eight cards of eggs, and consequently, even in the interior of Japan, each card of eggs costs the producer a little more than a dollar (the dollar is worth 5 fr. 85 c.), without the expense of transport, duty, &c., which are enormous.

Last year the price of cocoons rose as high as 20 rio per iccammé.

2nd.—As to these cocoons used for winding. These have been sold at a price ranging from a rio and a half to two rio per iccammé according to quality.

These facts, which I have set forth, sufficiently show that the tender and young leaves contribute more or less to the production of good crops. In all experiences afforded by the early crops raised in Italy and France, only the tender leaves of the young shoots are used, while only a small number of silk-worms of which the greatest care is taken, are raised. This is why these attempts have succeeded so well, while efforts to rear larger crops have failed.

I will cite a fact which will further confirm this observation.

Those daimios at Tokei, possessing large palaces covering a great extent of ground, seeing that the cultivation of silk attracted great wealth to the country, sent to Schimamoura for the best plants of the carboré, schimacougori, and icibé, and at the same time built large magnaneries. This year, when for the first time they raised silk-worms, not only did they have an excellent crop of cocoons, but what was even better, the uji was only developed at an average rate of 5 per cent. so that they obtained 90 to 95 per cent. of moths. The Japanese attribute this great success to feeding the worms with these young shoots.

I myself chose on the spot, and afterwards sent to Milan, 600 of these young mulberry-plants, 400 of the corboré, 100 of the schimacougori, and 100 of Icibé species. Besides, I gathered a kilo of mulberry seed of the best plants at Schimamoura, and I may observe that to an experienced eye the corboré and schimacougori, are easily distinguished from other mulberry trees as much by their colour as by their shape at the time of the sprouting of the fruit which gives the seed.

The eggs of the yellow cocoons.—For several years I had intended to hatch the eggs of our yellow cocoons which, on account of their produce, are so much better than any others. I saw that the eggs constantly deteriorated in consequence of the inroads of disease. I thought it would be an act of patriotism to save these precious eggs which disease threatened to render extinct, and to reduce to a historical remembrance. I believed that in transporting this seed to Japan, to a healthy country, the eggs would be fortunately preserved from that direful atrophy which attacks our silk-worms from yellow cocoons, and that in changing

the locality and the climate, they would eventually prosper in the land in which they had their origin. I believed that there would be found the means of their preservation, whether by means of employing another system of rearing, or by feeding the worms on vegetables better suited to their natures, and more in accordance with the condition of their original country.

I thought, as did Machiavel, that when an institution becomes degenerated it is possible to rejuvenate it by transporting it to its origin, and that this theory, admitted so far as it applies to human institutions, both moral and social, should also be applicable to vegetables or the lower animals.

The ancients, that is to say, the Greeks and Romans, did not cultivate the art of manufacturing silk. They bought the material from the Persian merchants, who themselves purchased it in Serica or in China, where the manufacture had been well understood 2,500 years before the birth of Jesus Christ. It was not till the year 550 A. D. that two Persian missionaries brought a few eggs to Constantinople. The Emperor Justinian encouraged this industry, planting mulberry-trees in the Peloponesus. This country was in the year 1130 invaded by Roger, King of Sicily, who transferred the silk manufacturing interest to Palermo, whence it spread westward, since the mulberry can live and prosper at an altitude of 700 metres above the level of the sea.

Having recognized the fact that the valuable eggs of the yellow cocoon were lost in the east, I believed, I repeat, that I should perform a useful act in bringing them to Japan whence they certainly came, *viâ* China to Europe—to strengthen and restore the seed, and then, on a return to health, to take them to our western countries.

I was confirmed in this resolution by the discovery that in the year 1705, a deadly disease having threatened to destroy the seed of the yellow cocoons in France, which had been long acclimatized in that country, several ounces of seed were sent to the extreme east, with the thought that in thus changing the climate, air and food, this precious seed would be preserved from the destruction which threatened it then as it does to-day. Two or three years after this, the seed of the yellow cocoons was sent back to France completely regenerated, from which time it recommenced to prosper as before the malady.

My resolution to renew this experience dates from the year 1866, but its accomplishment was retarded by those who ought to have been the first to favour it.

In order the easier to attain my end, I entered into relations with some influential persons in Japan, and, through their agency, I obtained from Japan several thousands of cards, but without any eggs attached to them. I desired that 2000 of these cards should be covered with eggs of our Italian yellow cocoons, then that they should be sent back to Japan, so that our own manufactures should be able to take some of the surplus of these

cards to raise our own silk-worms, which ought thus to become better, and to succeed by the adoption of the Japanese method, which consists in placing the eggs on cards made of silk paper rather than on tissues of linen or leather, heterogeneous substances, which do not suit the silk-worm, and do not protect it from dampness.

For several months my project was hindered from being put into practice. I then tried other means.

But, whether it arose from the Japanese being inclined to interest themselves more in their own silk-worms than with our own from yellow cocoons, or whether it arose from the Japanese prejudice against eggs which had been exposed to the sea-air—which they consider not fit to give good results—or whether it was that the eggs imported were not entirely free from the germs of disease, it so happened that my first effort failed, and the Japanese, seeing the worms from yellow cocoons injured, were discouraged, and disinclined to pursue a new method of cultivation.

For myself, being in no way disheartened by this annoying and prejudicial result, I was able last year to again bring to Japan eggs of yellow cocoons gathered on the hills of Tuscany—eggs that I placed on true Japanese cards; the same that I brought to this country to protect the eggs from damp, and the same which in Italy had given rise to frivolous and ridiculous tales as to my object when I sent them to the west.

Availing myself of my previous relations with the leading Japanese silk manufacturers, I was able to persuade them, though with the greatest difficulty, to renew the previous experiments.

This time the result was beyond all that could be desired. A full crop was obtained at Schimamoura, in Oneda and Yenesawa. The abundance of this crop surprised the Japanese, who immediately asked me to keep half the eggs which might be obtained for use during the next season. This I willingly did.

I know for certain that these eggs from cards imported by myself are universally spoken of in Tokei in a most favorable manner.

What aided me most to overcome the obstacles raised by the Japanese, was the fact, that my brother Joseph persuaded the Japanese to cultivate American corn as being more likely to succeed than that hitherto planted in Japan. The result of this experiment was marvellous, and my brother's advice was highly appreciated. In fact in a space of 300 tsuboes (the tsuboe is equal to about two square meters) the Japanese obtained 400 kilos of wheat instead of 300 which their own grain would produce. Now, the Japanese cultivate only foreign card, the seed of which my brother recommended.

Besides this, Mr. Vassali, a wealthy proprietor of Milan, favored me with a small sack of rice grown on his own property. This I intended to distribute to the Japanese, being persuaded

that it would add to the wealth of the country, improving the growth of rice.

I may say, in passing, that those who think that the Japanese rice is better than ours, appear to be in error. But I believe, as do many others, that it is necessary to renew the seed from time to time to restore its pristine vigour and to obtain the most satisfactory results. This, experience has proved. For instance, the Japanese are not in the habit of sowing the seed in the same spot from which it was reaped during the previous season—or, at least, they do so very rarely. They adopt the same measures with respect to the silk-worm-eggs, &c., &c.

The Winding of the Silk. The Increase of Price in Japan. The Italian Stamp.—Europe is but little interested in the methods of winding silk in use in Japan, because she has progressed far more than Japan in this branch of the industry. It is indeed stated that the Japanese Government proposes to send to Italy and France three men and as many women of experience to learn the European methods of winding.

But what is ignored in Europe—and I was able to make the statement at the last meeting of the Yokohama Chamber of Commerce, is the fact, that the advent of strangers in Japan has produced a sensible increase, in the wealth of the country.

Thus, for example, before the arrival of Europeans, or, at least, before the silk-worm trade sprung into existence in Japan, the superb and now productive lands at Schimamoura, surrounded by the river Yonegawa and its tributaries—these rich lands, I say, now exclusively devoted to the cultivation of the mulberry were, so to speak, of no value; the river inundating the land for several miles round, and often doing great damage by changing its course. Now, on the contrary, these lands, which had been held for eight years as valueless, sell readily at 150 rio the 300 tsuboes, while others, and from one to two kilometres from the river, are valued at 110 to 125 rio per 300 tsuboes, while before the value was only 25 to 30 rio.

In eight years the production of silk-worms at Schimamoura has been quadrupled. But Schimamoura proper is only about 20 kilometres square, and, according to the official statistics which I have before me, can only produce 30,000 to 40,000 cards of silk-worm eggs, while some 300,000 or 400,000 cards are annually sold as coming from this same locality.

I know all the growers at Schimamoura personally, and can confirm all I have written on this subject.

I will bring these observations to a close by recommending as the most urgent requirement, the freedom of commerce; for this year the cause of the bad hatching of the Japanese egg in Italy and France must be attributed to the inopportune nature of the stamp impressed by the Italian Consul.*

* The stamping of the cards by the Italian Consul has since been discontinued.

Since 1867, until the present time, the injury undergone by these countries may be estimated at more than 40 millions of francs, and the greater part is caused by the Italian Consulate stamp, which forces the Italians to pay two or three times more than was formerly the case.

And who is it that laugh heartily at all this? The Japanese. And how many times have they said, Italiagnin yacaranai; the Italians are not merchants?

Also it is well to remember, that, of all nations, Italy is most cordially received in Japan: but I say it, however, to our shame, for this friendship costs us millions upon millions every year.

The Japanese, perceptibly agitated when the Italians do not make their appearance, make a point of informing themselves exactly as to the time these illustrious gentlemen should come since their arrival sensibly increases the prices of their cards.

In the same way that the Japanese had a mania for pigs and dogs, so certain persons have had and have still a mania for stamps, without having foreseen the consequences.

It is only during the present year that another species of stamp has been adopted, so that even a blind man cannot make a mistake as to the eggs or as to the province from which they have come. But I fully believe that this innovation would not have been adopted if the vexations caused to the Japanese by it had been calculated. This I have been able myself to verify, and this annoyance is the result of the new rule, which obliges the Japanese to have their cards stamped before the moth has laid its eggs, or at least directly after, which is worse still, and causes a great deterioration in the eggs.

Able sericulturists, both Italian and French, have calculated that the silk-worm eggs traverse four periods.

The first, from the day when the moth lays its eggs to the 25th July.

The second, from the 25th July to the 25th December.

The third, from the 25th December to the 25th January.

And the fourth, from the 25th January to the hatching of the silk-worm.

To transport the eggs from place to place during the first period is extremely hurtful, and is one of the principal causes which prevent hatching. It is thus as injurious as absurd to oblige the Japanese, who desire to send their silk-worm eggs to Europe, to move their cards to the stamping office three days after they have been prepared. It is equally injurious both to the Europeans who have bought the cards, or to the cards themselves deteriorated by this too early operation, and therefore not able to compete in the market with those cards which have not been moved until there was no danger in so doing.

When our sericulturists go to the East to lay in a stock of eggs they do not go till the month of August, precisely in order

that the eggs should have time to ripen, or at least to be properly preserved.

And this is what the Japanese do:

As much out of desire to confirm to the requirements of the Italian Consul as to obtain the best price by being first in the market with their eggs, they pack the cards together and put them in cases capable of containing 500. Then they are transported on the backs of horses, both night and day, without taking the cards out of the cases to give the eggs a little air.

I myself have seen this vandalism.

I have remarked upon the great injury which such acts do to the reputation of the trade, both to the principal Japanese producers and to the highest officers of their government; but they have in reply objected by alleging the hard necessities imposed upon them by our official requirements, and, asking me to put myself in their place, have added that they, having no remedy for these abuses and their baneful results, had nothing to do but to remain silent. I have always made this the subject of my most pressing remonstrances, and I know that this year some attention will be paid to the question.

Besides, I placed at the disposal of the Japanese a few of our cases sub-divided into ten compartments, but well aired, and recommending, as a most important precaution, to transport the egg cards packed in these cases only during the night and in the cool; and also during the hot weather to give the cards plenty of air and shade, in order to avoid the serious inconveniences which do so much harm to the silk-worm interest in Europe.

In concluding, I will point out another abuse which should be remedied as soon as possible.

The pasting of the eggs upon the cards is done with so much patience and ability by the Japanese, that the most experienced eye cannot discover in what way the method of pasting is destructive of all probability of hatching. In Italy it is desired that the cards should be entirely covered with eggs, and this causes them to be dearer in Japan. Cards thus pasted being very rare; the Japanese, to meet the demands of the Europeans and to increase their profits, paste eggs, or what resembles them, upon the open spaces of the card where the moth has not laid. Thus many cards are to be found where only half or two-thirds of the eggs hatch, or at most seven-eights of what is expected, the rest of the eggs pasted on, not being able to hatch. This is a fraud and a swindle on the part of the Japanese, and although I am a partisan of free trade, I believe that in this exceptional matter, where we see that we have to deal with a people who glory and delight in deceiving strangers, our authorities ought to prevent the recurrence of such an abuse by the most urgent representations to the Japanese authorities.

The English, backed up by their Minister, acted thus in China, and even this year in Yokohama they have exercised all the power at the command of the Government to prevent all fraud or overcharge in the silk trade. The frauds are easy to be discovered, and we have seen the Japanese push their deceptions so far, as to mix with the silk sold by them that species coming from a double cocoon, or even adding sand or other foreign matter, to the skeins of silk in order to fraudulently increase the weight.

The use of scented woods, or of iron, in the construction of the cases for transporting the eggs, is considered as most injurious to the hatching of the silk-worm eggs; and experience has shown that eggs carried in cases which previously contained tea would not hatch.

I have been animated in writing the foregoing by a desire for the public weal, and for industrial and commercial progress. In the midst of the agitations of my life in Europe, I believed it well to compare, on the spot, our methods of sericulture with those of the extreme east, with a view to adopting the good features of the latter system, and of pointing out what might seem defective or insufficient. In the west we ought to study the rearing of the silk-worm more than we do; we should buy in the east several species of excellent trees which we are now deprived of, in order that we may regenerate our race of yellow cocoons, and obtain eggs which will put an end to the murderous atrophy which attacks the silk-worm.

Then the east would in its turn come to learn in the west the art and the best means of winding the silk, and this interchange of benefits and reciprocity of advantages will contribute to the final advent of a brotherly union among nations, who, in spite of strange theories put forth with respect to pre-historic periods, did not spring out of the ground like mushrooms—who, in all climates are plainly distinguished from the brute—it not being possible that man is a transformed monkey, since all men are descended from one source. And though the colour of the skin and the features may have undergone certain changes dependent upon climate or some other cause, man has none the less preserved the essential and indestructible characteristics denoting the unity of the primitive type—a unity which recalls to mind that of the sun, illuminating with its rays the human race, which, and in spite of distance, of the variety of climate, of temperament and education, remains subject to the imperial law of truth, of which the evidence is the word of peace and an international union drawing all men together in brotherly love.

I repeat, the little I have just traced to its source, is from the affection I bear for beautiful Italy, the country where I was born, and where I have spent the happiest part of my life, but now so far distant.

Will my readers be content with the few remarks I have just submitted to them? I do not know. But I will nevertheless conclude by declaring in all sincerity:—Feci quod potui; faciant meliora potentes!

YOKOHAMA;
21*st July*, 1871.

ISIDORO DELL'ORO.

INDIAN TEAS.

At the recent meeting of the British Association, Professor Hodges gave an account of the composition of tea and tea soils from Cachar. He said:—Notwithstanding the important place occupied by the tea plant in the dietary of so large a portion of the world, its chemical examination has attracted comparatively but little attention. We owe to Peligot and Mulder the most valuable investigations which have been made in connection with it; and more recently we have been supplied with some analysis of the ash of teas from the laboratory of Professor Horsford; while Wanklyn and Allen have lately contributed many facts of great value in reference to the examination of the tea of commerce and the detection of adulteration.

Some time ago, Professor Zöller read before the Physico-Medical Society at Erlangen a paper on the chemical investigation of a Himalaya tea ("Repertorium fur Pharmacie," Band xx. Heft 8), which possessed peculiar value, from the circumstance that the specimen examined might be regarded as consisting of genuine tea without any foreign admixture, having been received from the growers by the late Baron von Liebig. Professor Zöller's investigations, confirmed the correctness of observations which he had formerly made respecting the influence which the age of the leaves of plants exercised on the composition of the ash, that while young leaves are found to be rich in potash and phosphoric acid, and poor in lime and silica the amount of lime and silica in the ash increases with the age of the plant. As the best qualities of tea are known to consist, as I shall presently show, merely of the very young shoots of the plant, the estimation of the amount of potash, phosphoric acid, lime, and silica, may be usefully, as he suggested, employed in enabling us to judge of the quality of a specimen of tea. This opinion he found confirmed by the examination of the specimens of Himalayan tea

One hundred parts of the ash of this tea consisted of—

Potash ...	39·22
Soda ...	0·65
Magnesia ...	6·47
Lime ...	4·24
Oxide of iron ...	4·38
Protoxide of manganese ...	1·03
Phosphoric acid ...	14·55
Sulphuric acid ...	trace
Chlorine ...	0·81
Silica, acid, and sand ...	4·35
Carbonic acid ...	24·30
	100·00

The richness of the tea ash in potash and phosphoric acid, showing that the tea had been prepared from young leaves, suggested that the amount of matters in the leaves, soluble in water, and of nitrogen, and also probably of theine, would be large. These anticipations were confirmed by the investigations. The extract obtained by treating the leaves with boiling water weighed 36·38 per cent., and the nitrogen 5·38 per cent., while the theine amounted to 4·95 per cent., of the air dried leaves.

Some time ago I had an opportunity of submitting to examination specimens of tea grown in Cachar, under the superintendence of Samuel Davidson, Esq., formerly of Belfast, and also a specimen of fine Cachar tea forwarded to me from the same district by Dr. Joseph Nelson. Mr. Davidson's specimens were taken from the fields in August, and were carefully enclosed in tinfoil, and may therefore be regarded as representing genuine, unmixed specimens of Indian tea. Mr. Davidson also kindly supplied the following history of the crop from which the specimens were taken:—'The leaves were taken from plants in their seventh season, and consisted of the young shoots from which tea is manufactured—viz., the bud, the first, second, and third leaves down the stem. In none of the samples were there old leaves or actual wood. A shoot with this number of leaves is usually the growth of about twelve days after the bud has got started to grow. The indigenous sample is from the variety of the plant which was originally found growing wild in the jungles of these districts. It is, I should think,' the true *Thea viridis*. It is a very large growing plant—almost a tree—and its leaves, when full grown, are very large and succulent. It yields by far the best quality of tea. The other sample was from a hybrid plant. This is supposed to be a true hybrid, between the indigenous and China varieties, and certainly partakes very much of the peculiarities of both varieties. The China plant is the variety which, I think, is the correct *Thea Bohea* originally imported direct from China. It is a miserable, small-growing, stunted

plant compared to the indigenous, the full-grown leaves being only about two inches long, and the tea is inferior. The hybrid gives a good strong tea, and is a hardier plant than the indigenous, and so is very much liked; but the more closely it approaches to the indigenous, it is the more highly prized." The specimens received by me had been mainly dried in heated rooms. The produce of the crop was estimated at 400 lbs. of dried tea per English acre. It is so seldom that we are able to obtain any precise account of the history of the specimens of tea and other foreign productions which have been submitted to chemical examination, that Mr. Davidson's report possesses especial importance.

One hundred parts of each variety of the tea give me the following results:—

	Indigenous.	Hybrid.
Moisture	16·06 ...	16·20
Organic matters	78·81 ...	78·98
Mineral matters	5·13 ...	4·82
	100·00 ...	100·00
Nitrogen in the dried tea ...	4·74 ...	2·81

The ash of each respectively consisted of:—

	Indigenous.	Hybrid.
Potash	35·200 ...	37·010
Soda	4·328 ...	11·435
Chlorine	3·513 ...	2·620
Sulphuric acid	5·040 ...	6·322
Phosphoric acid	18·030 ...	9·180
Oxide of iron	2·193 ...	2·163
Protoxide of manganese ...	1·024 ...	0·800
Lime	8·986 ...	5·533
Magnesia	4·396 ...	5·910
Sand and silica	0·500 ...	1·300
Charcoal	2·900 ...	1·830
Carbonic acid	13·590 ...	12·600
	100·000	100·000

I was also enabled to submit to examination specimens of the soil and sub-soil from the field on which the tea had been grown. Both soils were of a reddish colour, and in fine powder, the sub-soil, which was taken 1 ft. 6 in. below the surface, being rather deeper in colour than the soil. A textural examination of the specimens was made according to the method which I have described in my work on "Chemistry for Farmers," and gave the following result:—

One hundred parts of each respectively were found to consist of—

	Soil.	Sub-soil.
Sand in fine powder	71·5 ...	82·5
Clay	28·5 ...	17·5

Carbonate of lime, less than 5 per cent.

Both soils may therefore be described as sandy loams.

Chemical Composition.

100 parts of each respectively consisted of—

	Soil.	Sub-soil.
Organic matters ...	4·75 ...	5·18
Chloride of sodium ..	0·11 ...	0·35
Potash	0·03 ...	0·03
Oxide of iron	6·00 ...	7·20
Oxide of manganese ...	trace ...	trace
Alumina	2·02 ...	3·86
Lime	trace ...	0·10
Magnesia	0·12 ...	0·05
Sulphuric acid ...	0·07 ...	0·35
Phosphoric acid ...	0·05 ...	0·05
Insoluble silicious matters	64·80 ...	56·50
Moisture	22·20 ...	24·44
Nitrogen per cent ...	0·158 ...	0·22

The amount of nitrogen and alkalies in the sub-soil, it will be perceived, exceeds that which was found in the surface soil. This, I consider, may be owing to the circumstance that heavy rains (40 inches within four months) had fallen for some time before the specimens were taken.

Another sample of Cachar tea, kindly forwarded to me by Dr. Joseph Nelson, was also examined, chiefly for the purpose of ascertaining how far we could rely upon the determination of the amount of matters which are removed by heating tea with boiling water, as indicative of the presence in the tea of commerce of exhausted tea or of foreign leaves.

One hundred parts of the specimen were found to contain 4·963 parts of moisture, and the ash amounted to 5 parts. By treating the leaves with boiling water until exhausted of soluble matters, and evaporating the solution to dryness, an extract weighing 42·4 grains was obtained. Determinations of the amount of nitrogen in the leaves as received, and also in the insoluble residue were made, and while the nitrogen of the original sample amounted to 4·425 per cent., the insoluble residue was found to contain only 2·109 parts, the amount of mineral matters, by treatment with water, being reduced to 1·56 parts, so that 68 per cent. of the total mineral matter of the tea, and about 58 per cent. of the nitrogen, had been removed in the infusion.

Monthly Proceedings of the Society.

Thursday, the 4th February, 1875.

Dr. George King, *President, in the Chair.*

The proceedings of the monthly meeting in December were read and confirmed.

The Secretary read the report from the Council.

The report was adopted.

The members next proceeded to the election of Officers and Council for the current year. Messrs. J. Lynam and G. L. Kemp, as scrutineers, reported the result to be as follows :—

President—Dr. George King.

Vice-Presidents—Mr. W. H. Cogswell, Mr. M. Henderson, Hon'ble Louis Jackson, and Baboo Protapa Chundra Ghosa.

Secretary—Mr. A. H. Bleechynden.

Council—Mr. R. Bleechynden, Baboo P. C. Mittra, Mr. E. Broughton, Baboo Gonendro Nath Tagore, Mr. W. Swinhoe, Mr. W. Pigott, Mr. S. H. Robinson, Mr. L. Berkeley, Mr. John Martin, Mr. W. Stalkartt, Mr. R. Knight, and Dr. S. C. Mackenzie.

The Standing Committees need no additions.

Reports

The Council submitted Reports from the Finance and Garden Committees, with a recommendation for their adoption.

The Finance Committee draw particular attention to the continued heavy expenditure on garden account which for the last 12 months amounts to Rs. 12,299-9-3, while the gross total returns from the garden does not exceed Rs. 298. They estimate the probable income of the Society for the current year, from all its various resources at not more than Rs. 23 to 24,000. On the detailed information of facts before them they are of opinion that whatever the income may prove to be, a sum of Rs. 19 to 20,000 should in the first instance be reserved for the primary objects of the Society. By the term primary is meant the most popularly availed objects of the Society. They therefore recommend that the garden expenditure be regulated in the first instance, strictly with reference to the requirements of the members of the Society, and that such expenditure do not exceed any surplus that may remain after providing for the more essential objects of the Society, and that such surplus cannot possibly exceed Rs. 4,000 to 4,500.

The Garden Committee, without reservation, accept the Finance Committee's Report, and bearing in mind the financial difficulties of the Society, recommend that pending a more favorable financial state, the garden expenditure for establishment and contingent be now limited from and after the 1st February to Rs. 441 per mensem.

They desire to call attention to the suggestion made in their report of 29th July last, *viz.*, "that an assortment of not exceeding 50 popular plants, including roses, be allotted gratuitously to each member requiring them annually, and now recommend the following instead. That from and after the 15th June next, and until further notice, each member be allowed to indent annually for ornamental plants to the extent of Rs. 20, on the understanding that only one plant be taken of any variety exceeding 12 annas. In conclusion, they urgently suggest the expediency of memorializing the Government for an annual money grant towards the support and maintenance of the Society.

Resolved—That these Reports be adopted.

Proposed by Baboo Peary Chand Mittra, seconded by Mr. W. Stalkartt, and *Resolved*, that the following recommendation from the Council be adopted :—

"That with reference to the Reports of the Garden and Finance Committees, the Council are of opinion that it be recommended to the General Meeting that an application be made to the Government of Bengal for an annual pecuniary grant in furtherance of the objects of the Society."

The Council propose, with reference to the suggestion of the Garden Committee, that the following be appended as a foot note to Section 2 of Chapter V. of the Bye-Laws, explanatory as to the extent of the privileges of members : "Members shall be entitled on and after the 15th June, 1875, to select from the Society's garden as per revised priced catalogue an assortment of rooted ornamental shrubs and rose plants to the value of Rs. 20, free of charge ; in no case, however, shall they have in any one assortment more than one plant of any one variety which exceeds (12) twelve annas in price, and their indents shall be strictly restricted to once only in each year, the prescribed allowance of plants being drawn at one time in one lot, and not in instalments during any one year."

The following candidates were elected as members of the Society :—

Messrs. J. Carey, C. E., W. S. Halsey, C. S., J. E. Grimley, A. H. Moore, Shah Nurul Hossain, Abdool Kurreem, Dr. R. C. Sanders, and Maharajah Coomar Radhapersaud Sing.

The following candidates were proposed for election :—

R. H. G. Matthews, Esq., Rampore Indigo Concern, Ghazeepore,—proposed by Mr. C. Nickels, seconded by the Secretary.

Alexis Bull, Esq., Manager, Ban Barree Tea Garden,—proposed by Mr. J. H. A. Branson, seconded by Mr. E. H. Cowie.

R. Groundwater, Esq., Tea Planter, Arcuttea, Munguldye, Assam, proposed by Mr. R. Macalpine, seconded by the Secretary.

S. S. Melville, Esq., C. S., Mympooree,—proposed by Mr. W. Waterfield, seconded by the President.

H. H. Burkinyoung, Esq., Oating Factory, Golaghat, Assam,—proposed by Mr. G. F. Pinney, seconded by the Secretary.

Baboo Nundloll Bose, Zemindar, Calcutta,—proposed by Baboo P. C. Mittra, seconded by Baboo P. C. Ghosa.

Rejoined—N. J. Campbell, Esq., of Elambazar.

The names of those who were elected in 1873, but had failed to respond, were next submitted namely,—

Col. George Fagan, Col. J. S. Rawlings, and Mr. John White.

Contributions.

1. Report on Administration of British Burma, 1873-74. From the Chief Commissioner.

2. Annual Report for the year ending 31st March, 1873. From Superintendent, Government Farms, Madras.

3. Report of Committee of Chamber of Commerce, Calcutta, from May to October 1874. From the Chamber.

4. A large quantity of seed of *Poinciana regia*. From Dr. H. Cayley.

5. A quantity (half-pound) of "Ramee" seed, (*Bœhmeria nivea ?*) From Dr. Forbes Watson.

6. A collection of seeds of Himalayan Conifers, and seed of *Corypha umbraculifera*. From Dr. Geo. King.

7. Some fine fresh tubers of *Gloxinias*. From Mr. Jaffery of Darjeeling.

8. A large quantity (30 pounds) of Cuzco maize. From Government of India, Department of Agriculture.

This fine variety of maize has been received from Peru, through the Secretary of State, and is now forwarded for careful experiments on its cultivation and a report of the results. Available to members and others on these conditions.

9. Five bound volumes of the Society's Journal, Vol. 14, old series, and Vols. 1 to 4, new series. From Col. J. Y. Gowan, Retired List.

In bringing this donation to notice, the Secretary observed how acceptable such are from members retiring from India, to aid in making up sets, of which so many are now wanting in the Society's library.

Mr. John Martin exhibited two fine specimens of *Hippeastrum*, in full flower—"crocea grandiflora" and "vittata rubra" for which ten marks were awarded.

Imported Seeds.

Read the following letter from Mr. W. H. Cogswell, V. P., regarding last season's importations of vegetable and flower seeds :—

"It has been no uncommon thing to hear you say in past seasons, that you have had many complaints from members as to the poor quality of the seeds supplied to the Society, but I hope to hear that you have had as many favour-

able reports this season as you had unfavorable ones last year. Knowing the great solicitude those annual seed orders have given, I think it due not only to the Society, but through it to the seedsmen who have executed those orders for the Society, to place on record the satisfactory result of this year's sowings. The germinating power of the seeds generally, has been marvellous, both in vegetable and flower seeds, particularly the German ones among the latter, and I think the firm who supplied them should have further orders entrusted to them. From general enquiries I have made, other members have been equally as fortunate as I have been.

"I estimate that fully 90 to 95 per cent. of seed supplied to me germinated and fully matured. I hope to hear that other members who have had to complain in the past, will not be backward in recording their experiences this season, as I am sure the returns would be highly satisfactory."

The Secretary also read reports from several non-resident members, expressive of their approbation of the seeds imported last year, especially those from Messrs. Haage and Schmidt of Erfurt. He likewise stated that he had received a few complaints, but as these were so limited, it was to be inferred that the seeds had, on the whole, given general satisfaction.

MAHOGANY SEEDS.

Read also another letter from Mr. Cogswell, dated 3rd February, to the following effect :-

"Towards October last I was priding myself on the possession of an enormous crop of mahogany seed, but as ill-luck would have it, that cyclone at the commencement of the Doorgah Poojah holidays swept over my garden and I lost about sixty capsules containing two to three hundred seeds which would have matured. At that early stage when all the green sap adds so materially to their weight, a storm makes sad havoc, and the young tender branch readily snaps with a ponderous capsule attached to it.

"I have still left on the trees a large number of seeds, which are beginning to mature, and a month hence I hope to be able to place them at the disposal of the Society. My main object in writing this is to bring the fact to notice, that as the trees in my garden have been so very prolific this year, it is reasonable to assume that other trees may be bearing seed, as freely, and that all who possess mahogany trees, and interest themselves in spreading the growth of such valuable timber, may be on the alert. A few weeks hence the capsules will gradually open, and the inner covering or skin will fall with it, leaving the seeds exposed on the cone, and unless gathered, will be blown away with the first strong wind. I shall protect mine very soon by tying up the capsules in thin cloth, and so preserve them, if they fall, to the ground. This hint may be useful to others."

The Secretary intimated that the demand for mahogany seed last year had been great, but he had been unable to meet it. Circulars were distributed about

two years ago to the members generally, applying for these seeds, but had been responded to by Mr. Cogswell alone. The Society would gladly receive donations from other parts of the country, to meet recorded applications.

As another number of the Journal will be shortly issued, the Council recommend that the copyright be reserved. Agreed to.

Thursday the 18th March, 1875.

W. H. COGSWELL, Esq., *V. P., in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following candidates were elected as members of the Society :

Messrs. R. H. G. Matthews, Alexis Bull, R. Groundwater, S. S. Melville, H. H. Barkinyoung and Baboo Nundloll Bose.

The following candidates were proposed for election :

Dr. Rivers, Calcutta,—proposed by Mr. H. A. Firth, seconded by Dr. Geo. King.

T. W. Scott, Esq., Assistant Engineer, Baree Doab Canal, Umritsur,—proposed by Mr. F. Halsey, seconded by Mr. S. H. Robinson.

H. W. Barber, Esq., Deputy Magistrate, Contai,—proposed by Mr. Frank Taylor, seconded by the Secretary.

R. W. S. Mitchell, Esq., Emigration Agent, Trinidad, proposed by Mr. H. A. Firth, seconded by Dr. King.

E. Chrestien, Esq., Bugha, *viâ* Bettia, proposed by Mr. H. Dear, seconded by the Secretary.

G. Wallace, Esq., Dooria Factory, Golaghat, proposed by Mr. G. F. Pinney, seconded by Mr. R. Blechynden.

Dr. Z. A. Ahmed, Civil Surgeon, S. P. Doomka, proposed by Dr. R. A. Barber, seconded by the Secretary.

J. W. Feltwell, Esq., Manager, Kookeecherra, Cachar,—proposed by Dr. Barker, seconded by the Secretary.

W. Peppe, Esq., Birdpore, Goruckpore,—proposed by Mr. W. F. Gibbon, Senior, seconded by Mr. Robinson.

P. Duff, Esq., Sirreoah, Naroduggur, North Baugulpore,—proposed by Mrs. Bowers, seconded by the Secretary.

J. F. R. Meiselbach, Esq., Dhurrohra, Heront, North Baugulpore,—proposed by Mrs. Bowers, seconded by the Secretary.

Major P. D. Henderson, Cashmere,—proposed by the Secretary, seconded by Dr. King.

Dr. A. Wood, Bijnour,—proposed by Dr. G. King, seconded by the Secretary.

E. B. Thornhill, Esq., C. S., Azimghur, proposed by Mr. C. Nickels, seconded by the Secretary.

Ernest Newton, Esq., Pleader, High Court, N. W. Provinces, Dehra,—proposed by the Secretary, seconded by Mr. R. Blechynden.

Dr H. S. Smith, Civil Surgeon, Allahabad,- proposed by Mr. W. Waterfield, seconded by Dr. King.

Manager, Government Garden, Gonda, Oude,—proposed by Captain W. E. Forbes, seconded by the Secretary.

Rejoined. -G. G. Fraser, Esq., Sumbulpore, and Col. J. A. Steel, Pertabghur, Oude.

CONTRIBUTIONS.

1. Administration Report, for 1873-74; Cultivation and Curing of Tobacco in Bengal. From the Government of Bengal.

2. Note on Caoutchouc from *Charanessea esculenta*. From Chief Commissioner of British Burma.

3. Minutes of the Calcutta Economic Museum. From the Secretary of the Museum.

4. Journal of the Branch Royal Asiatic Society, Bombay, No. 29, Vol. 10. From the Society.

5. Report of the Sanitary Commissioner for 1873. From the Government of Bengal.

6. Detailed list of articles contributed by Bengal to the Vienna Exhibition of 1873. From H. H. Locke, Esq.

7. Thirty Carob (*Ceratonia siliqua*) seedlings. From George Ricketts, Esq.

8. Eighteen *Araucarias* of sorts. From H. A. Firth, Esq.

9. A collection of Orchids and Ferns. From C. K. Hudson, Esq.

10. Two plants and seeds of *Amherstia nobilis*. From C. Ady, Esq.

11. A small collection of Orchids. From H. Luttman Johnson, Esq.

12. Tubers of Gesneras, Achimines, and Begonias. From Dr. T. Beaumont.

13. A large packet of Guinea grass seed. From R. Nicolson, Esq.

14. A small quantity of the best Coffee seed from the Shevarroy hills. From Captain H. H. Murray, R. A.

15. Specimens of Potatos raised in the vicinity of Elambazar, from English stock. From C. E. Blechynden, Esq.

Mr. J. Lynam exhibited some well grown plants of *Dendrobium aggregatum*, *D. macrophyllum giganteum* and D. species; also flowers of *Hippeastrum pardinum*, a South American plant.

Mr. George Bartlett exhibited a plant, in fine flower, of *Clematis Jackmani*.

Mr. John Martin shewed a white-blossomed Hyacinth, the last of several fine flowers he had raised during the cold season from bulbs imported from England. Mr. Martin had previously sent to the Society's Rooms, flowering plants of Crocus and Tulip.

PROVISION FOR IMPORTED SEEDS FOR 1875.

A memorandum from the Secretary was submitted on the above subject,—which, with certain modifications from the Council, was agreed to. It has been determined to order the usual supply of vegetable seeds from Messrs. Landreth

and Son of Philadelphia; vegetable and flower seeds from Messrs. Vilmorin, Andrieux, and Co., of Paris, and from Messrs Haage and Schmidt, of Erfurt. The shares for non-resident members to arrive in July, and those for resident members in September or October.

In connection with the above, the Secretary read extracts of a letter from Mr. F. Halsey of Madhopore, in the Punjab, who has so kindly undertaken to acclimatise seeds for the Society. Mr. Halsey reports favorably, altogether, on the various assortments forwarded to him last year. Of the flower seeds from Messrs. Vilmorin, Andrieux, and Co. all, with one exception, germinated well. Of those from Messrs. Haage and Schmidt, six kinds failed. Of the vegetable seeds from the first-named firm, all germinated well with three exceptions, and of these only one sort (onion) failed entirely. Of Landreth's vegetable seeds, six kinds failed, the remainder germinated well; "but in my opinion," observes Mr. Halsey, "they do not nearly come up to seeds imported from Europe, although they make fine plants;" and, he adds: "Of the seeds imported last year by the Society (I refer to vegetable seeds) without any hesitation, I award the palm to Vilmorin, Andrieux, and Co's, both for the germinating power of the seed and the results obtained both in appearance and flavour."

TEA SEED OIL.

Read a letter from Mr. Geo. Menzies Smith, of Joyhing Tea Estates, North Luckimpore, Upper Assam, submitting a bottle of tea seed oil. Mr. Smith writes:—

"Will you kindly have the oil examined, and its qualities tested, as I am anxious to know its value and the different purposes it can be put to. I have found out that the oil mixed with powdered sulphur and made into a liquid paste is a speedy and certain cure for itch, a very prevailing disease amongst the natives of Assam and the bordering hill tribes. I have also burned the oil which gives a good clear light."

Read the following report, kindly communicated by Mr. David Waldie, on this oil:

"I have examined roughly the sample of tea seed oil. The muddy appearance it had was simply due to dirt; you will find it now quite clear, merely from settling, but it has still a strong yellow colour. It cannot be called a fine oil, as neither colour nor flavour is good, though the latter is by no means disagreeable. It seems to have considerable viscidity in body, and might do for lubricating, unless it be a drying oil, which I have not had time to ascertain. With a small wick, it burns well enough, with a larger wick, it smokes."

WAX-INSECT FROM CHOTA NAGPORE.

Read the following letter from Mr. T. F. Peppe, of Ranchee, and submitted the specimen alluded to:

"I send you herewith some specimens of the wax-insect. I have found it on many of the most common trees Mangoe, Peepul, besides the Arjoon, so that its

value is increased as it can be propagated on so many different kinds of trees. I hope this year to be able to propagate it artificially, in the same way as the Lac-insect is propagated, and if I succeed, I will send you a note on it."

Read also the following note kindly communicated by Mr. J. Wood-Mason :

"The waxy excrescences on the peepul twigs submitted to me have been secreted by females of a species of *Coccidae* in all probability the *Coccus ceriferus* of Fabricius, which has been so long well-known to entomologists, and to which Gray's generic name *ceropiastes* is all but certainly applicable.

"The secreted substance is no doubt identical with the wax secretion of bees, and is collected by the Chinese and probably also by the natives of this country for manufacture into white wax, as is also that of several species belonging to other groups of *Homoptera*, in which order of insects the secretion of such a white powdery, cottony, or waxy substance is very general, constituting one of its most remarkable peculiarities. Sometimes, as in this case, the integument generally secretes it at others special apertures or pores emit it. The wax of this coccus contains a very large amount of water, which can be easily driven off by heat, the residue being melted wax.

N. B. "I think you will find an account of the insect in *Philosophical Transactions*, for about year 1793 or 4."

The Secretary observed that the paper referred to by Mr. Wood-Mason, in the Philosophical Transactions, relates to an insect collected at Madras, resembling the Pela of the Chinese, and evidently distinct from the Ranchee insect. Mr. Peppe first brought this wax-like substance to the notice of the Society in December, 1869. Mr. Beadon also sent specimens of it in February, 1874. The insect had been submitted to Mr. Moore, of the India Office, and the wax to Dr. Forbes Watson. No report had yet been received from them.

POTATO CULTURE IN THE BURDWAN DISTRICT.

Read the following extract of a letter from Mr. C. E. Blechynden, dated Bijura Factory, 3rd March, regarding the potatos previously referred to, raised from a small assortment presented by Messrs. Sutton and Sons of Reading :

"I enclose a railway receipt for a small parcel containing musters of the potatos grown from those you sent me, as received from Sutton, of Reading. The memorandum herewith will give all the information. If there is anything else you would wish to know, send me a line. The potatos would have been larger, if they had been planted in October. The soil on which I grew this crop was sandy-loam, with plenty of vegetable manure.

"MEMORANDUM.

Planted, 6th November, 1874.	*Dug, 2nd March*, 1875.
1 Sutton's new 100 fold Fluke Potato, 13 bulbs	13 bulbs received, weighed 1 seer, 14 chks.
	Produce 75 bulbs, weighing 10 seers, 14 chks.

2	Red Skin Flour Ball	...	... 22 bulbs received, weighed 1 seer, 8 chks. Produce 85 bulbs, weighing 9 seers, 8 chks.
3	Early Ash leaf Kidney	...	... 34 bulbs received, weighed 1 seer, 13 chks. Produce 235 bulbs, wg. 11 seers, 12 chks.

Ground occupied, 10 feet × 17 feet in all, ridges and hollows included. Ridges 3 feet apart; running length of field north and south. Of No. 1, One row and a quarter.

Of No. 2, 2 rows. Of No. 3, 2 rows and a quarter.

Sutton's Fluke Potatos, weighed 10 tolahs each...						Produce weighs 23 tolahs each.			
Red Skin	...	...	do.	8	do.	...	Do.	do.	18 do.
Early Ash	...	...	do.	6½	do.	..	Do.	do.	12 do.

"The above is not an average of produce weights, because the seed potato was nearly all of a size. Three sorts are sent. Of *small* potatos, "Early Ash" has given the most, the others hardly any. This shows that the "Early Ash" should have been sown much earlier. I planted the bulbs on the 6th November, Kidney came up sharp, next Red Skin, then Sutton's Fluke. One plant of Sutton's Fluke and two of Red Skin did not show above ground till the 6th January. Produce five and six bulbs each."

These potatos were much admired for their size and general appearance, shewing the locality to be admirably adapted for the culture of this useful esculent. The best thanks of the Society were accorded for the above careful experiment and report.

Notes and Queries.

Mr. G. F. Pinney of Rungajan Factory, Upper Assam, wishes to know if the Society possess any particulars of the Tea plant having been grown by cuttings instead of from seed. He heard recently that it had been done successfully, he believes, in Cachar, and asks for information regarding it.

The Secretary remarked that the Society did not possess any information on the subject; but, if the propagation of the plant had been so attempted, perhaps some of the residents in Cachar, or other tea growing districts, might be able to communicate the result.

Mr. Chester Macnaghten, of the Rajkumar College, Rajkote, Kattywar, is anxious to know if there is any record of the Crocus flowering in the plains of India. "I received some bulbs," writes Mr. Macnaghten "from Messrs. Dick, Radclyffe, and Co., last autumn, which I planted in pots in November, in the shade of a northern verandah. Nearly all the bulbs sprouted, and, though some

very soon died off, others have flourished with less or more vigour, and one plant has to-day (8th March) come into flower, vigorous and large. There is a promise of more flower from the same plant. I have also some tulips, which planted at the same time as the crocus and kept in shade, give promise of soon flowering. This place lies about the same latitude as Calcutta, is situated in a barren plain, and is not cooler (but drier) than most parts of the Indian plains."

The Secretary observed that the comparative success which had attended the attempt at culture of certain bulbous plants in the vicinity of Calcutta, such as hyacinth, crocus, and tulips, as exemplified in the flowers recently exhibited by a member (Mr. John Martin) would shew that such can be grown with ordinary care even in this climate. The trials made some five years ago by another member (Mr. Archibald Rogers) and of which a brief account was published at the time in the Journal, Vol. II., new series, of these and other bulbs, such as jonquils and narcissus, are also satisfactory, as affording hints for their successful culture.

Letters were submitted :—

From the Deputy Commissioner of Julpigoree, applying for Virginia tobacco seed for trial in his district. Capt. Money adds, that the tobacco grown at Julpigoree is so good that he feels sure the cultivation of American seed should be successful : Complied with.

From the Secretary, Board of Revenue, N. W. Provinces, applying for Carolina paddy for experimental purposes.

The Secretary intimated that enquiries were being made for this seed.

From Assistant Secretary, Government of Bengal, forwarding a note by Mr. Macaulay on Telka and Chali rice, with enquiry for information thereon. In course of enquiry.

Thursday, the 15th April, 1875.

W. H. COGSWELL, ESQ., *V. P., in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following candidates were elected as Members of the Society.

Dr. R. Rivers, Messrs. T. W. Scott, H. W. Barber, R. W. S. Mitchell, E. Chrestien, G. Wallace, J. W. Feltwell, W. Peppe, P. Duff, J. F. R. Meiselbach, R. B. Thornhill, E. Newton, Dr. Z. A. Ahmed, Major P. D. Henderson, Dr. A. Wood, Dr. H. S. Smith, and the Manager, Government Garden, Gonda, Oude

The following candidates were proposed for election :

W. Butler, Esq., Naga Dhoolee Factory Jorehaut,—proposed by Mr. G. F. Pinney, seconded by Mr. E. Broughton.

Charles Crowdy, Esq, Hadrakt Factory, Beegooserai, Monghyr,—proposed by Mr. G. M. Currie, seconded by the Secretary.

Edward Studd, Esq., Dhoolea Factory, Tirhoot,—proposed by Mr. T. M. Francis, seconded by Mr. E. Broughton.

Trevor Lloyd, Esq., Nurarh Factory, Madhobain, Tirhoot,—proposed by Mr. Francis, seconded by Mr. W. H. Cogswell.

Baboo Bhugaram Chunder Bose, Deputy Magistrate, Cutwa,—proposed by the Secretary, seconded by Mr. Broughton.

A. O. Hume, Esq., C. S., and C. B.,—proposed by Dr. George King, seconded by Mr. S. H. Robinson.

H. A. Mangles, Esq., C. S.—proposed by Dr. King, seconded by Mr. Broughton.

C. G. Norman, Esq., Broker,—proposed by Mr. M. Henderson, seconded by Mr. W. H. Cheetham.

W. B. Jameson, Esq., Merchant, —proposed by Mr. Henderson, seconded by Mr. Cheetham.

A. Smallwood, Esq., Broker,—proposed by Mr. Henderson, seconded by Mr. Cheetham.

Laurence Crowdy, Esq., Manjhot Factory, Beegooserai,—proposed by Mr. G. M. Currie, seconded by the Secretary.

F. McL. Carter, Esq., Manager, Chandpore Tea Estate, Chittagong,—proposed by Mr. W. A. Campbell, seconded by Mr. E. Broughton.

W. Cutts, Esq., Putteea Tea Estate, Chittagong,—proposed by Mr. Campbell, seconded by Mr. Broughton.

C. G. Stone, Esq., Boka-Hola Factory, Jorehaut,—proposed by Mr. G F. Pinney, seconded by the Secretary.

W. E. Smith, Esq., Manager, Sonari Factory, Seebsagur,—proposed by Dr. C. J. Simons, seconded by the Secretary.

Dr. Edwin Sanders, 2nd Sikh Infantry, Dera Ismail Khan,—proposed by Dr. S. C. Mackenzie, seconded by Dr. King.

CONTRIBUTIONS.

1. Report on the gums, resins, and resinous products in the India Museum as produced in India. From Dr. Forbes Watson.

2. Papers relating to the famine in Bengal and Behar, 1873-74, Vol. 2, and Minute of the Lieutenant-Governor of Bengal on the same subject. From the Government of Bengal

3. Journal of the Asiatic Society of Bengal, Part I No. 4, 1874, and proceedings for January, 1875. From the Society.

4. A large quantity of Mahogany seeds. From W. H. Cogswell, Esq.

5. A small collection of Potatos of sorts. From Messrs. Hooper & Co. (Full particulars regarding the Mahogany seeds and Potato tubers will be found further on.)

6. A further small collection of Orchids from the Khasiya Hills. From H. Luttman Johnson, Esq.

7. An assortment of seed of trees and shrubs from Brisbane. From the Acclimatisation Society of Queensland.

8. A quantity of Himalayan Conifer seeds. From the Superintendent of the Royal Botanic Garden, Calcutta.

9. Some more tubers of Caladiums, Alocasias, &c. From Dr. T. Beaumont.

10. A plant, from Simla, a species of *Anaectochilus*. *A. petola?* From J. E. O'Connor, Esq.

11. A small quantity of fresh Coffee seed from Ranchi. From the Rev. F. Herzog.

Cuzco Maize.

The Secretary intimated that since the receipt from the Government of India of the large supply of Cuzco Maize alluded to in the proceedings for February, he had distributed a portion thereof to about 25 applicants, in various parts of the country on the understanding that they should communicate the result in due course. He alluded now again to the subject, as there was still about half the quantity in hand and the season for sowing was approaching.

Ramie Seed.

The Secretary further mentioned that the Ramie (Rhea?) seed received from Dr. Forbes Watson in January last had been partially distributed, and he had received notice of its having germinated freely in the Andamans. There was still a portion of the seed remaining for distribution to any one interested in the culture of this fine fibre-yielding plant.

Liberian Coffee.

The Secretary stated, that having had many applications for plants and seeds of this new, and apparently, fine description of coffee from members and others, he had addressed several correspondents on the subject. Mr. John Smith, the Curator of the Royal Gardens, Kew, expressed his regret at not being able to assist, as they had none, neither did he know where to get them. Mr. William Bull, of Chelsea, to whom the Society was indebted for both seeds and plants at the close of 1873, writes as follows: "As regards the Liberian coffee, I have not a seed left, or would send you some. I am happy to say this most valuable coffee is now beginning to make its way, and I have a great demand for plants and seeds of it, so much so, that I am sending specially to Liberia for it, so hereafter hope to have a large supply, when I shall be pleased to accommodate you."

In reply to the enquiry of a member in regard to the plants in the Society's garden, the Secretary observed, he had not received any regular formal report on these,—nor indeed on the several plants and seeds contributed to the garden during the past year and previously, though he had instructed the Head Gardener, more than once, to send up such reports, monthly, as was the practice in former

years; whereupon, it was resolved, that the Head Gardener be directed to send to the office a report of trials on all plants and seeds which have been sent to him to the present time, the want of which has much disappointed those members and friends who have made contributions and are anxiously waiting to know results. Further, that he send similar reports to the office, in future, on the day before each monthly meeting.

MAHOGANY.

Read the following letter from W. H. Cogswell, Esq., V. P., presenting a large quantity of mahogany seed:

"In fulfilment of my promise to you, to place at the disposal of the Society a lot of my mahogany seeds, when ripe, I have now great pleasure in sending you 33 pods, gathered this morning. They are perfectly fresh, and if sown at once, they should all germinate. Please send about one-fourth of them to Dr. King, of the Botanical garden, and the balance to the Society's garden for distribution. In making this presentation, I do so, conditionally, that you will obtain for me, the number sown, and the percentage which germinates, as it is very unsatisfactory to make a free distribution of valuable seeds, and to receive no report of results.

"I consider myself singularly fortunate this season, for I have distributed 43 capsules or pods which will contain about 40 seeds each, on an average, say in all 1,720 seeds; if I add to that number the 60 pods which I lost during the October gale, the trees have yielded this season about 1,200 seeds. Out of 16 trees in my garden, 4 or 5 only have seeded, and they were first known to have done so about five years ago.

"The ages of the trees range from 30 to 40 years, as near as I can estimate them. My sirdar mally has known them for a quarter of a century. Of the great value of cultivating such timber, it is needless for me to speak. I hope, however, that other members will be able to assist the Society."

The Secretary observed that he had directed the Head Gardener's attention to Mr. Cogswell's remarks. He had also distributed small quantities of this valuable seed, to ten members, whose names had been previously registered, from a few more pods subsequently presented by Mr. Cogswell, and had still a little remaining for any members who would undertake to communicate the result of sowings.

POTATOS.

Read a letter from Messrs. Hooper & Co., of Covent Garden Market, London, presenting six kinds (3 lbs. of each) of potatos, *viz.*, Premax, Snowflake, Peerless, Model, Paterson's white Kidney, and Mona's Pride.

"We are a good deal interested and engaged in the introduction of new and improved kinds of *potatos* into Europe and other parts, and have been for some time aware of the decay of the sorts grown in India, and the consequent desirability of getting improved and more vigorous kinds into the hands of cultivators there.

"In the year 1870, we sent out to India a few potatos of a new sort called Climax, which were grown by a gentleman who was in correspondence with us, and the result was extremely satisfactory both in the first trial and in subsequent crops. A report of the trial of this kind was read at a meeting of your Society on the 20th of April, 1871.

"Since that time we have obtained in England several new kinds which have exhibited a great vigour of constitution, and also possess most excellent table qualities, and the desire to introduce some of them into India has led us to select half a dozen sorts, including again the Climax, and to forward them to you by this week's mail.

"These samples we beg that your Society will accept, and will dispose of in the best manner to ascertain their value as potatos for your climate. No doubt you will have them carefully grown, and we shall look with much interest for news of the results."

The Secretary reported that a portion of these potatos had been transferred to the Society's garden, and the remainder to Mr. John Stalkartt, Darjeeling, Mr. C. E. Blechynden, Burdwan, and Mr. T. Hindmarsh, Kanchapara.

In connection with the above, the Secretary called attention to the goodly supply of potatos on the table raised by Mr. C. E. Blechynden, from the small stock presented by Messrs. Sutton & Sons, of Reading, and of which specimens and a report were submitted at the last meeting. These potatos are fully equal to the original stock. Portions had been sent to Lt. Pogson, Simla, Mr. John Stalkartt, Darjeeling, and Mr. T. F. Peppe, Ranchi. The following is an extract of Mr. Peppe's letter:

"I would be so much obliged if you could send me a few tubers of each kind of the English potatos referred to in Mr. C. E. Blechynden's memo. of the 3rd March, submitted to the Society at their last meeting. If a larger quantity could be secured for me, I would be glad to meet all expenses. I have been experimenting on the cultivation of potatos during the rains and at other times, and would be much obliged for tubers of English stock."

Letters were read:

From the Secretary, Burmah Company, Limited, requesting information on the subject of Hemp cultivation. Complied with.

From the Vice-President of the Acclimatisation Society of Queensland, forwarding a collection of seeds, and, in reply to a recent communication, expressing his readiness to enter into correspondence and exchange of plants, seeds, and publications.

From C. Nickels, Esq., Jaunpore, on raising certain plants from cuttings:

At page 180, Vol. IV. Journal, Agricultural and Horticultural Society, Dr. Henderson says: "I have failed in all attempts to raise mahogany from cuttings, &c. Well, I am happy to say, I have succeeded in striking a cutting. If you

remember you sent me three mahogany seeds in 1873, one germinated, and it is now three feet high. Last rains it put out a side branch six inches long, and as it threatened to spoil the tree, I cut it off, and planted it in a mixture of pure sand (boiled and washed) and pounded charcoal, in a very small pot, at its side. This small pot was buried in a larger pot of sand and covered over with a bell glass, the bell glass in this instance was a wall-shade; in from 5 to 6 months it was rooted, when it was gradually hardened to the air: it is now in the ground doing well. I have also succeeded in a similar manner with Araucaria Cobkii and the Camellia."

In a subsequent letter Mr. Nickels writes:—"I forgot to tell you in my last that I did not shorten the leaves of the mahogany cutting. I fancy if the leaves had been removed, it would not have succeeded. I have also succeeded in raising a cutting of the Dammara you sent me some time ago; out of the six cuttings, two rooted, when I put them into the ground, one died, and the other is doing well."

Mr. Lynam forwarded for inspection two fine plants of *Caladium*, "Duchantry" and "Albert Edward;" also a well grown plant of *Schizolobium excelsum*, introduced from Brazil. Ten marks were awarded for the two former, and ten marks for the latter.

Thursday, the 20th May, 1875.

DR. GEO. KING, *President, in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members:

Messrs. W. Butler, Charles Crowdy, Edward Studd, Trevor Lloyd, A. O. Hume, H. A. Mangles, G. C. Norman, W. B. Jameson, A. Smallwood, Lawrence Crowdy, F. McL. Carter, W. Cutts, C. G. Stone, W. E. Smith, Dr. Edwin Sanders, and Baboo Bhugaram Chunder Bose.

The following candidates were proposed for election:

J. Phillips, Esq., Manager, Government Farm, Allahabad,—proposed by Mr. E. C. Buck, seconded by Dr. King.

J. Simson, Esq., Manager, Government Farm, Cawnpore,—proposed by Mr. Buck, seconded by Dr. King.

Walter B. Carshore, Esq., Nundinee Factory, Shapore Oondee *vid* Barh,—proposed by Mr. M. Lloyd, seconded by Mr. H. T. Creswell.

H. T. Balfour, Esq., Bank of Bengal, Benares,—proposed by Dr. R. M. Milne, seconded by Dr. King.

C. C. Stevens, Esq., C. S., Kishnaghur,—proposed by Mr. H. C. Richardson, seconded by the Secretary.

Honorary Secretary, Public Garden, Benares,—proposed by Dr. Milne, seconded by Dr. King.

Louis Schwendler, Esq., Calcutta,—proposed by Mr. F. Eisenlohr, seconded

by Mr. W. H. Cogswell.

John E. Tayloe, Esq., Barrackpore,—proposed by Mr. J. W O'Keefe, seconded by Mr. Cogswell.

W. L. Harwood, Esq., Waga Lurra Tea Estate, Chittagong,—proposed by Mr. W. A. Campbell, seconded by Mr. R. Blechynden.

G. Thomas, Esq., Zemindar, Monghyr, proposed by Mr. H. Dear, seconded by Secretary, Government Botanic Garden, Monghyr.

St. George G. Showers, Esq., Goria Habee Factory, Jorehaut Tea Company,—proposed by Mr. G. Pinney, seconded by the Secretary.

R. B. Magor, Esq., Merchant, Calcutta,—proposed by Baboo Peary Chand Mittra, seconded by Mr. F. Jennings.

Manager Bishnath Tea Company, Assam; Manager, Borelli Tea Company, Assam; Manager, Brahmapootra Tea Company, Assam; Manager, Hoolmaree Tea Company, Assam; proposed by the Secretary, seconded by Mr. S. H. Robinson.

Manager, Luckimpore Tea Company, Assam; Manager, Mungaldye Tea Company, Assam; Manager, Scottish Assam Tea Company, Assam; Manager, Majagram Tea Company, Cachar; Manager, Majuligheer Tea Estate, Assam; Manager, Tingri Tea Estate, Assam;—proposed by the Secretary, seconded by Mr. R. Blechynden.

J. V. Woodman, Esq., Barrister-at-Law,—proposed by [illegible] H. A. Branson, seconded by Mr. W. Swinhoe.

Rejoined Captain W. L. Sconce, Political Agent, Hill Tipperah, Comillah.

CONTRIBUTIONS.

1. Report of the Commission on Indian and Australian snake-poisons. From the President of the Commission.

2. Memoirs of the Geological Survey of India. *Palæontologia Indica*, Vol. 1. 2. From the Superintendent.

3. Records of the Geological Survey of India, Vol. 8, [illegible]. From the Superintendent.

4. Journal of the Bombay Branch of the Royal Asiatic Society, No. 30, Vol. X. From the Society.

5. Transactions of the Asiatic Society of Japan, Vol. 3, Part 1. From the Society.

6. Journal of the Asiatic Society of Bengal, Part 2, No. 1, 1874, and Proceedings for February, March, and April, 1875. From the Society.

7. Report of the Royal Botanic Garden of Adelaide, South Australia, for 1874. From the Director.

8. On the establishment of an Indian Institute, in connection with the Indian Museum and Library, by Dr. Forbes Watson. From the Author.

9. Report on the Committee of the Bengal Chamber of Commerce, from November, 1874, to April, 1875. From the Committee.

10. A small quantity of Cabool melon seed. From R. Nicholson, Esq.

11. A quantity of Bamboo seed and rice. From W. C. Taylor, Esq. Mr. Taylor, writing from Khoordah, in Orissa, mentions that the bamboos from which this seed has been gathered are of a very large and fine wild sort that grows in the jungles on the Madras frontier. They form splendid clumps which would be fine ornaments in a large garden or park.

12. A quantity of Teak and Sissoo seed from the Royal Botanic Garden, Calcutta. From the Superintendent.

13. A quantity of Onions of a fine description. From C. E. Blechynden, Esq.

GARDEN.

A report was submitted by the Head Gardener regarding plants and seeds contributed to the garden. This report embraces a period of about two and-a-half years. Many of the seeds are reported to have failed to germinate, and many plants to have arrived in bad condition, and others to have died after arrival. In the class of ornamental bulbous plants the Gardener has been unsuccessful with Begonias, Achimines, and Gesneras, but successful with Caladiums and Gloxinias. Roses have been generally a failure, both as regards imported plants, and attempts to propagate by cuttings. Last year these suffered much from drought; and of a very large number of cuttings put down last cold season, a very small proportion will unfortunately be available for distribution as plants during the approaching rainy season. The Gardener reports favorably on the small stock of introduced Liberian coffee plants. He has also succeeded in raising a good stock from seed of the Mocha kind from Southern India, recently presented to the Society. The mahogany seed lately contributed by Mr. Cogswell is also germinating fairly. Of a case of 12 Camellia plants, presented by Mr. John Swinhoe, of Shanghae, 11 have died; and of a consignment of grafts (100) of the best kinds of mango, from Bombay, obtained at considerable cost, but few are now alive. The Gardener reports the receipt of several donations of plants from the Hon'ble L. Jackson, Messrs. C. K. Hudson, R. M. Daly, G. Bartlett, John Lynam, Wm Stalkartt, S. Moses, H. A. Firth, Capt. W. B. Collins, Dr. Beaumont and others.

On the recommendation of the Council, Mr. J. W. O'Keefe was nominated to fill a vacancy caused by the departure of Mr. L. Berkeley, and to be a member of the Garden Committee.

FUNGI FROM THE INTERIOR OF WHITE-ANT HILLOCKS.

Read another letter on this subject from Mr. W. J. Gibbon, Senior:

"I take advantage of the opportunity to give you some further particulars I have observed in connection with mushrooms in the interior of white-ant hillocks.

"Subsequent to my writing to you on the above subject, 15th September last, I repeatedly broke into white-ant hillocks, and noticed that the mushrooms on

coming to a certain stage were devoured by the termites, and on doing so, they immediately began on the construction of new material (I refer to the bluish gritty substance of my previous letter, from which the mushrooms sprout).

"This stuff when new is of a milk white colour and acquires the bluish colour by age. It seems to me to be the comb in which the young termites are reared, and on that duty being performed, produces, at its proper season, mushrooms for food.

"This would corroborate the remark by Dr. D. D. Cunningham, regarding the similarity of termites to the leaf-cutting ants of Nicaragua, and is worthy of investigation by naturalists.

"I lately came across an article by the Revd. Mr. Berkeley, in Vol. XII of the *Intellectual Observer*, in which it is evident he is not ignorant of the fact of fungi being produced on white-ant hillocks in India. As he is the greatest authority of the day on mushrooms, I think it would be satisfactory to refer the matter to him. Unfortunately I do not know how to preserve mushrooms for any length of time so as to be identified. Drying them, I don't think could be well managed in the hot damp season in which they are produced.

"Any suggestions towards preserving specimens, I will thankfully receive and try my best to carry out."

Read likewise the following extract of a note from Dr. D. D. Cunningham; a copy of which has been sent to Mr. Gibbon:

"If your correspondent will procure a copy of "Fungi, their Nature, Influence, and Uses," by Cooke and Berkeley, International Scientific Series, H. S. King and Co., he will find in it directions regarding the collection and preservation of Fungi, as well as information as to the Podaxinei and other Fungi occurring in ant-hills.

"The cost of the book is trifling, and it can be obtained from Messrs. Thacker, Spink and Cc., of this city.

"If a specimen of "the bluish gritty substance" referred to in the letter be sent to you, I shall be happy to submit it to microscopic examination."

ATTEMPTS AT RAISING EUCALYPTUS GLOBULUS IN ASSAM AND CACHAR.

Read the following extracts of letters:

From Dr. O'Brien, of Debroogurr, to Messrs. Balmer, Lawrie & Co, of Calcutta.—"I have seen a good deal in the papers lately regarding the *Eucalyptus globulus* of Australia. I think I ought to mention, that you (as a member of the Agricultural and Horticultural Society) may communicate to the Secretary the success I have until now had in its cultivation. In June last you sent up some seed to me, which I did not think advisable to sow then, but waited until the end of September, when I thought the rains would begin to break up, and we would have some dry weather, and sowed some of the seed in the open, a lot of which germinated, but after a few days all the

young seedlings fogged off, as gardeners would call it, *i. e.*, they all died. At the end of October, I made another sowing; and although we had plenty of rain after it, the seeds germinated freely, and these seedlings have come on first-rate. I pricked a lot of them out into other beds a few inches apart, and when they had grown a few inches, transplanted them where I intended them to remain. Most of those planted out while small, have done very well, and I have some plants now nearly 4 feet high. The late heavy, and for a fortnight, almost incessant rain, has done them no harm, and I have no doubt they will grow well and thrive here. If they do not do well on the low flat lands in the neighbourhood of Debrogurh, they will certainly thrive on the higher lands in this district. Later on, *i. e.*, after the close of the rains, I will let you know how they do. The seed has kept very well without the least care. I sowed a little the other day, and they germinated very freely. Of the plants I had, I distributed a few to my neighbours, most of which I believe are doing well.

"I believe I am the only planter here who has succeeded in rearing any plants, although I have not bestowed any particular care on them. Others I know have had seed, but have got no plants, so I suppose they would report that the plant will not succeed here, as seems to be the general opinion. The Agricultural and Horticultural Society would no doubt be glad to learn that this useful plant is likely to succeed in Upper Assam.

From Mr. W. W. Robertson, of Arcuttipore, Cachar, to Messrs. J. Mackillican & Co., of Calcutta.—"With reference to the *Eucalyptus*, I beg to inform you that I have only retained twelve plants from a very successful sowing. I sowed them, when the seeds reached me in July last, and pricked them out ½ inch apart into empty tin lead cases. I afterwards transplanted them 2 inches apart, and finally put them into flower pots. The trees are very vigorous and grow 8 to 9 inches every week. I mulch them once every 8 or 10 days. I send a sample of Eucalyptus tea by banghy post. I think this will be the form in which it will come to be medicinally administered."

Both the above gentlemen were requested to communicate the state of their plants after the next rainy season.

EXPERIMENTAL PROPAGATION OF THE TEA PLANT BY CUTTINGS.

Read a letter from Mr. W. Foley, of Peelanuggur, Sylhet, on the above subject:

"In your monthly general meeting held on the 18th March last, I see that Mr. G. F. Pinney, of Rungajam Factory, Assam, asks you for information regarding tea cuttings. Although not a member of your Society, I send you the following notes of the experiments which were tried in this garden, and which turned out very satisfactory.

"*Land.* Choose a piece of flat land above the reach of inundations, in which make beds, 4 feet broad and as long as the ground will admit of; prepare the ground as if for a nursery, and make a ridge of earth, 6 inches high, all round, to keep in the manure.

"*Cuttings*. These are branches, selected from the prunings, from 2 to 7 and 8 inches in circumference. They are cut into bits, about 16 inches long and placed in a slanting position in lines. Each slip to be buried half its length and 6 inches apart. The lines to be 6 inches apart too. After all are put down, the beds must be thoroughly saturated with water; the next evening fresh cow-dung and water (liquid manure) of the consistency of thin jelly is poured over the land until it is one inch in depth all over. This should be repeated the third day, after which every 6 or 4 days the land is to be only watered, for if the crust which the cow-dung forms is allowed to dry, myriads of white-ants will collect under it. When the leaf buds appear, watering should be lessened and the cuttings will be ready to be planted out in the cold weather, when if taken up with the ball of earth unbroken, hardly a plant will die. I forgot to mention before, that artificial shade ought to be put over the nurseries, and when the slips have taken properly, remove gradually.

"A plant reared on the above system cannot be distinguished from a seedling, it forms just as good a bush and gives the same yield, but it does not bear so much seed. Indigenous and hybrid strike better than China, and the growth of cuttings is stronger, the latter does not throw out a tap root, and is therefore better for flat lands, where a seedling if put down sends its tap root deep, which, on coming in contact with water, dies; besides surface roots take manure more readily. Plants on the slopes of teelahs, under which there is a spring, are always observed to be sickly, this is owing to the tap-root touching water.

"Since January, 1870, I yearly make cuttings from all the best kinds of plants in my gardens.

"I would like to hear of any experiment that may be tried, and if successful."

CAOUTCHOUC & OIL-YIELDING PLANTS.

Read the following extracts of letters from Lt. J. F. Pogson:

"I observe that the *Ficus elastica* question is under discussion. I am told that the tree is growing at Sealkote in the Punjab. I know it is flourishing at Saharunpore, and there are old trees at Futtehgurh and near Dinapore. My idea is that we should make the *Burgut*, (F. Indica,) and the Peepul, (F. religiosa) milch cows to the F. elastica, by grafting it on them. They grow far and wide, and are rich in milk such as it is, and by making the F. elastica consume this milk, its own most valuable secretion would be greatly and permanently increased, whilst the cow will be none the worse for acting as feeder. Anyhow, both trees would be turned to account for many years to come, and as both are easily produced, there is nothing to prevent one having grafted India rubber plantations all over the country. The experiment is well worth trying, and I trust the attempt may be made.

"I notice that attention is being paid to the oil which may be extracted from the seeds of the sun-flower. I look upon this as time and money wasted. Oil, and

oil-seeds always command a good price, if the seed be sufficiently rich in oil which the sun-flower is not.

"I would strongly recommend European landed proprietors, to cultivate the common cress, or *Halim* of India, for the sake of its oil. One hundred pounds of the seed, on being pressed, will yield no less than 57 lbs. of oil, whilst the sun-flower gives but 15 lbs. The value of the sun-flower as a sanitary plant is now fully recognized in the Punjab, where fever districts have been conquered and made healthy. Why every compound in Calcutta is not protected by planting sun-flower, and "Toolsee," is most unaccountable. You have fevers, cholera, and stenches in great variety, yet sanitary plants are never apparently resorted to. I presume because they are indigenous. If the gum tree had answered, all Calcutta would have been operated upon, even if each tree cost a gold mohur."

In a subsequent communication, Mr. Pogson alludes to *Physalis Peruvianus*, as follows :

"Please note for publication, that the Brazilian currant, also called Gooseberry, native name *Tipparah*, is a very hardy "perennial," stands snow and the severest cold and frost, and thrives in rocky soil, sending down roots over 18 inches in length, and ½ inch in diameter, gradually tapering to a point.

"It should grow well in England and Scotland, and I dare say our hill seed would take at once to the cooler climate."

Applications were submitted from Dr. George Grant, Superintendent, Central Jails, Futtehgurh, for Cuzco Maize; from the Collector of Dharwar for Jute seed for the Government Model Farm, and from the District Engineer, Local Fund Committee, Basti, for seeds of forest and other useful trees. All complied with.

Thursday, the 24th June, 1875.

W. H. Coqswell, Esq., *V. P., in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members :

Messrs. J. Phillips, J. Simson, W. B. Carshore, H. T. Balfour, C. C. Stevens, C. S., L. Schwendler, J. E. Taylor, W. L. Harwood, G. Thomas, St. Geo. G. Showers, R. B. Mugor, and J. V. Woodman, Honorary Secretary, Public Garden, Benares; Managers of the Bishnath, Borelli, Brahmapootra, Hoolmaree, Luckimpore, Munguldyo, Scottish Assam, Majagram, Majuli Bay, and Tingri Tea Companies.

The following candidates were proposed for election.

The Deputy Commissioner of Akola, Behar,—proposed by the Deputy Commissioner, Oomraotee district, seconded by the Secretary.

G. E. Knox, Esq., C. S., Kirwee,—proposed by the Secretary, Public Garden, Banda, seconded by Mr. S. H. Robinson.

Manager, Luckwa Tea Garden, Assam,—proposed by the Hon'ble H. H. Sutherland, seconded by the Secretary.

Manager, Roopucherra Tea Garden, Cachar,—proposed by the Hon'ble H. H. Sutherland, seconded by the Secretary.

Manager, Boorsillah Tea Company, Morar, British Assam,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

Rajah Bishnath Sing, Bahadoor, Chief of Chutterpore, Bundelkund, —proposed by Dr. J. P. Stratton, seconded by the Secretary.

Captain N. Lowis, Manager, Chota Nagpore Estate, Ranchi,—proposed by Mr. F. T. Peppé, seconded by the Secretary.

J. Woodford Birch, Esq., H. B. M. Resident, Perak, Penang,—proposed by the President, seconded by the Secretary.

Manager, Jokai (Assam) Tea Company,—proposed by the Secretary, seconded by Mr. Cogswell.

Thadeus Agabeg, Esq., Indigo Planter, Baraset,—proposed by Mr. M. Rustomjee, seconded by Baboo P. C. Mittra.

The Hon'ble R. C. Oldfield, C. S., Allahabad,—proposed by Mr. Elliott Angelo, seconded by the Secretary.

Dr. Geo. Watt, Educational Service, Hooghly College,—proposed by Dr. Geo. King, seconded by the Secretary

Manager, Ballamookh Tea Garden, Cachar; Manager, Massempore Tea Garden, Cachar; Manager, Monacherra Tea Garden, Cachar; Manager, Julnacherra Tea Garden, Cachar,—proposed by the Secretary, seconded by Mr. Cogswell.

Manager, Kassomaree Tea Garden, Assam; Manager, Springside Tea Garden, Kursiong; Manager, Chunderpore Tea Garden, Assam; Manager, Silcooree Tea Garden, Cachar,—proposed by the Secretary, seconded by Baboo Peary Chand Mittra.

Manager, Koomber Tea Garden, Cachar,—proposed by Mr. R. Blechynden, seconded by the Secretary.

Rejoined—A. Hume Smith, Esq., Manager Estates, Independent Rajah of Hill Tipperah.

CONTRIBUTIONS.

1. Report on Census of British Burma taken in August, 1872. From the Chief Commissioner.

2. Transactions of the Royal Society of Arts and Sciences, Mauritius, Vols. 3 to 6, new series. From the Society.

3. Journal of the Asiatic Society of Bengal. Part 1, No. 1, 1875, and Proceedings for May, 1875. From the Society.

4. Report of the Acclimatisation Society of Queensland for 1874. From the Society.

5. Report on the Royal Botanic Gardens of Mauritius for 1874. From the Director.

6. Journal of the Bombay Branch of the Royal Asiatic Society No. 28, Vol. 10. From the Society.

7. Translation of T. Moerman's Essay on the Ramie or Rheea. From the Government of Bengal.

8. A collection of seeds of trees and shrubs. From the Queensland Acclimatisation Society.

9. A large quantity (34 quarts) of acclimatised vegetable and flower seeds, principally from the Society's imported stock of last year. From C. E. Blechynden, Esq.

10. Seeds of *Amaranthus salicifolius*, and *Wigandia Vigieri*. From C. Nickels, Esq.

Mr. Nickels mentions that the seed of the latter is from a plant raised from seed received from the Society two years ago. He considers September the best time for sowing it, or a month later in Bengal. When the plants are sufficiently high, they should be planted out permanently; they come into flower the following year. His plant is 12 feet high, with very large leaves.

11. A beautiful skein of "Rheea" cleaned and prepared in England from Rheea grown in Dehra Doon. From Ernest Newton, Esq.

12. Slab of wood obtained from a tree which attains large dimensions, and which has been found growing in the forests of Rammuggur, in the N. W. portion of the Chumparun district. The native name is "Jeegnah." From H. Dear, Esq.

Mr. Dear does not send specimens of leaf and flower, but from the seeds which were forwarded, the tree would appear to be *Dalrymplea pomifera*. It is a beautiful close-grained wood, and new to the Society's collection.

The Secretary called the attention of the Meeting to the portrait of Mr. Crawford, late President, which had been received since the last monthly meeting. This portrait has been obtained by private subscriptions from members of the Society on the occasion of Mr. Crawford's departure from India. It was agreed to place the picture in the position pointed out, opposite to Mr. Grote's portrait in the meeting room.

The Secretary called attention to several perforated silk-worm cocoons on the table. These he had received from Mr. Claude Dumaine. Captain J. Murray, of Dehra Doon, sent Mr. Dumaine some eggs of Cashmere stock, which hatched well and spun cocoons. Instead, however, of moths emerging in due time from these cocoons, a quantity of maggots issued forth, which shortly turned into flies! Mr. Wood-Mason, the Curator of the India Museum, had kindly examined the flies in question, and offers a solution of this to Mr. Dumaine's unexpected result, in the following remarks:

"The caterpillars that formed the cocoons, submitted to me a few days ago, had, no doubt, been attacked by a species of fly. The flies must have deposited

their eggs upon the bodies of the silk-worms, and the young grubs, as soon as they emerged from the egg, bored their way, by means of their jaws, into the interior of the body of the latter; there they must have fed upon the fatty matters (which are secreted in such vast quantities during their feeding days by all insects that have to pass through a more or less prolonged quiescent stage) of their hosts, until they were ready to pass into the pupal stage, when the caterpillars having in the meantime "spun up," they had to bore their way out of the cocoons, &c.

"A year or more ago that intelligent observer, Mr. S. E. Peel, informed me that some silk-worms which he had been rearing had been attacked by ichneumons, and sent me specimens both of the injured and the injurers, which latter turned out, on examination, to be flies (Diptera) and not ichneumons (= Hymenoptera)!

"There is, I should say, no order of insects in which parasitism is so prevalent as in the Diptera. This particular fly, for instance, being a member of an extensive section of the great family *Muscidæ*, the *Tachinidæ*, which are all parasitic on other insects!"

The Secretary next read a letter from Messrs. Lyall, Rennie and Co., forwarding certain dead silk-worms, in an early stage, from the Beerbhoom district. They state that these worms "were reared with the greatest care, from the very best seed, on good mulberry, and in favorable weather," and would wish, if possible, to trace the cause of their death, as they are unable to account for it.

In connection with the above, the Secretary submitted extracts of letters with which he had been favored by Mr. C. E Blechynden and Mr. D. Waldie.

Mr. Blechynden, dated Bigurah, near Elambazar, 20th May, 1875:—"The box containing the dead silk-worms reached me yesterday, a day after your letter, and I lost no time in trying to ascertain the nature of the disease from which the worms died. Of its existence I was before aware, having seen it frequently. In the rearing operations that I carried on for two years, I never had the disease in my rearing room, though I have had in each "Recotta" 60 frames of insects, whereas in the same space of time the native rearers have had their batches of insects frequently destroyed. In the book I presented to the Society called "a Treatise on the Silk worm," at page 135, I think, for I have not seen the book some eight years, you will find all the diseases to which silk-worms are liable (this amongst the rest) well and fully described; the authority and experience of Count Dandolo being quoted in all instances. I found the Count's descriptions perfectly accurate, proving him to have been a close and careful observer. But to give you my own observations made on the insects you sent me. I first took some of the white encrustation, and tested for chalk or lime. No action took place with the tests. It then occurred to me, that some years ago I had observed a like white encrustation on young Indigo, whenever the weather had been for any time very dry. This white deposit I had examined and tested,

and found to be saltpetre. I therefore concluded that as the deposit on the plants had taken place from their having absorbed the saltpetre from the soil, and it had effloresced on the stalk through the bark, perhaps the same thing had happened to the insects, and they had been killed by an encasing of saltpetre, from eating leaves impregnated with this salt or some other. I put the matter to the test by steeping some of the insects in water, and gently washing off the white matter. I then strained the water and poured it on a slip of glass, which, on exposure to the sun, gave a deposit of feathery needle-like crystals. On examining with the microscope, these showed all the appearance of saltpetre. The mulberry plants on which the worms were fed must have been grown on soil naturally containing nitre *or recently highly manured with animal manure.* The plants have taken up the salt, and the leaves of these being fully charged with the saline matter, the worms have had the salt, which has come through with the moisture given off by the pores, effloresced on the surface of their bodies. If a portion of the white matter is put on a watch glass, a few drops of water added, and then gently moved about under the microscope, small globules will be seen; these are the drops of moisture as they have exuded through the pores, and hardened on exposure to the air, layer upon layer, *from underneath,* till both air holes (which are along the side of the body—six on each side) and the pores having become closed death has ensued. This disease I believe does not occur when the worms have grown larger, and can consume matured leaves, by which time the mulberry has as it were digested the salt, and it is not so strong in the plant. It is only when the leaves and the worms are both young, that the former has the salt strong, and the latter suffer. I send the worms that have undergone washing: it will be seen that nearly the whole of the white crust has come off. A slip of protected glass is also sent. Let some one competent to the task (Dr. Waldie, for instance,) say what there is on the glass, saltpetre, or any, or no salt. The insects before washing, if magnified, show the same efflorescence that an old wall does when saltpetre breaks out. In this case there is gum mixed with the salt which renders it not so delicately soft as when seen on walls. The first thing to ascertain is if the mulberry leaves were taken from a newly-planted bed, and if the said bed was highly manured; and secondly, if the feathery spikes on the glass is nitre or not."

Mr. Waldie, dated 24th June :—"I have examined both the saline looking matter on the two small glass plates you gave me, as well as the matter washed off from the bodies of the silk-worm by myself. The liquid, when dried, yields a considerable quantity of small prismatic-looking crystals, something like saltpetre, though I could not succeed in getting any indications of nitre. Much of the greater part of the matter in solution was organic matter, in small parts soluble in spirit, but mostly soluble in water. This was a material impediment to the examination of the saline matter; and such a very small quantity of material to work

upon. The result of this, however, is that it consists in part of alkaline sulphates, little or almost no chlorides (no common salt therefore) and no nitrate. The principal part of the alkalies were found as carbonates when the matter was burnt, and have existed in the original state in combination with some organic acid, as they do in vegetable or animal matter before these are burnt. The ash consisted almost entirely of alkaline salts, without any salts of lime or magnesia or other earthy matter, and the proportion was considerable though not so great as that of the soluble organic matter."

Floricultural Notes.

Magnolia grandiflora.—Mr. Nickels, of Pussewa Factory, Jaunpore, draws attention to the success which has attended his attempts at the propagation of Magnolia grandiflora, *(See body of this part.)*

Clianthus Dampierii.—Mr. Gowan, writing from Serajgunge, mentions his success with this handsome plant, *(See body of this part.)*

In a subsequent letter of 12th June, Mr. Gowan adds:

"The plant of *Clianthus Dampierii*, I wrote you of, is still very healthy, and has at present eight fine bunches of flowers on it. We have had very heavy rain during the week, some of the flowers got rather spoilt by it, but I am now having the plant protected by mats from the rain. It stands about 2½ feet in height, and so far does not seem to have suffered from the rain."

Mr. Gowan has promised to send seeds if successful in gathering them.

Abnormality in a Mango Tree.

Baboo Bhoobun Mohun Sircar presented a specimen of an abnormal growth of a stem of the mango tree found in a village called Gooptipara, as a natural curiosity, on which Dr. King remarks to the following effect:—

"This is a very interesting abnormality. The upper part of the branch of a mango tree, including the naturally panicled inflorescence, has been transformed into a flattened leaf-like body, on the lower part of which leaves and on the upper part of which imperfect flowers are borne. The specimen is well worthy of preservation."

Wheat and Poppy Cultivation.—Manures.

Letters were submitted on the above several subjects from Lieut. J. F. Pogson, of which the following are extracts.—

June 12th.—"I have, as you are aware, for years advocated the cultivation of superior wheat, as an article of export to London. The dictates of common sense have led to the abolition of the export duty at one time levied on Indian wheat, and the immediate result has been the creation of an export wheat trade of value.

"I do not know the rates at which Indian wheat has been sold to profit in England, but I do know that if superior seed wheat was introduced, and the

culture taken in hand by the members of the Agricultural and Horticultural Society, that the acclimatised seed wheat would be much appreciated by the zemindars, who would in a few years give up the cultivation of inferior wheat, and exclusively produce the superior article.

"I do not know if the rules of the Society will admit of cereals being supplied to members in addition to other seeds. But I submit it would be a good plan to give a parcel of wheat, and seed rye, *(Secale cereale)* in lieu of two parcels of peas, and in this manner in a few years the new cereal (rye), and the superior wheat would be fairly introduced and established.

"I am now practically solving the Indian manure question. I have entirely excluded cow-dung manure from my "cuzco maize," the potatos sent by you, and from my Windsor beans and Indian saims. For the potatos I have used mineral manure mixed up with last year's fallen pine leaves *(Cedrus deodora)*. The manure being composed of the chemical components of potato ash as given in Liebeg's work. I have burned old beef bones, and used the white bone-earth, or ash, which supplied phosphoric acid and lime. Saltpetre gave the potash, Bazar "Sujjee," the soda, and bazar kusseses, or sulphate of iron, the sulphuric acid, and iron. The plants are thriving and the potatos especially so. As I have potatos elsewhere under farm-yard manure, comparison shows that pure mineral manure has it all its own way, as far as the growth and deep colour of the leaves go. But until the crop is out of the ground, positive results cannot be determined.

"Of the 100 cuzco maize seeds sent, 12 have been put under a charcoal dust manure, with 50 grs. of nitre and 25 grs. sulphate of iron to each seed. The remainder have been placed, (24) under compound bone-ash manure, and the rest under compound sulphate of lime manure, made by acting on bazar chunam with the fumes of burning sulphur with q. s. of nitre and sulphate of iron added to the sul. lime. So you see the experiment in hand is on a good scale and interesting. I find that in Bengal and Behar, salt and saltpetre are frequently met with, associated together in the saline soils of the country. The value of nitre as a manure is very great, and if it could be obtained from the soil, without violating the excise laws, or going to the expense of starting a factory, it would be a desideratum.

"In Egypt they have a plant, named "*Reaumuria vermiculàta*" which possesses the property of taking up saltpetre from the soil. Now if the land-owners or zemindars were supplied with the seed of this most ful plant, it might be cultivated as a crop, and when harvested, would be purchased for use as manure by all growers of first class wheat and potatos. The Indigo Planters would find it most valuable for indigo, and the Government poppy cultivators for the production of opium. Hence by making use of this salt all concerned would be benefited, and the forty lacs lost by the extinction of the saltpetre trade, might be made good by an increase in the production of opium, for the authentic

information in my possession shows that beegah for beegah, opium on poppy manured with nitre, gives a very heavy return.

June 17th.—"In my last letter I mentioned that a heavy poppy, and consequent opium crop, had been obtained by the use of saltpetre as part of a compost.

"I was unable at the time to lay my hands on the report, but having found it, I shall be glad to place the same at the disposal of the Agricultural and Horticultural Society if permitted to do so.

"The remarkable success which has attended the experimental culture of the poppy, and the increased production of the very best description of opium, is admitted to be due, to the use of poppy manure, prepared as laid down in "Pogson's Hand-book of Practical Agriculture," Part II, pages 12-13.

"The experiment was conducted without my knowledge, by a practical European land-holder, and the success attained seems to have astonished him. The opium produced was marked "Bala-dur Awul," *i. e.*, superior to the best. Quantity, 16 to 20 seers per beegah of 3,025 square yards. Under the old system, beegahs Nos. 1, 2, 3 produced respectively opium—seers 10, of best quality; opium—seers 7, second quality, (1-12 per seer); opium—seers 4, third quality, (1-8 per seer). The fourth beegah experiment produced only 2½ seers of opium, priced at Rs. 1-8, and was grown at a loss of Rs 2 to the producer. In this case it is clear that the poppy was cultivated for the sake of the Government advance. The opium produced in my place was "nearly 200 per cent. *over the average produce now obtained, and* 50 *per cent. over the best out-turn yet heard of in* Oudh!"

"If the saltpetre-assimilating plant was introduced, the opium *Assamees* would soon become rich and prosperous, and Government might have more than double the present quantity of opium from the same extent of land, the advances remaining unaltered. The sulphate of iron which is indispensable, can be obtained for the mere cost of digging, purifying, and removal from its site, in the Mirzapore district.

"I think, under proper care and culture, more than 20 seers of opium should be obtained for a beegah of 3,025 square yards

"I believe private persons may cultivate poppy under license, make and export opium after paying the excise duty of Rs. 600 per chest, and if two beegahs of land give one maund of opium, it would pay the European planter to produce it, but he would be well robbed by the natives on the estate."

Letters were read :—

From W. F. Gibbon, Esq., senior, Goruckpore, applying for some of the bamboo seed from Orissa, lately presented by Mr. W. C. Taylor. Mr. Gibbon reports that the plants raised from the bamboo seed, received from the Society about four years ago, promise well, but he is as yet unable to decide on their quality. The seed of *Eucalyptus globulus* entirely failed, but from what he has since read regarding it, he is convinced it is not suited for his district,—a rice-growing one.

From W. Young, Esq., C. S., Mynpoorie, N. W. Provinces, on the introduction of *Eucalyptus globulus:* "I never reported to the Society," writes Mr. Young, "an experiment I made at Goruckpore with *Eucalyptus globulus.* It was sown after the rains of 1870, and germinated very freely. I had hundreds of seedlings. I should add that the ground was richly manured garden. The plants grew very rapidly indeed, till the rains of 1871, when they all died off. Many of the plants were from six to seven feet high. I should like to try the tree here, which is a very dry sandy soil, and would be glad of any body's experience as to which to *avoid* in its culture."

From G. F. Pinney, Esq., Jorehaut, intimating that he has received the account of propagation of the tea plant by cuttings, submitted to the Society by Mr. Foley, of Julamuggur Factory, Sylhet, and has circulated it to nearly all the leading planters of his neighbourhood, who have promised to give it a trial, so he hopes to be able to communicate some satisfactory results next year.

From the Assistant Secretary, Government of Bengal, applying for American tobacco seeds of sorts, for experimental cultivation in Bengal. To be complied with.

Thursday, the 22nd July, 1875.

W. H. Cogswell, Esq., *V. P., in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members :—

The Deputy Commissioner of Akola, Messrs. G. E. Knox, J. W. Birch, T. Agabeg, the Hon'ble R. C. Oldfield, Dr. Geo. Watt, Rajah Bishnath Sing, Bahadoor, Captain N. Lowis; Managers, Lukim Tea Garden, Assam; Roopucherra Tea Garden, Cachar; Boorsillah Tea Garden, Morar; Jokai (Assam) Tea Company; Lallamookh Tea Garden, Cachar; Mussenpore Tea Garden, Cachar; Monacherra Tea Garden, Cachar; Julnacherra Tea Garden, Cachar; Kussomaree Tea Garden, Assam; Springside Tea Garden, Kursiong; Chunderpore Tea Garden, Assam; Silcoorre Tea Garden, Cachar, and Koomber Tea Garden, Cachar.

The following candidates were proposed for election :—

W. E. S. Jefferson, Esq., Secretary, Planters' Stores Company, Debrooghur,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Geoffry Nevill, Esq., India Museum,—proposed by Mr. W. Pigott, seconded by Mr. W. H. Cogswell.

W. H. Newton, Esq., Merchant, Calcutta,—proposed by Mr. Pigott, seconded by Mr. Cogswell.

W. Gray, Esq., Merchant, Calcutta,—proposed by Mr. Pigott, seconded by Mr. Cogswell.

R. A. Lyall, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. Pigott.

W. Lyon, Esq., Assistant Commissioner, Sumber Lake, Rajpootana,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Ronald C. Fraser, Esq., Manager, Margaret Hope's Tea Estate, Hope Town, Darjeeling,—proposed by Mr. John Stalkartt, seconded by Mr. Robinson.

John Mackinnon, Esq., Merchant, Calcutta,—proposed by Mr. John Martin, seconded by Mr. Pigott.

W. Helps, Esq., Manager of the Fallodhi Tea Company, Darjeeling,—proposed by Mr. H. J. Leitch, seconded by the Secretary.

Mr. H. Hartigan, V. C., Court-keeper, High Court,—proposed by Mr. C. T. Davis, seconded by the Secretary.

Manager of the Greenwood Tea Garden, Assam,—proposed by Mr. Martin, seconded by Mr. Pigott.

E. Claxton, Esq, Dy. Controller of Accounts, P. W. D., Allahabad,—proposed by Mr. G. Watling, seconded by Mr. A. Anthony.

CONTRIBUTIONS.

1. Blytt's Norwegian Flora, Vols. 1 and 2; Blytt's Norwegian Wild-growing Plants; History of the Cultivation of the land in Norway; and a beautifully executed map, shewing the geographical distribution of plants in Norway. From the Royal University of Christiana.

2. Memoirs of the Geological Survey of India. Palæontologia Indica, Vol. 1, 3. From the Superintendent.

3. Records of the Geological Survey of India, Vol. 8, Part 2. From the Government of Bengal.

4. Proceedings of the Asiatic Society of Bengal for June. From the Society.

5. A large plant of an Euphorbia. From W. C. Fink, Esq.

6. A small collection of Oxalis bulbs. From Dr. T. Beaumont.

GARDEN.

The Gardener's report was read. Mr. Head first refers to the various presentations to the garden since the date of his last report. Mr G. Bartlett has presented Chysanthemums of 18 varieties, a *Caladium Bellegmei*, *Alocasia macrorhiza*; also balsam and zinnia seeds from Lucknow. Dr. T. Beaumont has presented six kinds of *Oxalis* bulbs, quite an acquisition. Mr. C. J. Sutherland has given 12 plants consisting of clove, camphor, pepper, nutmeg, cardamom, chocolate, citron, orange, &c. From Dr. King has been received seeds of teak, sissoo, conifer of sorts, and *Victoria regia*, of which but few have as yet germinated. About 500 seedlings have been raised from the mahogany seed presented in April by Mr. Cogswell. Twelve Liberian coffee plants, and Mocha coffee plants from seed presented by Mr. Walter Galiffe and Captain H. Murray (Artillery) have been planted out. The bamboo seed from Orissa recently presented by Mr. W. C. Taylor has germinated freely. The cuzco maize has not done well, and shew no signs of yielding cobs. The Gardener refers to an

experiment he has been making on root-grafting roses, which is sufficiently encouraging to warrant a continuance of it, as being, in his opinion, superior to propagation by cuttings. Mr. Head adds, that propagation is being carried on by every available hand by the various processes of grafting, layering, gootering, and by cuttings. It is contemplated to make about one thousand grafts of mango from the trees that have been three years planted.

TOBACCO

Letters were read from Messrs. Gillanders, Arbuthnot, and Co., and from Captain Protheroe, Deputy Superintendent of the Andamans and Nicobars, forwarding specimens of tobacco from Burmah and Port Blair, and requesting report thereon.

The Secretary submitted the following report, obligingly furnished by Mr. Eisenlohr, a member of the Committee :-

BURMAH TOBACCO, FROM MESSRS. GILLANDERS, ARBUTHNOT AND CO.

No. 1—*Kyoutee, 3rd cut before the rains.* - Fine colour, regular, well-shaped, perfect leaf; good flavour, suitable for all purposes. Value for export, Rs. 15.

No. 2—*Kyoutee, 4th cut before the rains.* -Much coarser and defective; irregular cure; good for all purposes. Value, about Rs. 10.

No. 3 -*Kyoutee, 10th cut before the rains.*—Irregular twisted leaf, suitable for cutting only. Value, about Rs. 7.

No. 1—*Kyoutee, 2nd cut during the rains.*—Regular, well-shaped leaf; irregular colour, rather fresh, strong and oily, suitable for all purposes. Value, about Rs. 12 per maund.

No. 2- *Kyoutee, 2nd cut during the rains.*—Coarse, twisted leaf, dull colour; good for cutting only. Value, Rs. 5.

No. 1—*American, cut before the rains.*—Fine colour, pretty regular leaves; fine, rather strong flavor; suitable for all purposes. Value, Rs. 16 or 17.

No. 2—*American, cut before the rains.* -Coarse, twisted leaf, fair colour and strength, and flavour, suitable for cutting only. Value, about Rs. 6 to 6-2.

No. 1—*American, cut during the rains.*--Regular, well-shaped leaf, of good colour; strong flavour, suitable for all purposes. Value, Rs. 17.

No. 2—*American, cut during the rains.*--Twisted, irregular coarse leaf; good colour and flavour, good for cutting. Value, about Rs. 7.

ANDAMAN TOBACCO.

Coarse leaf, strong cure, very oily; but thoroughly sound, and a useful kind of Tobacco, if more carefully assorted as to size. Value, Rs. 6 to 7.

I quote per Bazar maund, and give the approximate values for export.

The bundles are all well cut; free of stems; and should be all packed in a similar way for export.

ACCLIMATED VEGETABLE AND FLOWER SEEDS,

The Secretary called attention to an assortment of seeds just received from

Mr. F. Halsey, raised at Madhoopore, in the Punjab; a portion from seeds imported last year by the Society, and a portion from country stock. This assortment comprises peas of five sorts, including "Maclean's little Gem," cauliflower, lettuce, artichoke and endive; and several kinds of flower seeds, mignonette, stock, lobelia, portulaca, and nemophila. The quantity is not sufficient for general distribution, but available to members applying for them. The best acknowledgments of the Society were tendered to Mr. Halsey for this useful contribution, and his kind offer of raising seeds next season was thankfully accepted.

In connection with the above, the Secretary referred to the several specimen boxes of imported seeds, vegetable and flower, from France, Germany, and America. These had arrived since the last monthly meeting, and a considerable portion had already been forwarded to non-resident members. They were all well packed, and, apparently, in good condition. It was directed that a box of each be at once sent to the Gardener for careful trial and report.

Read a letter from Messrs. Lyall, Rennie, and Co., returning their best thanks "for the most useful and interesting information furnished regarding the cause of death of the silk-worms submitted for examination," as embodied in the communications from Messrs. C. E. Blechynden and D. Waldie, published in last month's proceedings. "We sent the report" Messrs. Lyall, Rennie continue—"to our Manager, in Beerbhoom, to make the closest enquiries as to how the mulberry was manured on which the worms in question were fed. It was manured as supposed *with animal manure*, and this it appears is usual. We are circulating papers among the rearers, warning them against the system."

Read a letter from Mr. Augustus Moore, of Dhelia Julie Factory, Jorehaut, Assam, regarding his endeavors to raise the *Eucalyptus globulus*, of which the following is an extract:—

"In the beginning of May, I made a sowing of the Eucalyptus globulus seed which you sent me. The plants began to appear about twelve days afterwards. In all eleven came up, six of these damped off, but the remaining five were doing pretty fairly, although making very little growth. I am sorry to say, however, that my malee having taken it into his head to pot them off, has managed to kill all. I think that my sowing was made too late in the year, for the plants did not come up, as from all accounts they should do. Probably October would be the best time for sowing, the plants would then be strong before the following steamy weather. The Ramee seed failed to germinate."

Mr. G. W. Bartlett forwarded for inspection a well grown plant of Clematis in flower, to which eight marks were awarded. The plant was imported last November, but unfortunately without a ticket, so Mr. Bartlett is unable to give the specific name.

Thursday, the 26th August, 1875.

W. H. COGSWELL, ESQ., *V. P., in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members:—

Messrs. W. E. S. Jefferson, G. Nevill, W. H. Newton, W. Gray, R. A. Lyall, W. Lyon, R. C. Fraser, John Mackinnon, W. Helps, H. Hartigan, E. Claxton, and Manager of the Greenwood Tea Garden, Assam.

The following candidates were proposed for election:—

A. L. Home, Esq., Deputy Conservator of Forests, Bengal,—proposed by Dr. Schlich, seconded by Mr. J. S. Gamble.

Baboo Kishen Chand, Pleader, Baedwara, Delhi,—proposed by Mr. C. Kirkpatrick, seconded by the Secretary.

R. F. Rampini, Esq., C. S., Julpigoree,—proposed by Dr. F. C. Mackenzie, seconded by Dr. D. D. Cunningham.

E. Urquhart, Esq., Indigo Planter, Rajpore Concern, Tirhoot,—proposed by Mr. J. J. Guise, seconded by the Secretary.

James Speid, Esq., Tea Planter, Luckipore, Sylhet,—proposed by Mr. E. A. Jack, seconded by Mr. H. J. Leitch.

Manager Chincooree Tea Company, Cachar; Manager Lutesial Tea Garden, Assam; Manager Central Cachar Tea Company,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

The Hon'ble Sir Richard Garth, Chief Justice, High Court, Calcutta,—proposed by the Hon'ble L. Jackson, seconded by the President.

W. E. Creaton, Esq., Calcutta,—proposed by Mr. H. J. Leitch, seconded by the Secretary.

Rudston Brown, Esq., Bhikanpore Factory, Tirhoot, proposed by Mr. C. H. Pope, seconded by the Secretary.

Geo. Swaine, Esq., Ottur Factory, Tirhoot,—proposed by Mr. Pope, seconded by the Secretary.

C. J. Fearon, Esq., Chupoorah Factory, Manghoul, Monghyr,—proposed by Mr. C. H. Crowdy, seconded by the Secretary.

Manager Giell Tea Company, Darjeeling; Manager Central Terai Tea Company, Darjeeling; Manager Balasun Tea Company, Darjeeling; Manager Chenga Tea Association, Darjeeling; Manager Chumta Tea Association, Darjeeling; Manager Teesta Valley Tea Association, Darjeeling, Manager Singbulli and Nurmah Tea Company, Limited; Assistant Manager T.. ;Ling Tea Company, and Assistant Manager, Singbulli and Nurmah Tea Company, Limited, Darjeeling,—proposed by Mr. Leitch, seconded by the Secretary.

R. Taylor, Esq., C. S., Calcutta,—proposed by the Secretary, seconded by Mr. Cogswell.

E. P. N. Martin, Esq., Tea Planter, Tezpore, Assam,—proposed by Mr. G.

Grace, seconded by the Secretary.

Chairman of the Kishnaghur Municipality,—proposed by Mr. C. C. Stevens, C. S., seconded by Mr. S. H. Robinson.

Manager Nuddea Ward's Estate, —proposed by Mr. Stevens, seconded by Mr. Robinson.

Manager Moran Tea Company, Seebsagur, Assam,—proposed by Baboo P. C. Mittra, seconded by the Secretary.

W. Kilby, Esq, District Superintendent of Police, Pubna, —proposed by the Secretary, seconded by Mr. Robinson.

Robert Wilson, Esq, Poopree Factory, Tirhoot, -proposed by Mr. T. M. Francis, seconded by the Secretary.

Baboo Bancy Madhub Sen, Calcutta, -proposed by Baboo Peary Chand Mittra, seconded by Rajah Narendra Krishna, Bahadoor.

Rai Samanand De, Bahadoor, Balasore, proposed by Mr. Geo. Stevenson, seconded by the Secretary.

F. Charriol, Esq, Merchant, Vice-Council for Spain, Calcutta, —proposed by Dr. C. F. Tonnerre, seconded by Mr. F. Lamouroux

Gullaston Gregory, Esq., Attorney-at-Law, Calcutta,—proposed by Dr. Tonnerre, seconded by Baboo Nobin Chunder Burral.

Rejoined.—C. B. Garrett, Esq., C. S.

CONTRIBUTIONS.

1. Jennings's Orchids, and how to grow them in India. From the Author.

2. Memoirs of the Boston Society of Natural History, Vol. XV, Part 3 and 4, Vol. XVI., Parts 1 and 2, and Proceedings Vol 2, Part 3, Nos. 1 and 2. From the Society.

3. Report of Committee of Agriculture of the U. S. Government for 1872, and monthly reports of Department of Agriculture for 1873. From the United States Government.

4. Annual Report for 1872 of the Smithsonian Institution, and Ohio Agricultural Report for 1872. From the Institution.

5. Journal of the Asiatic Society of Bengal, Part 2, No. 1, 1873, and Proceedings for July. From the Society.

6. Notes on the cultivation of the Poppy. From Lieut. J. F. Pogson.

7. Proceedings of the Zoological and Acclimatisation Society of Victoria, Vol. IV. From Baron Ferd. Von. Mueller.

8. An essay by Baron Von. Mueller for the new volume of the Melbourne Exhibition. From the Author.

9. A small assortment of vegetable seeds raised from seed supplied last year by the Society. From Dr. R. Brown, Political Agent, Munnipore.

10. Seed of *Sorghum saccharatum*. From C. E. Blechynden, Esq.

The following is a notice from Mr. Blechynden regarding this seed :—

"I send the Sorgo seed (6 seers) all I have left. This seed is from a quantity

you sent to me when I was in Tirhoot. I sowed it there, and it ripened seed just as I was leaving, so I gathered and sent the whole to one of your oldest Members, Mr. Henry Deverell, at Ackregunge, knowing he would give it a careful trial, especially as he had a number of plough cattle to feed. He did give it a trial and was so satisfied with its qualities as a fodder, that he has continued the cultivation ever since. I had forgotten all about this, when on writing to me on the 7th July, he says, 'you remember a sort of Gona (? you sent me, black seed, *Sorgho saccharatum*, I think you called it; it is first rate fodder for cattle, they fatten on it very fast.' On this I wrote for a little seed, when he sent me 20 seers! I have sent some to Tirhoot, sown some here, and now send you the rest. Four seers suffice for one Bengal beegah. I sowed mine on the 23rd July, and it has germinated splendidly."

11. A small collection of seeds from Queensland. From the Queensland Acclimatisation Society.

GARDEN.

The Gardener's Report was submitted. Mr. Head alludes to several donations during the month, more especially from the Royal Botanic Garden, a valuable collection of ornamental plants, including Palms and *Araucarias*; from Dr. T. Beaumont, some tubers of *Tydæas*, and from Mr. W. Helps, through Mr. Leitch, some orchids and ferns from Darjeeling. These latter were unfortunately, in bad condition, especially the orchids, nearly all of which have perished. The Gardener intimates that beds of all the kinds of Croton that he had in sufficient stock have been planted, and preparation has been made to complete the planting of the outside border with two or three specimens of all plants suited for the purpose. In respect to roses he thus writes: "I was premature and over-sanguine of success in my last report, by increasing roses by root grafting; I have done a quantity more since. The few roots of *gigantea* which were available and first done are a partial success. The other, a strong growing common *Noisette*, the same kind as received from Arrah under the name of "Miss Glegg" which I had been growing on expecting it would do for grafting purposes, is quite a failure, showing that all kinds would not do for the purpose. Last year I found this *Noisette* was not a good kind to graft on, as a stock, the sions not attaching themselves well upon it, and being much slower than *gigantea*; this kind I had numbers of, whereas I had but very few of *gigantea*, and those were procured from the shoots thrown out from our old roses worked on it. I have no stock of either *gigantea* or *Edouard* the only two recognized kinds easily propagated by cuttings and forming famous stock for grafting; if a few hundred of each could be procured at once, sufficiently strong to graft on, it would be well to do so, for we have no stocks to graft on. I am now layering the roses, and shall probably make a good number of plants that way. I am also putting in a few cuttings of each kind by way of an experiment."

Mr. Head alludes, in conclusion, to a few recent thefts from the Garden of *Crotons* of rare kind, *Caladium*, &c., and states he has his suspicions as to the parties concerned.

TOBACCO MANUFACTURE AT THE POOSAH MODEL FARM.

Submitted the following papers on the above subject :—

To the Secretary to the Agricultural and Horticultural Society of India, dated Calcutta, 22nd July, 1875, from the Officiating Junior Secretary to the Government of Bengal.

SIR,—Government having at its disposal about 700 maunds of country tobacco manufactured by Dr. Drown at the Poosah Model Farm according to the Manilla process, I am directed to forward, for your inspection, samples of the tobacco, and to request that the Lieutenant-Governor may be favored with an expression of the Society's opinion on the quality and commercial value of it. It will be observed that the cases are packed so as to fill up space with 1st and 2nd quality, in the same manner as tobacco is packed in Manilla for the manufacture of cigars, that is, the 1st quality for wrappers, and the 2nd quality for centers.

From the Acting Secretary to the Government of Bengal, to the Secretary to the Agricultural and Horticultural Society of India, Calcutta, dated 5th August, 1875.

SIR,—With reference to your letter dated 30th July, 1875, I am directed to forward herewith, a printed copy of a Report on the Tobacco experiments, conducted by Doctor E. Brown, at the Poosah Model Farm.

Report on the Tobacco Experiments conducted by DR. EDWARD BROWN, PH.D., *at "Poosah Model Farm," in Tirhoot, between March 16th and June 20th,* 1875.

1. *Size and quality of leaf.*—I found the tobacco grown in the district of Tirhoot in Bengal larger in size than any tobacco leaf I had met with in Manilla, or any other part of the world. I measured some of the Tirhoot leaves, and found them 3 feet 2½ inches in length by 14 inches in breadth; the texture close and fine, leaf generally tough and strong, and well suited for cigar-making (*vide* two chests of tobacco forwarded to the Commissioner of Patna as sample). But I found flavour and strength in this tobacco strangely wanting, and this I attribute to the country method of maturing the plant, which is quite different to the method employed in Manilla.

2. *Season.*—I find that I arrived at Poosah Model Farm (March 16th, 1875) fully two months and a half too late. The tobacco harvest was then practically finished, and all the best of the native crop had been cut and cured a month and a half before I arrived there, the time for cutting the best of the tobacco crop being January and February in each year. The only tobacco that could be purchased in the neighbourhood when I arrived (for me to experiment on) was of a late sowing, and *second crop*, the *latter* principally.

Owing to the dryness of the weather, together with hot winds and total absence of dew on the ground at night, I was unable to take the tobacco down from the strings during the whole of April, and it was not until the 2nd May, after the first shower of rain, that I was able to attempt the curing of the leaf properly; and then the threatening aspect of the weather kept me on the alert day and night while I had the tobacco spread on the ground; and on the 18th May rain came on from the north-west very suddenly and without any previous indication. I was unfortunately unable to house all the tobacco leaf I had on the ground, and consequently a portion of it got damaged, but this would not have happened if I could have got the coolies to work in time; but for some unexplained reason, their wages had not been paid for more than a month and a half, while all the other farm servants were fully paid up; and many of my tobacco coolies refused to go to work that night in the rain.

3. *Carting in the Tobacco.*—A large portion of the tobacco purchased on Government account lay at a distance of 16 to 17 miles from Poosah, and the bullock-carts, having three rivers to ford, occupied nearly 24 hours in the transit. The Superintendent of the farm would cart in the tobacco in the *green state*, in direct opposition to both my written and verbal instructions to him, *viz.*: "to allow the tobacco to be partly dried on the ground where it was cut before carting it in,"—*vide* my letter to the Commissioner of Patna, No. $\frac{1}{25}$, dated 7th May 1875. The tobacco thus carted in heated or sweated on the road, and consequently a large portion of it was much damaged, and I had to hand 385 cart-loads of tobacco over to the tobacco coolies to be immediately dried in the sun to save it from being entirely spoilt; and by carefully tending it, and using my solutions on it, I have saved the Government from otherwise considerable loss; and the damaged tobacco is now marketable at about the same rate as native-cured tobacco, and has been valued at Poosah at Rs. 5-8 to Rs. 6 per maund, whilst the tobacco delivered to me in good condition, and not second crop, and cured by the Manilla process, has been valued by native brokers at Poosah at from Rs. 12 to Rs. 16 per maund.

4. *Native method of cultivation.*—The natives of Tirhoot have a very strange way of cultivating the tobacco plant. Instead of keeping from 12 to 16 leaves on the upper portion of the stem of the plant, they cut the stem down to within 6 to 10 inches of the ground, and preserve all the lower leaves, actually those laying on the ground; and consequently the tobacco is covered with dust and mud, which injures the leaf considerably when beaten to rid it of this dirt; and when there is not sufficient dirt on the leaves to suit a native idea of what is proper, they sprinkle dust on the leaves to keep away blight as they say! They use very little manure of any kind; cow-dung and rotted straw being their only manures, are I think not adapted to produce good flavoured tobacco; but both soil and climate being so very favourable to the growth of the plant in this district, that it attains a very large size almost unaided by manure; and it is my

humble opinion that tobacco in Tirhoot may be brought to almost any state of perfection by careful cultivation and proper curing; and were I a capitalist, I would not wish for a better source of investment than the cultivation of tobacco in Tirhoot; but I certainly recommend trying exotic seed, especially Manilla, as the climate of that country resembles that of Bengal.

5. *Time of sowing, planting, and cutting.*— The tobacco of Tirhoot is sown in seed nurseries at the latter end of July and beginning of August; transplanted out into the fields in September; and the leaf ripens in January and February, these months being best suited for curing the leaf, as there is abundance of dew on the ground, and rain seldom falls during these months.

6. *Quantity and quality of leaf cured.*— In all, 46 beegahs of tobacco plant were purchased on Government account this season at Poosah, and I estimate the total quantity of leaf cured from this ground will be between 600 and 700 maunds. Some portions of this tobacco have turned out very well indeed, and by my process of curing the leaf, it resembles the rich reddish-brown colour so much prized in Manilla tobacco; and some cheroots I made myself from this leaf are a very fair imitation of Manilla cheroots; and if the Government are willing, I could engage, say, eight to ten native cigar-makers in Calcutta, and take them up to Poosah, and make a few lakhs of cigars before Christmas. An expert at cigar-making can make from nine to ten thousand cigars per month, and I believe such natives can be obtained at Calcutta at nominal wages. At the same time, I should be quite willing to superintend the cultivation of, say, 200 beegahs of tobacco at Poosah this year, as well as carry out any other experiments the Government of Bengal might be pleased to entrust me with; which, altogether, would yield a large profit to Government.

7. *Manufacture of Snuff.*—I have made a fairly good snuff from the stalk and refuse leaves of the Tirhoot tobacco; and a large quantity of snuff can be made from the refuse leaf remaining, which is of no service for any other purpose.

The Secretary also read the following report, obligingly furnished by a Member of the Committee, Mr. F. Eisenlohr, on these specimens:—

"1. Irregular coarse, good sized leaf, very irregularly cured and partially too fresh, to be merchantable. The leaf is of a very oily nature and of sweet and mild flavor, but hardly adapted for wrappers, owing to the coarseness of ribs and stems, which had better be cut at the thick end. The leaves should be better assorted, as to colour, perfection and size.

Approximate value Rs 8 per bazaar maund, difficult of sale.

2. Coarse twisted leaf of irregular colour and cure. Sweet good flavor, suitable for fillings and cuttings only some very fresh and juicy.

Stems should be cut as much as possible. The quality could be much improved by being made up similarly to No. 1 in flat bundles. Value about Rs. 5 per bazaar maund."

Disease on Silk-worms.

The following communications were next submitted in continuation of certain papers laid before the June Meeting:—

Extract of letter from Messrs. Lyall, Rennie & Co., dated Calcutta, 29th July.—"Referring to our previous correspondence on the subject of silk-worms, and the cause of the death of the specimens which we sent you, we now beg to hand you copy of a letter received to-day from our Manager at Gonotea, accompanied by some further samples of worms that have died in a more advanced stage than the previous ones.

"There seems to us little doubt that it must be the effect of the manure used to cultivate the mulberry that gives it a flavor which poisons the worms; but we would much like to have your opinion on the matter, as it is one of much importance to those interested in silk in this country."

Communication from Mr. G. V. Jones, Manager at Gonatea Silk filatures, dated 28th July, 1875.—"In continuation of the diseases I am trying to sift out with regard to the silk-worms dying, I to-day send by post another small quantity. These worms are on the point of spinning, and if you take a penknife and slit them in half down the back, you will perceive the gummy substance that they spin the fibre from perfectly formed; this is most unaccountable as the most critical stages have been all passed, and every appearance of them coming properly to maturity. I myself cannot help thinking this has a great deal to do with the fault of the mulberry. I told the man whose worms they are not to feed his worms upon it, and whilst young did not; but seemingly after they had passed all through these sicknesses, thought it was all safe and did; they, until then, showed no signs of dying, which makes it look very suspicious where the fault lies. Again, whilst walking out one evening I saw another cutting mulberry, which I knew to be manured with cow-dung. I tasted a leaf, and it decidedly to me had a taste of saltpetre. I told him then not to feed his worms on it, which, however, he did, and they, I hear, have all died. Now, if you put saltpetre on meat, it turns red like these worms I now forward; so perhaps it is the saltpetre that has had the same effect and killed them. In another village of ours the men have had exactly the same seed, in fact procured from the same house as the first man had, whose worms died; but they have been all fed on good mulberry out in the maidan, not in any way manured, and they are all turning out well and to-day beginning to spin; so this again is another proof. I think it would be as well to forward the worms, as soon as possible, to the Agricultural and Horticultural Society before their getting decompo- l. But the natives tell me they will not become at all offensive, which again makes me think it has acted as a sort of pickle in fact on them.

"I am glad to be able to say, as yet I have heard very little of the worms dying out. A few here and there who have not listened to my advice with regard to mulberry. Of course of those further off I have no *pucka* news as yet.

"I am now boiling some mulberry which I know to be highly manured. My intention is to forward it to you for analysation. The sediment decidedly looks suspicious, but the worms have all ripened to-day, and no signs of any dying."

Report by Mr. C. E. Blechynden, dated 3rd August, 1875.—I have to acknowledge receipt of your letter of the 30th July, giving cover to a communication from Messrs. Lyall, Rennie & Co., forwarding copy of a letter from their Silk Manager at Gonatea, together with specimens of silk-worms that have died from the same disease which caused the previously forwarded specimens to perish, and asking information as to cause of death at so advanced a stage of the insect's life.

In reply, I beg to state that the disease is identical with that which destroyed the first specimens you sent for my inspection. As to cause of its appearance at so late a period, I am in the dark as to the mode of rearing pursued, but infer from what Mr. Jones says, that it is the "native mode." In that case we have not far to seek, *viz*, a sudden rise of temperature, either naturally or artificially produced. By the latter I mean using fire in the rearing room. In either case the sudden change has caused the body of the insect to be coated with salt and earthy matter. From Mr. Jones's letter I gather that he warned the rearer of the worms not to use leaves gathered from trees newly manured. This he attended to, till the insect had passed through all the most critical periods of its life; after which thinking all was safe he probably fed the worms with the interdicted leaves. No bad consequences would perhaps have ensued, but for the worm being over-heated. From my experience of what rearers are in the habit of doing, I incline to the belief that fire was used in the rearing room to heat it, as heat is considered by them as essential at the time the worm is about to spin. Probably the morning on which the insects were "ripe," or ready to spin, was a rainy one; the rearer having no separate shed to put the spinning trays into, kept them in the rearing room, lighted a cow-dung fire and thereby raised the temperature to a high point; and as there was no circulation of air in the room, bad consequences ensued; as the worms having been fed on leaves saturated with salt and earthy matter, gave out through the pores of the skin, that which forms the crust on their bodies. In an open shed most likely all would have gone on well, or even if the heat of the room had not been unduly augmented.

I return herewith copy of Mr. Jones's letter, together with the box containing the dead worms. These latter are embalmed, not pickled, as Mr. Jones suggests.

ALOE FIBRE.

Read the following letter from the Officer in charge of current duties, Department of Agriculture and Commerce, N. W. P., dated Naini Tal, 5th August:—

"I have the honor to forward per bhanghy post, a sample of fibre from a species of aloe grown in the Jaunpore district, and prepared by Mr. R. Tregear,

Indigo-planter of the Kalinjara Factory, with the request that you will have it valued for commercial purposes.

"I have asked Mr. Tregear to be kind enough to furnish an estimate of cost of production which I shall have the pleasure of communicating to you on receipt."

Read also the following report from Mr. Cogswell, a Member of the Fibre Committee:—

"The sample referred to, marked Yucca Fibre, contains some very good, clean, and strong fibre; it is, however, much mixed and irregular in quality, some of it has been very carelessly prepared and indifferently retted. The staple is too short to be of much value, and much more fibre was cut off the end than was requisite. If it could be brought to market 3 by 4 feet in length, all of it well, and carefully prepared, as some portions of this sample are, it would be worth about £40 a ton; in its present state, however, I doubt if more than £15 a ton would be paid for it. It is somewhat difficult to value it here; but the local European makers of ropes would not pay more than about Rs. 5 a maund for it, owing to the defects which I have enumerated."

Mr. Lynam forwarded for inspection two fine grown plants of *Maranta tubispatha*, and *Dioscorea illustrata*, both of South American origin. Mr. Lynam has found the *Maranta* to do well in a shady veranda. Eight marks were awarded to each.

Thursday, the 21th September, 1875.

W. H. COGSWELL, Esq., *V. P., in the Chair.*

The proceedings of the last Monthly Meeting were read and confirmed.

The following gentlemen were elected Members

The Hon'ble Sir R. Garth, Messrs. A. L. Home, R. F. Rampini, E. Urquhart, James Speid, W. E. Creaton, Rudston Brown, George Swaine, C. J. Fearon, Baboo Kishen Chand, Managers Chincooree, Jutteseal and Central Cachar Tea Companies; Messrs. R. Taylor, C. P. N. Martin, W. Kilby, Robert Wilson, F. Charriol, and G. Gregory; Managers, Giell, Central Terai, Balasun, Chenga, Chunta, Teesta Valley, Singbulli and Nurma, and Teng Ling Tea Companies; Chairman of the Kishnaghur Municipality; Manager, Nuddea Wards Estate; Manager, Moran Tea Company; Baboo Baney Madhub Sen, and Rai Samanund De Bahadoor.

The following candidates were proposed for election:—

H. F. White, Esq., ex-Engineer, Bundelcund Road Division, Nowgong,—proposed by Dr. J. P. Stratton, seconded by Baboo Peary Chand Mittra.

Fred. Whitney, Esq., Merchant, Calcutta,—proposed by Mr. W. Pigott, seconded by Mr. W. H. Cogswell.

A. E. Sharpley, Esq., Barrister-at-Law, Agra,—proposed by Mr. H. F. White, seconded by the Secretary.

Secretary Public Garden, Nagode,—proposed by Mr. White, seconded by the Secretary.

Joseph Lay Shillingford, Esq., Sahara Factory, Purneah,—proposed by Mr. G. W. Shillingford, seconded by the Secretary.

E. A. Hobson, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. J. E. Radcliffe.

Manager, Kamptee Gwallie Tea Estate,- proposed by Mr. Pigott, seconded by Mr. Cogswell.

Manager, Mesai Jah Tea Estate, - proposed by Mr. Pigott, seconded by Mr. Cogswell.

CONTRIBUTIONS.

1. Report of the Sanitary Commissioner for Bengal for 1874. From the Government of Bengal.

2. Journal of the Asiatic Society of Bengal, Part 1, No. 2, 1875. From the Society.

3. Records of the Geological Survey of India, Vol. 8, Part 2, 1875. From the Government of Bengal.

4. Plants of *Dioscorea illustrata*, *Dimbentonia magnifica*, and *Hippeastrum pardinum*. From J. Lyman, Esq.

5. Seeds of Eucalyptus globulus. From Dr. W. Campbell.

6. A small stock of acclimatized Aster seed. From C. Nickels, Esq.

GARDEN.

The Gardener's monthly report was submitted. Mr. Head refers to a few contributions since the date of his last report, including a small collection of orchids from Arracan from Captain Pollock, of the *Mahratta*. The propagation of such plants as it was necessary to increase has been continued with tolerably favorable result; the mango grafts appear to have taken well, and will be ready for removal during the next month. Peaches have done well, and are being distributed as required. Some of the lychee *gootees* have been removed and potted; neither these nor loquots have taken so well as expected. The Gardener writes thus respecting roses: "I have been having layers made of roses, which to all appearance are going on quite favorably; some of those first layered upon examination a few days back, having rooted, will, I hope, be ready for distribution in a month or thereabouts. Grafts are being made on the first supply of 'Edouard,' and a few others that I had by me which are sufficiently strong for the purpose. Cuttings 20 to 25 of each variety have also been put into pots, filled with equal parts, sand and leaf soil, or what is leaf soil to us, rotted garden refuse, which appears likely to be a universal failure; this has been done with a view to ascertain the best time to increase roses by cuttings. For my part I am inclined to think increasing roses by cuttings cannot be done with advantage, excepting a few kinds; that budding is the best and surest

mode, and if a good stock of *gigantea*, *Edouard*, and such free growing kinds are got, that only should be the mode generally adopted. I hope with the Edouard that I have had sent this year already, to get up a stock of that variety for future work, and as *gigantea* is not procurable, I shall plant out some on purpose for stock of that kind, so that in future there may be plenty of roses." A trial sowing of imported vegetable seeds has been made, and the results have proved tolerably successful. A full report on these will be furnished hereafter.

CUZCO MAIZE.

The Secretary stated that it would probably be in the recollection of Members that in January last the Government of India, Department of Agriculture, presented the Society with 30 pounds of Cuzco Maize for careful experiments on its cultivation and a report of the results. This seed has been distributed to upwards of sixty applicants over many parts of India, in the Punjab, N. W. Provinces, Central Provinces, Tirhoot, and parts of Behar, lower and upper Bengal, &c. Reports have been received from several of the recipients, all to the same effect, that the seeds germinated readily, have grown well, but have not yielded fruit. From Tirhoot, which was considered a good locality for trial, seeing that Maize is so largely grown there, Mr. H. W. Stevens of Durbunguh writes, "the Cuzco corn has been a failure; it germinated and grew to a great height, but developed very small cobs, quite barren of grain." Mr. T. M. Francis of Mozufferpore, who obtained a good quantity for himself and several intelligent zemindars, remarks—"the Cuzco Maize, I am sorry to say, has completely failed. At first it grew vigorously, and in my garden it formed a number of cobs, but every plant died off before these had time to ripen. I have received similar reports from all those among whom I distributed the seed. It might succeed better if sown in the cold weather, or about October, but I do not think the climate admits of its being grown as a crop for the rains. If you can let me have a few seeds I will try sowing them in October, and let you know the result." Mr. List, District Engineer, Bustee, observes, "the Cuzco Maize germinated freely, and grew to an enormous height, the plant flowering, but no pods ever forming; they have now died down without producing any seed from which to renew experiment." Lieut. Pogson, writing from Simla, remarks, "my Cuzco Maize is more or less in flower, but as yet only two plants have put forth cobs. I have several plants fully 12 feet in height. I strongly suspect that this maize requires a calcareous soil to flourish, and if I succeed in ripening the cobs, the acclimatized seed shall (D. V.) be sown in richly *limed* soil next year." Dr. Lynch reports that the results of his sowings in the Alipore Jail gardens proved fruitless, and so with the trials in the Society's garden. Several other Members have similarly reported. Referring to the remarks of Mr. Francis, the Secretary mentioned that he had sown some seed out of season, immediately on receipt in January, and that the plants became stunted, did not exceed four

feet, and died down without flowering; whereas those sown at the commencement of the rainy season attained a height of 12 feet, flowered, but formed no cobs. (Specimen placed on table.)

Resolved, that a copy of the above be sent at once to the Government of India, and a supplementary communication hereafter, should the Society receive any further reports.

Disease in Silk-worms.

The Secretary submitted the following papers on the above subject in continuation of those read at previous recent meetings:

From Messrs. Lyall, Rennie & Co., *to* A. H. Blechynden, Esq., *Secretary Agricultural and Horticultural Society, dated Calcutta, 10th September*, 1875.

Sir,—Referring to our late correspondence on the subject of disease in silk-worms in this country, we now beg to hand you the following enclosures, all bearing on the same subject, and which may prove of interest to you:

1. Letter from our Manager at Gonatea to the Magistrate of Beerbhoom.

2. Letter from the Commissioner of Burdwan to the Magistrate of Beerbhoom.

Mr. Jones will act on the suggestion made in this letter, and send to the Chemical Examiner a bottle of water in which some worms have been washed, for analysis.

It is gratifying to find the officials of the District taking an interest in the subject.

3. Letter from Dr. Waldie, F. C. S., with analysis of the three bottles of essence of mulberry sent to him for examination.

4. Letter from Mr. Jones to ourselves. The enclosures he refers to are Nos. 1 and 2 as above.

The more we go into the subject the more apparent it becomes that the cultivation of the mulberry is at the root of the evil, provided of course that the *seed* from which the worms are reared is good.

We have had a good deal of correspondence with friends at home on this subject. They have been trying to procure some practical works on the subject, but have failed to do so either in England, France or Italy. We regret much that a copy of your brother's work is not to be had.

From G. V. Jones, Esq., *to the Magistrate of Beerbhoom, dated Gonatea, 18th August*, 1875.

Are the Government of Bengal at all likely to take up that what I wrote you about regarding the mulberry, as this tremendous industry carried on not only in Beerbhoom, but Moorshedabad, Rajshahye, Malda, and Midnapore is gradually dying out merely from ignorance of the mulberry cultivators not knowing the chemical properties of cow-dung manure; my circulars are, I hear, doing a great deal of good, and being taken up very warmly by the zemindars.

From SIR W. J. HERSCHEL, BART., *Officiating Commissioner of Burdwan, to the Magistrate of Beerbhoom, dated the 4th September*, 1875.

SIR,—I have the honor to acknowledge the receipt of your No. 1086, dated 20th August with enclosures regarding the epidemic at present injuring the silk-worms of the district.

2. The matter appears important enough to deserve further enquiry. The question seems to be as Mr. Blechynden puts it, what is the white efflorescence on the skin of the worms? Is it nitre, or any salt derived from manure? If not, what is it? Mr. Waldie's answer seems to say it is not nitre. I am reluctant therefore to conclude that it must be derived from animal manure applied to the mulberry. The white caking appears to be soluable in water. I would suggest that the Chemical Examiner be supplied with a half pint of water in which a greater number of worms have been washed, and that a decisive experiment be made with food consisting of young leaves of stable manured young plants. Old leaves of the same plants, and the same two leaves of plants not so manured.

3. You may forward a bottle of the saline solution, if you can obtain it, to the Chemical Examiner for report.

MEMO. No. 1474, *Beerbhoom Magistrate, the 7th September*, 1875.

Copy forwarded to G. V. Jones, Esq, of Gonatea with request to supply the saline solution. R. HIME,

Magistrate.

From D. WALDIE, ESQ., *to* MESSRS. LYALL RENNIE & CO., *Kassipur, Calcutta, 3rd September*, 1875.

GENTLEMEN,—I have examined the three samples of essence, or more properly, extracts of mulberry leaves submitted to me for that purpose. There was no statement given of the quantity of leaves which had been boiled to yield these extracts so that any quantitative comparison of them is impossible. Nor have I any information as to whether the extract in each case was in the same proportion to the leaves used, or in no proportion at all.

Table No. 1	No. 1	No. 2	No. 3
Quantity of liquid fluid grain	16·82	15·74	5·25
Dry extract by evaporating the liquid grain	15·87	22·97	6·48
Soluble salts after the vegetable matters had been burnt off	3·67	3·86	·94
Carbonate of lime	·76	1·42	·45
Table No. 2.—In relation to the dry extract itself.			
Dry extract	100·	100·	100.

Table No. 1	No. 1	No. 2	No. 3
Soluble salts (vegetable matter burnt off,)	23·15	16·76	14·5
Carbonate of lime	4·70	6·18	6·9
	27·85	22·94	21.4

The soluble mineral salts was chiefly potash salts, a little sulphate and the remainder chloride of potassium (muriate of potash) and carbonate of potash, as is usual in vegetable ashes from the destruction of organic, (or vegetable) and as existing in the plant itself. Some soda salts of same nature were also present, but the potash salts were the principal constituents.

There were earthy salts present too, chiefly salts of lime, and there was estimated a carbonate of lime to give an idea of their general proportions. Besides the lime, there was present some iron and alumina and phosphoric acid, possibly the alumina may be only an accidental constituent.

This is not a very full or exact analysis, but it would not have been worth while attempting a better one with such quantities of material, and that too having no known relation to its sources.

Table 2 shews the relative proportion of dry matters to the extract, but this gives no information as to their relations to the leaves. It only shows that the extract of No. 1 is the richest in mineral salts. No. 3 the poorest; and it also shows that the soluble alkaline salts are in largest proportion in No. 1 and in smallest in No. 3, which will be more distinctly shown thus—

	No. 1	No. 2	No. 3
Alkaline salts	83·4 ..	73·0 ...	67·8
Carbonate of lime	16·6 ..	27· ...	32·2
	100·	100·	100·

There is evidently a much larger proportion of soluble alkaline salts in Nos. 1 and 2, the manured samples then in No. 3 the non-manured one.

The quantity of sample No. 3 was much smaller than the others. I think it ought to have been the largest.

I tried to ascertain if there was any nitrate present, but could detect none. The presence of such a large excess of vegetable matter makes it very difficult, but I do not think that there is any present, or if any, only a very minute quantity.

From G. V. JONES, ESQ., *Gonatea, 8th September*, 1875, *to* MESSRS. LYALL, RENNIE AND CO., *Calcutta.*

SIRS,—The two books on the breeding of silk-worms together with copies of Mr. Grant's two letters to Mr. Rennie were safely received by me, and after

careful persual of all, I yesterday forwarded them on to Mr. Stocks, as requested; though all go deeply into the requirements of the worm to keep them in a proper and healthy state, yet for this country the way and houses in which they are reared, beside the state of the temperature in these parts being so totally different, makes them quite unsuitable to us. I see in Count Dandolo's book he gives many reasons and agrees in many points that the natives do in this country, *viz*, sudden changes in temperature, good seed, bad winds, "here particularly an easterly, bad food, and even goes so far as luck, or as the natives say 'Nuseeb' which, however of course, is absurd; but the main point in which I am giving my particular attention to, is the mulberry, of which there is nothing said with the exception of the one remark, 'bad food.' Now every one knows that eating anything unwholesome is pretty sure to disagree with you, and with such a very tender insect as the silk-worm is, I should certainly consider, the primary thing to be considered is 'good food.' With regard to the ventilation out here, they are rather placed disadvantageously; the flies being so troublesome, they cannot keep the rearing houses properly open so as to have a free circulation of air, as the least crevice they get into, not only irritate the worms much but pierce the body of the worm to lay their eggs in, *vide* Mr. Claude Dumain's letter, printed in the Agricultural and Horticultural Society's Meeting, June 24th, 1875; the worms even after this live long enough sometimes to spin their cocoon, but oftener die before. I think myself it would be a very good plan to send all the correspondence we had with the Agricultural and Horticultural Society, as well as Dr. Waldie's analysis to Mr. Grant, to see if he could find any one who could tell us really if the mulberry is in fault, as no one has positively said so, and why? You will see Mr. Blechynden in his first letter says, the worms have died from eating leaves impregnated with this salt, *viz.*, saltpetre or some other; so perhaps the alkaline salts, Dr. Waldie mentions in his analysis, are just as fatal.

I enclose a second letter I wrote to the Collector of the District, as well as a communication I received this morning from the Commissioner to him. The saline solution asked for I intend forwarding him at once.

BLIGHTS.

Mr. James Dallas, of the Blanerne Tea Factory, Cachar, forwards sample leaves punctured by the same insect that, he believes, causes blight in tea. The following is extract of Mr. Dallas's letter:

"I beg to call the attention of those Members of the Society interested in the tea blight question to the punctured leaves which accompany this note. I gathered them this afternoon from plants growing in the midst of dense jungle on the north-east side of a large ant (termite) hill, and they appear to me to be identical with the leaves of tea when attacked by the Assam Tea Bug! I searched carefully for the insects, but failed to find them, probably, I think, because it was too early in the day.

"If these marks prove to have been caused by the insect causing blight in tea, of which there can, I think be little doubt, it is interesting as showing clearly, and without the possibility of error, that the insect may, and probably does, infest the jungles surrounding tea gardens where blight exists, but it still remains to be shown that it comes from the jungle to the tea, and not from tea to jungle."

It was agreed to send these leaves by the next mail to Mr. Grote, for submission to the Scientific Committee of the Royal Horticultural Society.

Lieut. J. F. Pogson, writing from Simla, 1st September alludes to a potato blight occurring at that station:

"We have had," observes Mr. Pogson, "a new kind of potato blight, the green part of the leaf, is either eaten away by invisible insects, (Infusoria,) or else disappears in a most unaccountable manner. The skeleton and fibres of the leaf are left, and also the fine semi-transparent membrane, which separates the upper part of the leaf from the lower or under part. The stems then change colour to a sickly yellow, and gradually dry up. A native who has cultivated potatos largely close by my garden has had his crops similarly attacked. The blight has also attacked the beans, the windsors suffering severely, the scarlet runners slightly. But as yet the Indian *Saims* have not been touched.

"The English potatos sent by you after attaining a most vigorous growth, and coming into full and luxuriant flower, were all attacked, and now are leafless stems, passing from yellow to brown. I have some experimental potatos put down close to tomata plants. These have not been touched, neither has the tomata."

Mode of preserving Seed.

Mr. C. Nickels, of Pussewa Indigo Factory, Jaunpore, gives an account of a mode of preserving seeds which he has found to be very effectual: *(See body of Journal).*

Letters were read—

From J. M. Robertson, Esq., of Arcuttipore, Cachar, in continuation of that submitted at the May meeting regarding his trials at raising Eucalyptus globulus:

"Of the twelve Eucalyptus globulus seedlings sown by me at the end of July 1874, only six are now alive. The excessively wet weather which has prevailed this season has evidently been the cause of death in the others. They had attained heights of from three to seven feet. Of the survivors, one is 16 feet high, two are 11½ feet, and three are eight feet."

From G. H. List, Esq., C. E., District Engineer, Bustee, furnishing the result of sowing of certain seeds supplied in April last:

"Four of the six mahogany seeds sent, germinated, two of them damped off at once, and two were in a flourishing condition when I went on leave a month ago. On my return I found one had been destroyed through carelessness of my malies,

but the other is a very fine healthy tree about 12 inches high, with luxuriant foliage.

"The Eucalypti (Globulus and Rostrata) germinated freely, but all damped off. This district, like Goralubpur, seems not to be adapted to them. The Gigantia and Jamah seed did not germinate.

"The Bamboo seed entirely failed to germinate, but I think from carelessness of my mallee in my absence allowing the ground to be flooded.

"Pouciana regia and Sissoo do well here, the station is full of the first named.

"The Juniperus excelsa, Cupressus torulosa, Juniperus communis, and Taxus bacata all failed to germinate; but I fear, in my absence, my instructions were not attended to. I should be glad to try them again if small quantities could be sent me.

"I should particularly like to have a few more mahogany seeds, as they promise well, although only one tree has survived; also the Bamboo seed, [complied with] as this district is deficient in good bamboos where they are much required.

"I fear the results I send you are not such as to warrant me to expect a further supply, but if you can spare them, I shall be very glad to try again and report further results."

Thursday, the 18th November, 1875.

W. H. COGSWELL, Esq., *V. P., in the Chair.*

The proceedings of the September meeting were read and confirmed.

The following gentlemen were elected members:—

Messrs. H. F. White, Fred. Whitney, A. E. Shappley, J. L. Shillingford, E. A. Hobson; Secretary Public Garden, Nagode; Managers Kamptee, Gwalior, and Mesai Jan Tea Estates.

The following candidates were proposed for election:—

F. R. S. Collier, Esq., C. S., Kungram, Rungpore,—proposed by Mr. T. E. Coxhead, seconded by Mr. W. H. Cogswell.

P. Michea, Esq., Deodehurn Factory, Benares,—proposed by Mr. R. S. Pyne, seconded by the Secretary.

E. S. Moseley, Esq., C. S., Durbuncha, Tirhoot,—proposed by Mr. G. W. Shillingford, seconded by Mr. Cogswell.

G. Billings, Esq., Deputy Magistrate, Meerut,—proposed by Mr. R. H. Smith, seconded by the Secretary.

Sultan Mirza, Daroga, Garden Reach,—proposed by the Secretary, seconded by Mr. Cogswell.

John Kelherer, Esq., Kotahie Factory, Goruckpore,—proposed by Mr. W. J. Brooke, seconded by Mr. T. M. Francis.

W. R Finch, Esq., Shahpore Oondee, Tirhoot,—proposed by Mr. Francis, seconded by the Secretary.

Manager of the Pattareah Tea Company,—proposed by Mr. R. W. Hall, seconded by the Secretary.

Rejoined.—A Blandford, Esq., Turtepore Indigo Concern, Malda, and Henry F. Brown, Esq., Merchant, Calcutta.

CONTRIBUTIONS.

1. Annals of Indian Administration in 1873-74. From the Government of Bengal.

2. Report on the progress and condition of the Royal Gardens at Kew, during 1874. From the Director.

3. Report of Commissioner of Agriculture of the United States for 1873. From the U. S. Government.

4. Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. 7, Part 2. From the Society.

5. Administration Report, Hill Tracts, North Arracan for 1874-75. From the Chief Commissioner of British Burma.

6. Journal of the Asiatic Society of Bengal, Part 1, No. 3, and Part 2, No. 2, and Proceedings for August 1875. From the Society.

7. A Wardian case of plants from the Royal Botanic Garden, Hongkong. From the Director. These plants, consisting principally of litchees, have arrived in good order.

8. Four plants of *Amherstia nobilis*. From the Hon'ble Sir R. Temple.

9. Acclimatized seed of *Danbintonia magnifica*. From Mr. John Lynam.

10. Acclimatized Geranium seed of three kinds. From Mr. C. Nickels.

11. Palm seeds of two kinds, *Sabal Palmetto and Arenga saccharifera*. From the Royal Botanic Garden. From Dr. King.

12. A quantity of Sweet Briar seed (hips). From Lieutenant J. F. Pogson.

13. Seed of an intensely hot Chillie from Assam. From Mr. F. C. Moran.

Mr. Moran remarks that this chillie "is very large, much larger than the West Indian Capsicum; it is red and thorny; it is terribly hot, if a ripe one is cut in a room, the smell pervades the whole place. I have never seen any thing like it. I believe it is called the Bhotan Chillie."

GARDEN.

The Gardener's report was submitted. Mr. Head alludes first, to the loss sustained in October of nearly the entire establishment, consequent on the action of the Public Works Department in offering a higher rate of pay for laborers for the new Zoological Garden. It was not only the loss of hands, but hands trained to the particular requirements of the garden. The garden has suffered somewhat by this action, not only in extra expenditure for inexperienced hands, but from the difficulty of obtaining labor at the same rate as heretofore. A portion of the Economic garden has been sown with peas, imported and acclimatized, to raise seed for distribution to members next season.

Experiments are also being made with certain vegetables, treated with certain manures. There is now in stock about 500 mahogany seedlings which are available to zemindars and others desirous of introducing this fine timber tree on a large scale. Between 800 and 900 mango grafts of good kinds have recently been made, which can now be distributed to members at 8 annas per graft, and those of last year at 12 annas. The Gardener states as follows in respect to roses:—"The layers of roses are, to all appearance, ready for removal and will be available shortly. I purpose, although rather out of season, at once to graft all the 'Edouard' plants supplied, and to make as many stock of that variety and *gigantea* as I can, and to give up trying to increase, excepting kinds known to root freely, by cuttings, for I am convinced there are not many kinds that will do well by cuttings; but to depend on our stock by grafting, budding, &c., upon Edouard, *gigantea* or any other that will root freely and suit for stock."

Mr. Head submits a plant of "Ramee" *(Bœhmeria nivea?)* raised from the seed presented by Dr. Forbes Watson in February last; also a plant of "Rheea" from garden old stock for comparison. "There is a little seed still remaining on the Ramee which, as far as I could observe, did not produce any sterile flowers, but were all fertile. I have collected the seeds produced which is also sent, a little having been sown for trial to ascertain if it is perfect and will germinate, which it has not at present. The Rheea has produced sterile flowers in abundance lately, and is now producing fertile ones, which previously I had not observed. The Ramee seed was nearly ripe before any flower was produced on the Rheea, consequently the latter had no effect in fertilizing the former. To all appearance the plants appear to be one species, there may however be some botanical difference. Our Rheea is much the strongest, being divisions of old established plants, and the Ramee only this year's seedling. They are growing side by side, and were both planted at the same time. The plants sent are fair examples of the stock" The Gardener also forwards a plant of Liberian Coffee and one of Mocha for comparison, the former being considerably larger than the latter. Twelve of this splendid description are planted out and are doing well. He adds, that he is endeavouring to propagate it by cuttings; the few obtainable are looking well at present, but shew no signs of rooting; and he thinks it very doubtful if they will succeed, as coffee is difficult to propagate by cuttings.

Silk-worm disease.

Submitted the following remarks from Colonel Julian Hobson, 14th Regiment, Bombay N. I., at Kolapore, on the above subject:—

"In the *Pioneer* of the 8th Instant I have read with much interest the correspondence laid before the meeting of the Agri-Horticultural Society of India on the subject of the silk-worm, and from the descriptions given of the disease it appears clear to me, that it is the silk-worm fungus disease known

under the scientific name of 'Botrytis Bassiana,' a genus of the Mucedine's order, Family Hyphomycetes; the disease is better known as Muscardine, and the destruction from it is very great at times in districts where the silk-worm is cultivated. The Revd. M. J. Berkeley, the prince of Mycologists, has given a figure of the fungus in his paper on the potato disease, and a full account of the fungus with figures may be found in Robin's Vegeteaux Parasites, 2nd Edition, 1853, as well as in papers on the same subject in the 'Comptes Rendus.' I mention these points as the papers referred to may be at least in some scientific library at Calcutta to refer to, for without having specimens of the 'white efflorescence' or fungus from the skin of the silk-worm to examine under the microscope it can but be a conjecture on my part that it is the fungus 'Botrytis Bassiana' so common to these worms, still I cannot help thinking that I am correct in the conclusion I have arrived at. As for the cause that must for the present be considered *sub-judice*, since it is no easier to explain how the silk-worm is attacked by this parasite than the fly by the fungus Sporendonema, or the fish by the mouldy-looking parasite belonging to the Saprolegniei, or the leaf of the Jasmine attacked by the pretty and interesting fungus Æcidium. Having once discovered the cause of the disease then, and not till then, can the remedy be attempted; still I would suggest that as soon as a silk-worm shows the slightest taint of disease, that it should be killed and the skin burnt with a view to the spores of the fungus being destroyed. I have no doubt but that Dr. D. D. Cunningham, of the General Hospital, Calcutta, would soon settle the point whether I am correct as regards my conjecture, that the disease of the silk-worms is the fungus 'Botrytis Bassiana.'

"I would beg to suggest that some of the white caking alluded to by Sir W. J. Herschel, in his letter, be sent to Dr. D. D. Cunningham, who, I have no doubt, will settle the point at once, or if sent to me I shall be very glad to examine it."

Dr. Cunningham states that he examined, some years ago, specimens of silk-worms covered with a white coating, and ascertained that the latter was due to the presence of *botrytis*. Dr. Cunningham has kindly offered to examine specimens anew, and Messrs. Lyall, Rennie & Co. have promised to send them up when the disease reappears. At present the worms are quite free from it.

Castor Oil Cake as a manure for the Tea Plant.

Mr. G. Menzies Smith, the Manager of the Joyhing Tea Estates, in North Luckimpore, Assam, applies for information in respect to the above in the following extract of a letter dated 18th October:

I should feel much obliged if you would furnish me with information on the following points:—

"1. Has it been brought to your notice that Castor Oil Cake has been used largely by Darjeeling planters in the manuring of tea plants; and if so, with what results?

"2. Is it the case that, where applied, it has doubled the out-turn of the plant in one season?

"3. Is it the case that Darjeeling planters bought up large quantities of the cake last season as far as Allahabad?

"4. Have you any information as to what quantity of the cake is applied to each bush as a manure?

"5. What would the cake cost a maund to land it on the factory?

"6. Have any Darjeeling planters grown castor oil plants on their estates for this purposes; if so, what is the cost per acre, and what is the yield of the seed, oil and cake?

"I believe some years ago there was an experiment tried in Calcutta to make gas from the cake; can you give me any information on this point?"

Agreed to publish Mr. Smith's queries in the proceedings, with the view of eliciting replies thereto from the tea-growing districts generallly.

RESULT OF SOWINGS OF ACCLIMATIZED POTATOS AT SIMLA.

Read the following extract of a letter from Lieutenant Pogson, dated 16th October:—

"Whilst writing this letter I caused the English potatos sent by you to be dug up. Two of the red flour ball, rotted before sowing time. I had therefore 8 potatos 'Early Kidney;' 8 ditto "hundred fold fluke," and 6 ditto 'red flour ball.' The produce is as follows: Red flour ball 4 lbs., of which ten largest weigh 3 lbs.; 'hundred fold fluke' 3 lbs., of which ten largest weigh 1½ lbs; and 'Early Kidney' 1 lb.—nineteen potatos in all being the produce.

"Thus in spite of the blight and two seed potatos short the 'red flour ball' has given the highest return, and had the blight not taken place, the produce would have been higher.

"These 22 potatos were exclusively manured with mineral manure, no dung manure of any description being used. If desired the composition of the mineral manure will be supplied.

"If the Society would import a small quantity of 'Bovinias' and let me have some on arrival I think they would be a great acquisition, and the crop raised by me would be at the Society's disposal."

The Secretary reported that these potatos were sent to Mr. Pogson in April last. They formed portion of a quantity presented by Mr. C. E. Blechynden, which again was the produce of a parcel received from Messrs. Sutton and Sons, of Reading, last year.

In connection with the above, the Secretary read the following letter from Colonel Hobson:—

"In the report of the Agricultural and Horticultural Society of India published in the *Pioneer* of the 8th Instant, I observe a letter from Lieutenant Pogson from Simla, drawing attention to a potato blight occuring at that station which he attributes to 'Infusoria.' From his description of the disease it

doubtless is the fungus '*Peronospora infestans*,' and should Lieutenant Pogson have examined the diseased plant under the microscope and seen moving particles, they were the zoospores which are either oval or semi-oval, and which from agitating themselves doubtless moved out of the field of the microscope, which possibly induced Lieutenant Pogson to erroneously conclude that the blight was caused by Infusoria, an error he could never have fallen into had he been better acquainted with the character of Infusoria."

REMARKS ON THE WORKING OF ENGLISH AND AMERICAN PLOUGHS.

Read the following letter, dated 1st November, from Dr. S. Lynch, regarding his trials of two ploughs from the Society's collection:—

"I am very glad to reply to your enquiry as to our experience of the two ploughs you were good enough to lend me for trial in the Jail garden. Both of them, the English and the American, were easily worked by a pair of ordinary bullocks, each turned up the soil to a depth of six inches, and there was no perceptible difference in the quality of the work turned out. But I imagine that no native farmer would care to own the English (iron) plough when he could do the same work with the wooden American plough of simpler construction and with a renewable point to the share. We find here that the points rapidly wear down, and the plough share being made in one large piece, the alteration required is expensive. In the American 'Self-Sharpener' the moveable tip not only lasts longer but costs little to replace.

"With regard to the work which either of these ploughs can do, as compared with the native implement, we find that a native ploughman, using the English plough, can get his field turned over to the depth of six inches much more quickly than he can do it to a depth of three inches with the native plough. But beyond the mere ploughing or turning over of the soil, the English plough is capable of assisting in the cultivation of the ground in several other ways, whilst the native instrument is nothing but a plough. Work done by the hoe can be more cheaply and rapidly performed by our plough—such as ridging the earth for crops which require to be grown in ridges, laying out furrows for potatos, kachors, arrowroot, &c., and earthing these up as they require it, taking up the ripe kachors, &c., out of the ground; all this sort of work which now requires the laborious use of the hoe can be done with great economy of labour by the plough and bullocks. There is a very rapid way also of planting potatos and kachors and similar tubers, with the assistance of the plough. A light boy can be seated on the plough, and with a basket of potatos and a bamboo tube through which to drop the potatos as the furrow is made, the work of ploughing and planting goes on as fast as the bullocks can travel.

"I know of only one objection to the introduction amongst natives of English ploughs, and that is the want of command over his bullocks by the ploughman when using this implement.—they require a second man to lead them. With the native plough which comes close up between the animals, the plough-

man alone is required as he can touch the animals to guide them."

Read also extract of a letter from Mr. C. E. Blechynden, dated 14th July on the same subject:—

"You want a report on the plough (American) you sent me. It works beautifully. I used in light soil two bullocks, but on heavy land four, using at the same time a 'Wimpletree,' or 'Dragbar'. The best plan, I found, was not to exact too much at once, either from plough or cattle, so I used to plough shallow at first, then deep. This can easily be managed by means of the front wheel. Of course the natives could not turn out such neat work as an English ploughman, nor can you with bullocks expect a very straight furrow; but that a superior kind of work can be done in comparison with the native plough was quite apparent when I held the stilts myself, which I used to do by the hour; it is splendid exercise."

INTRODUCTION OF FOREIGN KINDS OF WHEAT INTO INDIA.

Submitted the following remarks of Lieutenant Pogson, of Simla, on the above subject:—

"I see by the Bombay papers of the 15th instant that 'large purchases of wheat are being made in the North-West Provinces and Punjab by European Firms for exportation to Europe.' I notice that one of your Calcutta Firms has purchased six thousand tons (Mds. 1,62,000) for this purpose.

"Now I beg leave to submit that ten times this quantity would be purchased if good seed wheat was introduced, and as the Society may not move in this matter, perhaps the publication of this portion of my letter may induce the wealthy Firms who have started this most profitable export wheat trade, to import seed wheat from Europe, and if the seed wheat is *sent in the ear* (being filled into 'hop pockets,' or gunny bags, painted over), it will reach India in a perfectly sound state.

"We want the gold of England and Europe, to flow towards India in such a manner as to reach the hands of the cultivators of the soil, and by distributing imported seed wheat, and dealing with the zemindars direct, European firms would become Indian benefactors, and as ryots and zemindars will freely take payment in gold at market value, the importation of sovereigns would be a profitable undertaking, for in India, gold will always be at a premium, even if introduced by tons. Gold jewellery for married native women, is part of their religion, and the men have a decided penchant for gold ornaments and charms. Golden Grain *versus* Golden Coin will make the ryot a prosperous man. But he can do nothing without good seed.

"The Polish wheat, which ripens in 60 days after sowing and the Dantzic or forty days' wheat, (Triticum Polonicum of Willd) would be a God send to India, and the many eared Egyptian wheat, Triticum compositum, (Linn) would thrive in the Punjab. The wheat of Spain would also be of great value.

"I shall be most happy to conduct any wheat experiments. Polish wheat

sown here in March should be ready in May, the regular harvest season, and this seed wheat sown in October in the Punjab, would ripen by January, and very much earlier in Behar and North-Western Provinces."

COMMUNICATIONS ON VARIOUS SUBJECTS.

Letters were read—

From S. E. Peal, Esq., offering some remarks on Dr. Aleyboom's paper on the tea bug. (Transferred for Journal).

From Messrs. Vilmorin Andrieux & Co., forwarding the result of sowings of some assortments of their vegetable and flower seeds. These assortments were packed by Messrs. Vilmorin Andrieux & Co. in several ways, then sent out to the Society, and returned to them as requested. The result, which is curious and interesting, will be published in the Journal.

From Messrs. Ede and Hobson, Agents in India for the sale of Messrs. Ohlendorff and Co.'s dissolved Peruvian Guano, submitting, for the information of Members of the Society, specimen of the same, and printed certificates from various parts of the world "as to the effective produce and plant-preserving powers of this manure."

From the Collector of Banda, forwarding sample of the "flower of the Kans weed," *(Saccharum spontaneum)* wishing to know the best way of cleaning it, and if it would then be of any value.

The Secretary mentioned that he had stated in reply that he was unable to suggest any mode of cleaning; and that if he could, it was very doubtful whether any price could be obtained for it. Attempts had been made to utilize the downy filament contained in the follicle of the "Muddar," *(Calotropis gigantea)* and "Seemul" *(Bombax pentandrum)*, but except as stuffing for pillows and quilts, he had not heard of its being successfully applied to any other purpose, in consequence of its very great weakness. The flower of the kans would seem to be still weaker.

For the above communications and presentations, the best thanks of the Society were accorded.

Thursday, the 16th December, 1875.

W. H. COGSWELL, ESQ., *P. V., in the Chair.*

The Proceedings of the last Meeting were read and confirmed; and the following gentlemen elected Members:—

Messrs. F. R. S. Collier, P. Michea, E. S. Moseley, G. Billings, John Kelherer, W. R. Finch, Sultan Mirza, and Manager of the Pattareah Tea Company.

Chowdry Zalim Singh, zemindar of Seohara, in the Bijnore District, was proposed as a member by Mr. A. Boulderson, C. S., seconded by the Secretary; and Mr. W. A. Pryce, Station Master, Asansole, E. I. Railway, by Mr. B. J. Yate, seconded by the Secretary.

CONTRIBUTIONS.

1. The Forest Flora of North-West and Central India; by Dr. D. Brandis. From the Author.

2. On the establishment of an Indian Institute in connection with the India Museum and Library; by Dr. Forbes Watson. From the Author.

3. Records of the Geological Survey of India, Vol. 8, Part 4, and value of Poudrette as a manure. From the Government of Bengal.

4. Proceedings of the Asiatic Society for November 1875. From the Society.

5. Six Durian plants from Moulmein. From C. Ady, Esq.

6. Two plants full of capsicums. From J. G. Whitty, Esq. Mr. Whitty has raised these plants at Kurhurbalee, from Italian seed. The fruit is unusually large, measuring 4½ inches in length and nine inches in circumference, and is being reserved for seed when fully ripe.

GARDEN.

The Gardener's report was submitted. Mr. Head states having supplied a large quantity of shrubs of ordinary kinds for the Zoological Garden, and more plants are required. The "Ramee" seed alluded to in his last report has germinated freely. [A quantity is in stock for applicants.] The Litchee plants received from the Public Garden, Hongkong, have been put out and are doing well. The Gardener sends for inspection a sample of "Daniel O'Rourke" pea, raised from Buists (American) seed sown on 2nd November; "it is the most forward of all the peas, is not a good cropper, but earlier than either Landreth's (American) or Haage and Schmidt (Prussian) "Daniel O'Rourke," sown at the same time. I do not think it is true, but an early selected stock of it. I send also for inspection a plant of *Clivea Gardenii* in flower; it came from Kew, in the last case received from there; it flowered last year. The truss of flowers is not nearly so large as I have seen them in England,- probably Calcutta is too hot for it, it being in England an intermediate house plant." [The Secretary mentioned that a member had informed him that he had raised trusses double the size.] Mr. Head also sends his report of trial sowings of the vegetable seeds received from Messrs. Landreth, Haage and Schmidt, and Vilmorin Andrieux; that from Buist of Philadelphia was not just then at hand.

CUZCO MAIZE.

The Secretary called attention to the various reports submitted at the September meeting, on the failure of the Cuzco maize. He had now to refer to the following letters of a more favorable nature. Looking to the fact that the original habitat of this variety of maize is at so great an elevation above the sea, from eight to ten thousand feet, we can readily understand the cause of failure in every instance where its culture has been attempted in the plains of India:

Coll. T. H. Chamberlain, writes as follows, from Ranikhet, in Kumaon, under date the 7th November :—

"Some time since I noticed in the *Pioneer* newspaper report of the proceedings of the Agricultural and Horticultural Society, that the maize which had been distributed was being reported upon. Dr. King kindly sent me up some, which I divided with my brother who commands the Oudh Division.

"Here is the result of mine. I sowed in all 150 pips, of these 50 were of the red seed. Out of these 150 all germinated and grew to fine healthy plants; 10 to 12 feet high; 32 only have borne *no* fruit; 118 have borne exceedingly fine, well formed, heads.

"I have never tasted anything better at table of the kind, and I am letting the whole nearly (having gathered some 10 heads in all to try) ripen, in order to distribute it among the villages, and also to get it into cultivation for bazar sale.

"I planted mine in well prepared holes about 4 feet apart, with good old manure, leaf mould and sand, mixed together. I sowed in the middle of June, and they made immense growth. I dare say in another 15 or 20 days' time they will be fit to pick as fully ripe; and I shall then do myself the pleasure of sending you down a couple of heads of both kinds that you may see how the seed has answered in this climate. My garden is about 5,950 feet above the sea, faces S. E., and no special pains have been taken with these plants, which grew near other kinds—American and hill.

Mr. Francis Halsey, Madhopore, Punjaub, 8th December:—"I have never furnished you with any account of the Cuzco maize seed. It was sown on the 15th July, when the ordinary Indian Corn of the country is sown and germinated freely. By the 15th September it had reached the height of 15 feet when the male flowers appeared,—at the same time the female flowers commenced forming, and I was in hopes I was going to have a large crop. About a fortnight went by, and seeing no signs of increase in the cobs, I slit up the sheath of the leaf containing it and found the flower was so constricted that the pollen from the male flower could not pass down to the seed bearing portion of the plant. I waited another fortnight to observe the result of my operation, when I had the pleasure of seeing a few seeds form. I then slit open all the remainder, and they all commenced to form seed, but unfortunately the season was too advanced for the seed to come to maturity. But on the cob, I have saved, I have some dozen seeds which have arrived at full maturity. These seeds, I have little doubt, will bear plentifully next year.

"I cannot say, I quite understand the cause of this, except that I have often had trouble, the first year, with exotic seed of all sorts, in fact I may say the produce of imported seed rarely comes to perfection in any quantity during the first season of its introduction. If the Cuzco maize comes from the country its name indicates, I fancy it comes from a high and almost rainless table land of the Andes, and consequently it is not astonishing that it should find a difficulty in succeeding here. But at the same time, it seemed to thrive most extraordinarily during the rains, which this year amounted to 75 inches between the time it was sown and the commencement of October. It has a strong tendency

to send out adventitious roots, and if these are earthed up to the height of three feet, notwithstanding its inclination to grow so very tall, it is quite capable of sustaining its own weight.

"I am doubtful whether it is likely to turn out a satisfactory description for this country,—the village mills are not fitted to grind it, and it does not appear to be of a prolific nature or as inclined to return its seeds as rapidly as many of the native kinds. An English farmer prefers the small round native seed of this country to the horse tooth American varieties. I fancy because they can get greater weight per bushel from the former.

"I should like to have some more seed of it next year, if you have any to spare."

Lieut. J. F. Pogson, who had previously communicated in the earlier stages of his experiments, adds as follows:—

"*September 22nd.*—You will be glad to hear that the Cuzco maize is getting on famously. The cobs have set on 12 plants; on 5 highly manured plants they as yet range from 2 to 5. Now as one single grain of the Cuzco maize seed weighed five seeds or grains of the Hill seed, an average of three cobs of Cuzco equals 15 cobs of Hill or common maize. I will look to this when the seeds get ripe any how. I have been successful, and as zemindars gape at maize plants now ranging from 12 to 15 feet and beg for the seed, for next year, some good has come from the introduction of the new maize.

"In 1862, you sent me some cobs of American Maize, and in 1863 and 1864, I gave numerous zemindars the acclimatized seed, which is now well established. In the bazar three cobs of Hill maize are sold for one pice, (¼ anna) and only one cob of the American for the same price. Thus 12 of the common represent one anna, and 4 of the American give the same price. I do not think the Cuzco will answer in the plains, but it will thrive in the Hilly districts of the Punjab. It will grow in Sylhet, on the Orange soil, and any where else where the soil is calcareous.

"*October 16th.*—I have just been through my three patches of Cuzco maize, and find that there are thirty seven plants with cobs now on them. One plant with cobs was destroyed a few days ago by a monkey, thus making 38 plants in bearing out of the one hundred seeds put down. Three seeds were accidentally destroyed after sprouting; but all the others came up, so no fault can be found with the seed. In my last report, I mentioned that one to five cobs per plant had been produced, (please read 1 to 4 cobs in place of 5.)

"The half eaten cob, left by the monkey, was examined by me, good sized grains had formed. They were cream colored, and very sweet to the taste.

"I have now every hope of being able to acclimatize the seed as six cobs are ripening fast, and others are changing colour, whilst some are quite green, and I suspect will not come to any thing.

"I will in due course report further on this maize, and send you some of the seed.

"*November 19th.*—The Cuzco maize is steadily ripening its cobs, and (D. V.) next year will be fairly started in these hills. I will, when ripe, send you some of the seed, and I think to acclimatize it so as to suit your climate. The seed should be sent to Sylhet being sown and grown on the best Orange tree soil, which, as you know, is highly calcareous. The seed so raised in 1876, will in 1877, grow in all parts of India, provided the best Sugar-cane land be selected for the purpose. The change from Peru to India was very great, hence I am not surprised at the general failure of the maize. My success is due to a good climate and suitable manuring. The Thermometer, placed in the sun to-day, marked 112° Farenheit at 12 o'clock. It being 74° Farenheit in my open verandah facing the south. This heat is quite sufficient to ripen maize or any thing else."

Coll. Chamberlain's and Lieut. Pogson's promised seed has not yet come to hand

TUSSUR SILK.

Read the following letter from Monsr. Lotteri on the above subject :—

"With reference to our last conversation, I have the pleasure to enclose two copies of my remarks on Tussur Cocoons. One copy is intended for your Society, and I shall feel much obliged if your Society will be good enough to forward the other copy to Government in the Dpartment of Revenue, Agriculture and Commerce, so that they may the better appreciate the importance of the subject.

"As regards my views in the matter, I would be quite satisfied if Government and the owners of the forests referred to, would subscribe towards the expenses of a model filature of which I would have charge, feeling perfectly persuaded that the liberality of Government would sufficiently remunerate me.

"My series of samples are entirely at your disposal, in case you or any one else should wish to inspect them."

It was agreed, on the recommendation of the Council, to forward the enclosure to the Department of Agriculture and Commerce. The specimens were admired for their superiority over the ordinary native reeled tussurs.

Letters were read—

'From Captain Protheroe, at Port Blair, forwarding a bag of acclimatized Carolina paddy. This grain has now been introduced into Port Blair for five years and Captain Protheroe wishes to know whether it has at all deteriorated. Mr. Swinhoe was of opinion that, though still of fair quality, this grain had deteriorated.

From Mr. R. G. Watling, Manager Oil Factory, E. I. Railway at Manowri, near Allahabad, in reference to the enquiries of Mr. G. M. Smith, of Assam, which were introduced into last month's proceedings, regarding the localities from which oil cake could be obtained as a manure for the tea plant. Mr. Watling states that no less a quantity than 12,458 cwt. had been despatched in the eleven months of this year from Manowri to Biddabutty near Howrah. The freight to Howrah is Rs. 66 per hundred maunds. The rate per maund at which it is obtainable at Manowri is not given.

A. H. BLECHYNDEN,

Secretary.

REPORT

OF THE

Agricultural and Horticultural Society

OF

INDIA.

Report from the Council, at the Annual General Meeting, held on the 27th January, 1876.

THE Council have now to submit their usual Annual Report for the past year.

The progress of the Society, as regards the election of new Members during the year 1875, is greatly in advance of previous years; an accession much needed for the attainment, if practicable, of a number, in excess of the average of previous years, but which it has unfortunately failed to do. Although the number elected and rejoined are 160 (exceeding that of any previous 12 months) against 112, 89, 87, and 133 in four previous years, and although the deductions by declared resignations (52) deaths.*, (23) are in the aggregate six less than that in 1874; yet the number of names (65) removed from the list at the end of 1875, on account of non-payment of subscriptions for two years and upwards; as also the removal of the names of certain parties (7) who were elected in 1874 and 1875, but have failed to respond to the notices of election (in all 72), coupled with the names of 25 Members who, owing to long absence from India, or not rejoining on return, have also been removed, reduce the paying number to 663 or 12 less than in the year 1874. Of these 663, it may be mentioned, that 59 Members included in the list as resident in the country, have not yet responded to calls for subscription,—thus further reducing the actual paying number of Members to 604. In addition to the above 663 nominal paying Members, the Society comprises 31 life Members, 17

* J. Woodford Birch, Walter R. Brown, James Cowell, H. P. Clark, Alfred Courjon, Wm. Cutts, Lieut.-Col. A. F. Corbett, J. Gouldhawke, W. F. Graham, James Hills, G. G. MacPherson, W. J. H. Money, J. W. Maseyk, J. Mackay, Sir Edward Ryan, V. Roquet, William Stevenson, Jr., M. D., J Shaw, J. M. Scott, C. J. Spencer, Cecil Stephenson, Capt. H. W. Toogood, and Samuel Wauchope.

Honorary, Associate and Corresponding, with 116 absent in England, bringing up the total to 827 Members, as specified in the subjoined classified statement:—

Classification.	In 50 previous years.	In 1871.	In 1872.	In 1873.	In 1874.	In 1875.	Gross Total.	Total real number at the close of 1875 after deducting lapses.
Honorary Members ...	20	2	0	0	0	1	23	8
Associate Members ...	6	0	0	0	0	0	6	2
Corresponding Members ...	14	0	0	0	1	0	15	7
Civilians, Covenanted and Uncovenanted	693	24	14	10	14	16	771	120
Merchants and Traders ...	606	14	10	10	18	15	673	103
Agriculturists	596	22	27	19	41	90	795	250
Military Officers	639	34	12	15	4	4	708	97
Medical Officers	229	8	8	7	6	7	265	41
Asiatics	267	16	8	8	25	10	334	90
Clergy	39	0	1	1	0	0	41	6
Law Officers	121	4	4	2	6	6	143	28
Miscellaneous, Police and Civil Engineers ...	137	9	3	17	8	12	186	75
	3,367	133	87	89	123	161	3,960	827

Of these 827 *Members,* 175 *are resident in Calcutta,* 502 *in the Country, and* 150 *in Europe.*

Among the Members lost by death, the names of the Right Hon'ble Sir Edward Ryan, an Honorary, and Mr. James Cowell, a Corresponding Member, cannot be passed over in silence. Sir Edward Ryan was for several years, and until his retirement from India in 1840, the President of the Society, and in that capacity, and previously as a Vice-President, he rendered valuable service. The Society under his management commenced that career of prosperity, which it has, till recently, maintained. Mr. James Cowell, was a zealous and active working-member

during his long residence in this country; he more especially took much interest in those important staples, cotton and fibres, and was always ready to afford the Society the benefit of his experience in these and other articles. On his return to England he was elected a Corresponding Member, and in that capacity continued his interest in the affairs of the Society, till declining health obliged him to cease his communications.

The Council regret inability to report so satisfactory an improvement in the financial position or prospects of the Society as could be desired, and must hopefully rely on permanent aid, as formerly, from the Government Imperial funds, to secure the stability and proper and effective working of the various objects of the Society.

Included in the amount of ordinary receipts, are three distinct items, *viz.*, interest on vested funds Rs. 180, proceeds of sale of *Araucarias* Rs. 2,042, and proceeds of sale of ornamental shrubs Rs. 1,093-7-6, aggregating Rs. 3,915-7-6, which, being deducted from the legitimate ordinary sources of income, would reduce the amount of receipts to Rs. 31,832, which is below the average ordinary income of the Society for five previous years.

The entire amount of the vested funds of the Society has been sold, and proceeds absorbed in meeting past liabilities. The Society's garden, which had been laid out at some considerable expense, has now been denuded of all its stock of valuable *Araucarias*, (some of them six and seven years old) as also of the greater portion of its stock of well grown and well advanced in size, handsome and attractive ornamental shrubs, the majority of which were reared before the garden was commenced on, while others, introduced and planted in the garden on its first formation, have nearly all been disposed of. The Society cannot therefore expect for some time any further income from these three sources. These extraordinary sales, while they have tended so materially to swell the receipts for the year under review, have been effected at the cost and partial spoliation of the garden, in order to meet pressing demands on the Society.

The amount under the head of subscription, is shewn to be slightly in advance of previous years. This increase is mainly attributable to the amount realized from new Members on account of admission fees; and but for this fact the actual amount of subscription would not have exceeded the ordinary average.

The cost of maintenance of the garden, although greatly reduced, continues a heavy drain on the resources of the Society, absorbing not less than one-third of the annual subscription with, unfortunately, not so proportionate a return as to render the operations of the garden as yet so satisfactory to Members as could be desired.

The Society have to record with thanks the temporary aid kindly afforded by the Government of Bengal by a donation for the year of Rs. 2,400., which amount, together with the sale

proceeds of imported *Araucarias* and other ornamental shrubs, as above adverted to, has enabled the Society to defray its old liabilities.

The arrears from Members who have availed of their privileges, is Rs. 1,680-1-7 for balances of subscription and other charges, or say Rs. 290, more than last year. The Balances of arrears for four previous years, may be set out as follows :—

1871,	Rupees	271	5	0			
1872,	„	89	5	0			
1873,	„	195	10	9			
1874,	„	174	4	1			
					730	8	10
Arrears for 1875				...	1,680	1	7
				Total, Rs. ...	2,410	10	5

A large portion of the Rs. 730-8-10 may be looked upon as hopelessly bad, representing as it does claims on deceased Members and Members who have left the country, &c., and will at the close of another year be reduced by carrying all such irrecoverable amounts to the debit of profit and loss account.

The Council are of opinion that such results of the working of the Society reflect credit on the executive. Were the entire arrear (Rs. 730) irrecoverable, the loss on each year would not exceed Rs. 180 per annum, and considering the nature of the connection of Members with the Society, and the absence of all coercive measure to enforce payment of subscription, &c., the loss may be considered trifling, arising as it does for the most part on account of deaths, leaving the country, and other risks inseparable from all monetary transactions.

In respect to the distribution of plants from the garden, it it may be mentioned, by way of record, that 240 applications have been partially met, but not from that number of Members seeing that several were obliged to apply repeatedly in consequence of the inability of the Gardener to meet their requisitions fully at one time.

From the Gardener's return it would appear that out of 240 applications, 77 were for fruit grafts and 19 for cuttings of ornamental shrubs and rose plants ; further that 7,149 ornamental rooted plants have been delivered, including 686 roses and 520 cuttings of ornamental shrubs and 120 of roses, besides 1,858 grafts and seedlings of fruit trees.

To non-members, 1,800 ornamental plants have been sold, and 5,629 to the new Zoological Garden.

The Council desire to record their obligations to several Members for contributions of plants and seeds, including, among others, Mr. H. A. Firth for a valuable collection of *Araucarias*. Messrs. C. K. Hudson and L. Johnson for Orchids ; Dr. T. Beaumont for bulbs and tubers of rare plants; Dr. Geo. King for

seeds, and to the Superintendents of the Hong-Kong and Mauritius Government Gardens for plants, and to the Queensland Acclimatisation Society for seeds.

Several subjects of interest and usefulness have come before the Society during the past 12 months, including communications on the disease of the cultivated (mulberry) silk-worm in Bengal; on the tussur silk-worm; tobacco culture with reports on specimens; the culture of mahogany and coffee, including the Liberian variety; reports on trial of the Cuzco maize in various parts of the country; introduction of certain varieties of potatos, &c. Notices on all these having appeared in the monthly proceedings need not be further dwelt on in this Report.

Another number of the Journal has been published, Part I. of Vol., V. Part II. is now in the Press.

It will be observed from the foregoing remarks how needful it is for the future stability of the Society, and to enable the Council to carry out its operations on a more extended scale, than recently, that a larger annual amount should be placed at their disposal. The Council, therefore, at the commencement of another year, seek the active co-operation of the Members to aid them in extending the usefulness of the Society. An Indian community has always been a fluctuating one, and never more so than, for obvious reasons, at the present time; and, consequently, a considerable addition is annually needed to fill up vacancies. With such object in view, the Council, in conclusion, conceive they are not preferring an unreasonable request in asking each Member during the year to place at least one of his friends on the list of subscribers.

Statement of Receipts and Disbursements of the AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA, *from 1st January to 31st December*, 1875.

RECEIPTS.

From Members—Subscriptions collected during the year				...	22,951	7 8
„ Accruings of Interest from Government Securities				...	180	0 0
„ proceeds of country vegetable and other seeds	247	8	0			
„ proceeds of surplus stock of American, French, and German vegetable, and French and German flower seeds ...	1,749	0	0			
„ proceeds of fruit grafts ...	1,350	0	0			
„ proceeds of copies of Journals of the Society	96	4	0			
„ proceeds of copies of other publications of the Society	91	10	0			
„ proceeds of seed cabinets sold ...	28	8	0			
„ proceeds of copies of Hand-book for Indian Vegetable Gardens	37	0	0			
„ amount of freight re-paid	885	9	6			
„ amount of Suspense Account in deposit for appropriation on various accounts ..	810	6	3			
„ proceeds of sale of Araucarias ...	2,042	0	0			
„ proceeds of sale of ornamental plants, grass, &c., and cooly hire at the garden, Alipore	1,693	7	6			
					9,031	5 3
„ Agency Seed Deparment—Amount from Members in re-payment of packing and forwarding charges, pots, boxes, &c. ...				...	3,585	6 0
Total, Ordinary Receipts, Rupees ..				...	35,748	2 11

EXTRAORDINARY RECEIPTS.

From Government of Bengal Donation for the year 1875	2,400	0	0			
„ proceeds of sale of Government Securities	8,470	8	0			
					10,870	8 0
Total, Rupees ...				...	46,618	10 11
Balance in the Bank of Bengal on 31st December, 1874				...	6,751	1 6
GRAND TOTAL, RUPEES ...				...	53,369	12 5

DISBURSEMENTS.

PURCHASE OF SEED ACCOUNT.

By Messrs. D. Landreth and Son, on account of consignments of seeds received in 1874, and in part for 1875	7,677	3	11			
Carried over ...	7,677	3	11			

Brought forward ...	7,677	3	11			
By Messrs. Vilmorin, Andrieux & Co., on account consignments of seeds received in 1874, and in part for 1875	6,033	6	6			
„ Messrs. Haage & Schmidt, on account ditto ditto ditto ...	3,736	1	11			
„ Messrs. Law, Somner & Co., on account ditto in full	1,017	8	1			
„ Messrs. Dick, Radcliffe & Co., on account ditto in 1874 in full	454	9	3			
„ Robert Buist, Jr., ditto ditto in 1875 in part	1,103	7	2			
„ sundry parties for country vegetable seeds, potatoes, &c. &c.	105	8	0			
				20,127	12	9
LIBRARY ACCOUNT.						
By Messrs. H. S. King & Co., for sundry publications	46	14	4			
„ sundry parties for Books and Newspapers ...	47	0	0			
„ Duftry for binding books	46	0	0			
				139	14	4
PRINTING ACCOUNT.						
By Messrs. T. Black & Co., for printing Bye-laws, Letters of Calls, Money Receipts, Annual Reports, Cash and Subscription books, &c., &c. ...	...			175	4	0
JOURNAL ACCOUNT.						
By Messrs. T. Black & Co., for printing 750 copies of Journal, Vol. V., Part I., New Series				564	5	3
ESTABLISHMENT ACCOUNT.						
By Office Establishment from December 1874, to November 1875	8,015	11	0			
„ Agency Seed Department, ditto ditto ...	3,000	0	0			
				11,015	11	0
ADVERTISEMENT ACCOUNT.						
By Advertising Notices of Meetings, Seeds for distribution and surplus seeds for sale, &c.	...			74	8	0
FREIGHT ACCOUNT.						
By Freight paid on Australian Field Seeds and Mr. Buist's American Vegetable seeds ..	50	11	4			
„ Freight paid on packages of seeds, plants, &c., sent to Members	1,042	2	3			
				1,092	13	7
METCALFE HALL ACCOUNT.						
By proportion of House, Police, and Lighting rates, from October 1874 to September 1875, and Water-rates to December 1875 ...	657	0	0			
„ Messrs. Burne & Co., further part for repairs to the building	2,000	0	0			
„ sundry petty repairs to the building ...	23	10	0			
				2,680	10	0
				35,870	14	11

				Brought forward ...		35,870 14 11
				STATIONERY ACCOUNT.		
By sundry parties for Stationery purchased ...			...		44 4 0	
				REFUND ACCOUNT.		
By amount refunded balances of accounts due to Members ...			...	62 11 0		
Ditto	ditto	for seed cabinets sold		30 0 0		
Ditto	ditto	for Hand-book for Indian Vegetable Garden ...	...	37 0 0		
					129 11 0	
				PURCHASE OF PLANTS.		
By Mr. W. Bull, in full for rare plants supplied				144 3 7		
„ sundry parties for fruit grafts, flowering shrubs and Roses purchased ...			...	268 11 3		
					412 14 10	
				PETTY CHARGES ACCOUNT.		
By postage on letters, copies of Journals, &c., sent and received ...			.	186 10 9		
„ Bank of Bengal Commission on Interest drawn, brokerage for Government Securities sold, discount on Cheques on foreign Banks, stamped Bank Cheques, &c. &c.				39 9 4		
„ Punkawallahs, hackery, boat and cooly hire, extra packermen, landing and forwarding charges, cost of Wax-cloth, Sealing-wax, Twine, &c. ...			...	427 0 5		
					652 11 6	
					37,110 5 3	
				NEW GARDEN ACCOUNT.		
By cost of sundry materials and for propagation of Roses, fruit grafts, orchids, &c. ...		...		254 3 0		
„ cost of tools, implements, and contingencies, &c. ...		...		1,554 14 9		
				1,809 1 9		
„ salary of Head Gardener, from December 1874 to November 1875 ...		2,030 0 0				
„ commission to Gardener on sale of plants . ..		368 0 0				
„ wages of Native Establishment, Mallies, Coolies, &c. ...		2,729 2 9				
				5,127 2 9	6,936 4 6	
Total Expenditure, Rupees ...				...	44,046 12 9	
By balance in the Bank of Bengal on 31st December 1875 ...				...	9,322 15 8	
Grand Total, Rupees ...				...	53,369 12 5	

MEMORANDUM.

DISBURSEMENTS

To amount of ordinary disbursements during the year 1875, as per Statement	37,113	2	
,, Amount of Extraordinary Expenditure during the year 1875, as per Statement	6,946	6	
Total Expenditure, Rs.		44 64	12 9
,, Balance in the Bank of Bengal on 31st December, 1875		9,322	15 8
Grand Total, Rupees		53,369	12 5

LIABILITIES.

Messrs. D. Landreth and Son, for balance of seeds supplied in 187	£	58	0	0	
,, Vilmorin Andrieux and Co., &c. ditto ditto	,,	46	8	3	
,, Haage and Schmidt for ditto ditto	,,	13	10	3	
Robt. Buist, Jr., for ditto ditto	,,	15	2	3	
Messrs. Jas Carter and Co., for Potatoes in 1873	,,	24	0	0	
,, Jas Veitch and Sons, for rare plants	,,	68	5	3	
Total	£	225	6	0,	or say in Rs. 2,515 0 0
Messrs. Burn and Co., balance repairs to Metcalfe Hall					3,860 8 0
,, Grindlay and Co.					132 8 0
					3,993 0 0
Total, Rupees					6,508 0 0

RECEIPTS

By Balance in the Bank of Bengal on 31st December 1874			6,751	1 6
Amount of Ordinary Receipts during the year 1875 as follows:—				
Subscriptions &c	28,247 5 5			
Agricultural Department	3,585 6 0			
		31,832 11 5		
By Amount of Extraordinary receipts, as follows:—				
Sale of Nurseries	2,042 0 0			
Sale of Ornamental Shrubs, &c	1,693 7 6			
Interest on vested funds	150 0 0			
Sale of Government Securities	8,470 8 0			
Government of Bengal Donation	2,400 0 0			
		14,785 15 6		
Total Receipts, Rupees			46,618	10 11
Grand Total, Rupees			53,369	12 5

ASSETS.

Amount of Cash balance		9,322	15 8
Balance of subscription, &c, due from Members from 1871 to 1874	730 8 10		
Ditto ditto for 1875, as follows:—			
Balance of subscription, Rs. 1,084 5 1			
Balance of seeds, grafts, freight, &c. 595 12 6			
	1,680 1 7		
		2,410	10 5
Total, Rupees		11,733	10 1
Memo:			
Society's proportion cost of erecting the Metcalfe Hall	23,557 15 9		
In landed property including building at Alipore	20,646 6 0		
		44,204	5 9

LIST OF MEMBERS

OF THE

Agricultural and Horticultural Society

OF

INDIA.

DECEMBER 31st, 1875

ALPHABETICALLY ARRANGED,

CLASSIFIED,

AND

DISTINGUISHING THE YEAR OF ADMISSION.

Office Bearers.

Presidents :

DR. GEO. KING.

Vice-Presidents :

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Secretary and Treasurer.

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DR. S. C. MACKENZIE.

J. W. O'KEEFE, ESQ.

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List of Members.

* This mark denotes Members who are absent from India, and therefore non-contributors.

† This mark denotes Members who, though absent, are desirous of continuing their subscriptions.

HONORARY MEMBERS.

	Don Ramon de la Sagra, Island of Cuba ...		
	The Right Hon'ble Sir Lawrence Peel, London	1842	1856
	R. Fortune, Esq.		1856
	A. Grote, Esq., London	1837	1868
5	The Revd. T. A. C. Firminger, London ...	1851	1868
	Baboo Peary Chand Mittra, Calcutta ...	1847	1871
	John Scott, Esq.		1871
	J. A. Crawford, Esq., London	1857	1874

CORRESPONDING MEMBERS.

	D. J. MacGowan, Esq., M. D., Ningpo	1851
10	Mons. Natalis Rondot, Paris	1858
	Lieut.-Col. W. H. Lowther, Jubbulpore ...	1864
	Dr. H. Cleghorn, Edinburgh	1867
	Vause Fretwell, Esq., Supdt. of Model Farms at Bhurgaums, Kandeish	1869
	C. Brownlow, Esq., Cachar...	1870
15	Samuel Jennings, Esq., London	1874

ASSOCIATE MEMBERS.

	Capt. E. P. Nisbet, London	1842
	Geo. Bartlett, Esq., Calcutta	1870

LIFE MEMBERS.

		Admitted
	Anund Rao Puar, His Highness, the Rajah of Dhar, Dhar, *via* Indore, C. I.	1872
	Bentall,* Edward, Esq.	1837
	Bhopal, H. H. the Begum of	1870

LIFE MEMBERS.—*(Continued.)*

		Admitted.
	Bhowany Sing, Maharajah, Duttea	1864
5	Bishop,* Major H. P. (Artillery)	1853
	Bishnath Sing, Rajah Bahadoor, Chief of Chutterpore, Bundlekund	1875
	Brodie,* Major T.	1836
	Bulger,* Frederic Pole, Esq.	1837
	Carew,* R. R., Esq.	1846
10	Colvile,* Sir J. W.	1849
	Gopaul Sing, Rajah of Jabooah, *via* Indore ...	1874
	Hawkins,* John Abraham Francis, Esq. ...	1837
	Heralall Seal, Baboo, Calcutta	1858
	Joy Sing, Deo Bahadoor, Maharajah of Chikari ...	1868
15	Jung Bahadoor, Maharajah, G. C. B., Nepal ...	1860
	Lowther,* Robert, Esq.	1836
	Maharaj, Dheraj Matabchunder Bahadoor, Rajah of Burdwan	1836
	Maharajah of Johore	1868
	Manikjee, Rustomjee, Esq., Merchant, Calcutta ...	1837
20	Mills,* Andrew John Moffat, Esq.	1836
	Munsier Ali, H. H., The Nawab Nazim of Bengal ...	1874
	Palmer,* T. A. G., Esq.	1861
	Rajkissen Mookerjee, Baboo, Landholder, Ooterparah	1836
	Richards,* J., Esq., Merchant	1834
25	Roodurpurshaud, Chowdry, Nanpore, Tirhoot ...	1867
	Roop Deo, Rajah of Ali-Rajpore, *via* Sirdarpore, C. I.	1874
	Roordur Purtab Sing, Rajah Bahadoor, Dewan of Punna	1868
	Sheodial Sing, H. H. Mohakhan, Rajah of Alwar ...	1863
	Suttyanundo Ghosal, Rajah Bahadoor, Bhookoylas...	1869
30	Thompson, Dr. R. F., Hooghly	1865
	Wigram, Percy, Esq., C. S., Bustee	1871

ORDINARY MEMBERS.

A.

		Admitted.
	Abbott, Horace, Esq., Rajapóre, *via* Koosteah ...	1858
	Abbott, A. E., Esq., Tikala Factory, Tirhoot ...	1874
	Abbott, H. E., Esq., Manager, Jauntpore Factory, Tirhoot	1874
	Abdool Gunny, Kajee, Nawab, Zemindar, Dacca ...	1860
5	Abdool Jubbur, Moulavi, Calcutta	1874
	Abdool Kureem, Sohundam, Behar	1875
	Ady, Charles, Esq., Merchant, Moulmein ...	1864
	Agabeg, Thadeas, Indigo Planter, Baraset ...	1875
	Ahmed, Dr. Z. A., Civil Surgeon, S. P. Doomka ...	1875

A.—*(Continued.)*

		Admitted.
10	Ahmed Alim, Nawab, Russapugla	1874
	Ainslie,* Hon'ble W., Civil Service ...	1847
	Aitchison, W., Esq., Manager, Doloo Tea Garden, Cachar	1869
	Alexander, N. Stuart, Esq., C. S., Tipperah ...	1864
	Alexander,* Lieut.-Col. W. R. E.	1867
15	Ameer, Allee Khan, Moonshie, Bahadoor, Calcutta ...	1869
	Angelo, E., Esq., Cossipore	1873
	Anley, George, Esq., Civil Engineer, Purneah ...	1861
	Anthony, Adam, Esq., 1st Assistant Accountant-General, Allahabad	1870
	Archer,* Revd. J. B.	1869
20	Armstrong, T. W., Esq., Supdg. Engineer, Takly, Nagpore, Central Provinces	1862
	Armstrong, Joseph Samuel, Esq., C. S., Pooree ...	1865
	Assistant Manager, Ting Ling Tea Co., Darjeeling ...	1875
	Assistant Manager, Singbulli and Nurmah Tea Co., Limited, Darjeeling	1875

B.

	Baillie, Dr. N. B., Civil Surgeon, Bhaugulpore ...	1872
25	Baird,* Lieut.-Col. A. F.	1861
	Balfour, H. T., Bank of Bengal, Benares ...	1875
	Banee Madhub Roy Chowdry, Zemindar, Allahabad	1873
	Banee Madhub Sen, Baboo, Calcutta	1875
	Blandford, A., Turtipore Indigo Concern, Malda ...	1875
30	Barber, H. W., Esq., Deputy Magistrate, Contai ...	1875
	Barker, Dr. R. A., Civil Surgeon, Beerbhoom ...	1870
	Barlow, G. N., Esq., Civil Service, Bhaugulpore ...	1864
	Barron, Capt. W., Dy. Supdt., Revenue Survey, 4th or Moradabad District, Nynee Tal	1871
	Barstow, H. C., Esq., Civil Service, Sehore ...	1868
35	Bartlett,* Col. H. T.	1865
	Barton, E. J., Esq., C. S., Bogra	1874
	Bayley, The Hon'ble E. C., Civil Service, Calcutta...	1863
	Bayley,* Stuart Colvin, Esq.	1859
	Beadon, Henry, Esq., Civil Service, Hazareebaugh ...	1867
40	Beaufort, Francis L., Esq., Civil Service, Calcutta ...	1838
	Beaumont, Dr. Thomas, Residency Surgeon, Indore	1870
	Beckett, W. O. A., Esq., Dy. Commr., Cooch Behar...	1871
	Beeby, G. O., Esq., Solicitor, Calcutta	1860
	Beer Chunder Manick, Bahadoor, Maharajah of Tipperah	1870
45	Bennett, Walter H., Esq., Supt., New Tea Concern, Assam	1873
	Benode Beharee Mullick, Baboo, Calcutta ...	1873

B.—(*Continued.*)

Admitted.

Benson, George, Esq., Pleader, High Court, N. W. P., Bareilly 1868
Berkeley, L., Esq., Simla 1855
Berkeley, Vilters, Esq., Judge, Small Cause Court, Nynee Tal 1869
50 Bevefidge.* H., Esq., C. S. 1865
Bhoojender Bhoosum Chatterjee, Zemindar, Calcutta 1873
Bhugwan Chunder Bose, Baboo, Deputy Magistrate, Cutwa 1875
Bhugwan Sing, Sirdar, Umritsur 1871
Bhugeruttee Mohendra, Bahadoor, Maharajah of Killoh, Dewkonull 1871
55 Bignell, R. A. D'O., Esq., Assistant Superintendent of Police, Tirhoot 1867
Billings, G., Deputy Magistrate, Meerut 1875
Bimala Churn Bhuttacharjea, Deputy Collector and Magistrate, Nowada, *via* Behar 1870
Birch,* Capt. R. G. 1867
Blacker, G. M., Esq., Merchant, Calcutta ... 1856
60 Blathwayt, Capt. L., Assistant Commissioner, Hazareebaugh 1871
Blechynden, R., Esq., Merchant, Calcutta ... 1858
Blechynden, A. H., Esq., Secretary, Agri-Hort. Society of India, Calcutta 1851
Blissett, T., Esq., Govt. Tel. Department, Calcutta ... 1874
Boddam, Col. Hungerford, Hazareebaugh ... 1871
65 Boileau, G. W. K., Esq., Silk Concern, Furreedpore 1874
Bond, T. T., Govt. Engineer, Steam Mills, Cawnpore 1873
Bonnaud, Arthur, Esq., Merchant, Calcutta ... 1873
Bourne, Walter, Esq., Chief Engineer, E. I. Railway, Calcutta 1855
Boulderson, A., Esq., C. S., Bijnore 1872
70 Bowers, Mrs., Bhuptnai, Protaubgunge, Bhaugulpore 1872
Boxwell, J., Esq., C. S., Nya Doomka 1874
Brae, T., Esq., Dabracole, Commercolly, E. B. Railway 1854
Brander, James, Esq., E. B. Railway, Sealdah ... 1865
Brandis, Dr. D., Inspector-General of Forests ... 1874
75 Branson, J. H., Esq., Barrister-at-Law, Calcutta ... 1874
Bridgman, J. H., Esq., Goruckpore 1868
Brodhurst, M., Esq., Civil Service, Benares ... 1859
Broucke, W. J., Esq., Indigo Planter, Bhugha Factory, *via* Chumparun 1859
Broughton, E., Esq., Merchant, Calcutta ... 1865
80 Brown, Col. D., Commissioner, Tenasserim Provinces, Moulmein 1856
Brown, Dr. Robert, Political Agent, Munipore ... 1868
Brown, Forbes Scott, Esq., Merchant, Penang ... 1840

B.—(*Continued.*)

Admitted.

Brown, J. A., Esq., Superintendent of Roads, Cachar 1870
Brown, T. Allen, Esq., Deputy Collector, Allahabad 1873
85 Brown, H. F., Esq., Merchant, Calcutta 1875
Brown, Lord Ulick, Civil Service, Calcutta ... 1867
Brown, Rudston, Bhikanpore Factory, Tirhoot ... 1875
Browning, C. G., Esq., Director, Public Instruction, Nagpore 1872
Buck, E. C., Esq., C. S., Nainee Tal ... 1870
90 Buckley, Major F. A., 37th N. I., Landour ... 1874
Bull, Alexis, Bambarria Tea Estate, Seebsagar, Assam 1875
Burkinyong, H. H., Oating Factory, Golaghat, Assam 1875
Bury, Percival, Esq., Tea Planter, Cachar ... 1869
Buskin, E. G., Esq., Calcutta 1864
95 Buskin, M., Esq., Serepore Factory, Chuprah ... 1870
Butler, Walter, Naga Doolia Factory, Jorehaut, Assam 1758
Butt,* Geo., Esq., Civil Service 1866
Byrne,* William A., Esq. 1870

C.

Cadell, Alan, Esq., Civil Service 1872
100 Calder, G. L., Esq., E. B. Railway, Kanchraparah ... 1871
Campbell, N. I., Esq., Elambazar, Bhulpore ... 1875
Campbell,* Hon'ble Geo. 1865
Campbell,* Major A. E. 1871
Campbell, D. W., Esq., Locomotive Supdt. E. I. Railway, Jamalpore 1870
105 Campbell, A., Esq., Tea Planter, Selim Tea Estate, Kurseong 1872
Campbell, W. A., Esq., Manager, Surgoo River Tea Plantation, Chittagong 1874
Cantonment Magistrate, Cawnpore 1873
Carew, R. H., Esq., Tea Planter, Cachar ... 1874
Carleton, C. F., Esq., Indigo Planter, Meerpore, Motecharry, Chumparun 1868
110 Carnac,* C. F., Esq., Civil Service 1865
Carnac, H. Rivett, Esq., C. S., Ghazepore ... 1869
Carter,* J. H., Esq., Civil Service 1870
Carey, J., Esq., C. E., Indore 1875
Carter, F. McL., Esq., Chandpore Tea Estate, Chittagong. 1875
115 Carshore, Walter B., Nundinee Fy., Shapore, Oondee 1875
Carnegy,* P. T., Esq., Asst. Comsr., ... 1872
Carritt,† Alfred, Esq., Merchant, ... 1873
Castle, C. T., Esq., Supdt. of Police, Etawah ... 1865
Chamarett, A., Esq., Surveyor Genl's Dept., Calcutta 1874

C.—(*Continued.*)

		Admitted.
120	Chambers, Charles, Esq., Civil Engineer, E. I. Railway, Jamalpore	1868
	Chardon, A., Esq., Bimayram Factory, Dhoolian ...	1874
	Chardon, W. B., Esq., Seepah Factory, *via* Arrah ...	1864
	Charriol, F., Esq., Merchant, Calcutta	1875
	Chairman, Kishnaghur Municipality, Kishnaghur ...	1875
125	Cheetham, W. H., Esq., Merchant, Calcutta ...	1870
	Chennell, Thos., Esq., Dewen Tea Estate, Debrooghur, Upper Assam...	1870
	Chester, Major, H. D. E. W., Officiating S. A. C. G., Mooltan	1869
	Christian, A., Esq., Putterghat Factory, Mudheepoorah, Bhaugulpore	1872
	Christian, E., Esq., Bugha, Champarun... ...	1875
130	Chunder Kaunt Mookerjee, Baboo, Calcutta ...	1866
	Chunder Kirtee Singh, Maharajah of Munnipore ...	1874
	Clark, Col. E. G., Settlement Officer, Kheree ...	1872
	Claxton, E., Esq., Dy. Controller of Accts., P. W. D., Allahabad	1875
	Cogswell, W. H., Esq., Calcutta, *Vice-President* ...	1866
135	Cole, Conductor Thos., Secunderabad, Deccan ...	1873
	Cole, Revd. J., Supdt., Lawrence Asylum, Sanawur	1865
	Collins, Capt. W. B., Calcutta	1873
	Collis, F. S., Esq., Barrister-at-Law, Calcutta ...	1871
	Colvin, B. D., Esq., Merchant, Calcutta... ...	1868
140	Collier, F. R. S., Esq., C. S., Kungram, Rungpore ...	1875
	Comley, J. M., Esq., Calcutta	1871
	Commandant* Deolee Irregular Force, Deolee ...	1871
	Cooke, F. C., Esq., Taleah Factory, *via* Burhuj, Goruckpore	1866
	Corbyn,* Capt. E. C.	1871
145	Cornell, W., Esq., Civil Service, Bancoorah ...	1861
	Cosserat,* Lewis, Esq., Indigo Planter ...	1859
	Cowie, E. H., Esq., Merchant, Calcutta	1874
	Cowley, F. W. R., Esq., Civil Service, Buxar ...	1867
	Craven, James, Esq., Monghyr	1871
150	Creaton, W. E., Esq., Merchant, Calcutta ...	1875
	Cresswell, W. S., Esq., Merchant, Calcutta ...	1874
	Cresswell, H. T., Esq., Shahpore Oondee Factory, Barrh, Tirhoot	1874
	Crowdy, Chas., Esq., Hadrukt Fy., Beguserai, Monghyr	1875
	Crowdy, L. J., Esq., Manghot Fy.. Beguserai, Monghyr	1875
155	Crosthwaite, R. J., Esq., B. A., C. S., Dehra ...	1869
	Cumming, W., Esq., Indigo Planter, Muniharee Factory, Sahebgunge	1851
	Cunningham, Dr. David Douglas, B. M. S., Calcutta	1872

C.—(*Continued.*)

		Admittal.
	Currie, G. M., Esq., Civil Service, Monghyr ...	1268
	Curtis,* J. F., Esq., Indigo Planter	1860

D.

160	DaCosta, Joseph, Esq., Pleader, Civil Court, Bhaugulpore	1865
	Dalbusset, E., Esq., Merchant, Calcutta ...	1871
	Dalgliesh, E. W., Esq., Tea Planter, Dulsing Serae, Tirhoot	1873
	Dalton, Colonel E. T., Commissioner of Chota Nagpore	1848
	Daly, F. D., Esq., Manager, Simla Bank, Umballa ...	1867
165	Daly,* R. M., Esq., H. M., Bengal Marine ...	1869
	Dando, Capt. A. Cunningham, Calcutta	1872
	Dashwood, H. W., Esq., Civil Service, Benares ...	1860
	Davies, Lieut.-Col. J. S., Judicial Commissioner, Chota Nagpore	1857
	Davies, Lieut.-Col. F. J., Barrackpore	1869
170	Davies, A., Esq., Calcutta	1874
	Davis, H. H., Esq., Asst. Conservator of Forests, Chittagong	1873
	Davis, C. T., Esq., Solicitor, Calcutta	1874
	Davis, W. P., Esq., Bengal Police, Hazareebaugh ...	1870
	Davison,* Lt. T., 15th King's Hussars	1872
175	Davidson, James, Esq., Debrooghur, Assam ...	1870
	Dear, Herschel, Esq., Monghyr	1860
	Deas, C., Esq., Ramkistopore, Howrah	1874
	Debendra Nath Mullick, Baboo, Calcutta ...	1870
	Denham, C. H., Esq., C. E., Howrah	1874
180	Dennison, W. T. M., Esq., Kurian Estate, Baitenzerg, Java	1873
	Deputy Commissioner of Sumbulpore	1866
	Deputy Commissioner of Oomraottee	1869
	Deputy Commissioner of Ellichpore	1869
	Deputy Commissioner of Woon	1869
185	Deputy Commissioner of Bassim, West Berar ...	1871
	Deputy Bheel Agent, Maunpore, Mhow, Indore ...	1872
	Deputy Commissioner of Akola, Berar	1875
	Desaran, Edwd. Dubois, Esq., Dariapore Factory, Purneah	1874
	Determes, T., Esq., Merchant, Chittagong ...	1873
190	Deverell, H., Esq., Indigo Planter, Ackrigunge Factory, *via* Berhampore	1854
	Dhaj Nursing Bahadoor, Col., Nepaul	1873
	Dickens, Col. C. H., Artillery, Calcutta... ...	1856

		Admitted.
	Ditmas, J., Esq., Tea Planter, Balleeparah Garden, Assam	1874
	D'Oyly, W. H., Esq., Civil Service, Rampore Beauleah	1872
195	Dodgson, W., Esq., Kallygunge Factory, Rungpore...	1864
	Dods,* Jas., Esq., Merchant	1873
	Dombal, Rchd. De, Esq., Katchee Katta, *via* Chooadanga.	1872
	Drigbijee Sing, K. C. S. I., Maharajah of Bulrampore, Oudh	1873
	D'Silva, E. A., Esq., Asst. Dispensing Chemist, Calcutta	1873
200	Duff,* W. P., Esq., Merchant	1867
	Duff, P., Esq., Sirrcoah, Narodduggur, North Bhaugulpore	1875
	Dunn, Lt. T. D. W., 62nd Regt., Dum-Dum ...	1873
	Dunne, M. P., Esq., Zemindar, Sumshabad, Azimgurh	1872
	Dwarka Nath Dutt, Baboo, Calcutta	1874

E.

205	Eden, Hon'ble A., Civil Service, Rangoon ...	1873
	Edwards, Anthony, Esq., Meerpore Factory, Mottecharree, Chumparun	1866
	Egerton, R. E., Esq. C. S., Simla	1864
	Eisenlohr, F., Esq., Merchant, Calcutta... ...	1870
	Eldridge,* F. G., Esq., Merchant, ...	1867
210	Erskine,* H. C. Esq., Indigo Planter ...	1855

F.

	Falcon,* A. B., Esq., Civil Service	1858
	Farquharson, J. F., Esq., Nunmatti Garden, Gowhatty	1874
	Fearon, C. J., Esq., Chupoorah Factory Manghone, Monghyr	1875
	Feltwell, J. W. Esq., Managukookee, Cherra, Cachar	1875
215	Ferris, Dr. G. R., Calcutta	1865
	Finch, W. W., Esq., Shahpore, Oondee, Tirhoot ...	1875
	Firth, H. A., Esq., Emigration Agent, Calcutta ...	1873
	Fisher, Lieut.-Col. G. B., District Supdt. of Police...	1865
	Fisher,* J. H., Esq., Civil Service	1871
220	Foley, E. G., Esq., Culleecherra Garden, Sylhet ...	1873
	Forbes, Capt. W. E., Settlement Officer, Gonda, Oudh	1873
	Forlong,* Lieut.-Col. J. G. R.	1870
	Fox, Michael, Esq., Beheea	1873
	Fraser, G. G., Esq., Indigo Planter, Sumbulpore ...	1875
225	Fraser, Ronald, Manager, Margarett Hope Tea Estate, Hope Town, Darjeeling	1875

F.—(*Continued.*)

		Admitted.
	Francis, T. M., Esq., Solicitor, Muzufferpore, Tirhoot	1871
	Freeman, H., Esq., Lall Serriah Factory, Seegowly, Chumparun	1866
	Fuller, Daniel, Esq., Tea Planter, Chittagong ...	1874
	Fyz Alee Khan, Nawab, Bahadoor, Jeypore ...	1871

G.

230	Gale, M. H. L., Pundoul Concern, Tirhoot ...	1873
	Galiffe, J. F., Esq., Chundernagore	1856
	Gamble, J. Sykes, Esq., Asst. Conservator of Forests, Darjeeling	1872
	Garbett, Lieut. C. H., Asst. Commr., Maunbhoom ...	1868
	Gardner,* D. M., Esq., Civil Service	1872
235	Garrett, C. B., Esq., C. S., Dacca	1875
	Garth, Hon'ble Sir Richard, Chief Justice, High Court, Calcutta	1875
	Gibbon, T. M., Esq., Indigo Planter, Beteah Factory, Tirhoot	1874 1860
	Gibbon, W. F., Esq, Senr., Doolha Factory, Goruckpore	1870
	Gibbon, W. F., Esq., Turcoleah, Chumparun ...	1874
240	Gilman, J. H. S., Esq., Sonapore Tea Factory, Gowhatty	1874
	Glass, J., Esq., Ex-Engineer, D. P. W., Kamptee, C. P.	1866
	Gocool Nath Chatterjee, Calcutta	1874
	Gokul Chunder Dutt, Calcutta	1874
	Gomess, A. D'B., Esq., Commr. of Soonderbunds, Calcutta	1874
245	Goonendra Nath Tagore, Zemindar, Calcutta ...	1872
	Gopeenath Roy, Baboo, Calcutta	1871
	Gordon, John, Esq., Bank of Bengal, Calcutta ...	1865
	Grace, Geo., Esq., Tezpore, Assam	1865
	Graf*, C., Esq., Merchant	1869
250	Graham, W., Forbes, Esq., Indigo Planter	1867
	Graham, Wm. Francis, Esq., M. C. S., Chicacole ...	1871
	Grant*, Thomas, Esq., Indigo Planter	1848
	Grant, G. H., Esq., Indigo Planter, Bhaugulpore ...	1859
	Grant, C., Esq., Lebong, Darjeeling	1864
255	Grant, Lieut-Col., C. D. W. S., Madras Retired List, Secundrabad	1874
	Gray, J. S., Esq., Messrs. Smeal & Co., Cachar ...	1874
	Gray, Dr. E., Jorehaut, Assam	1875
	Gray, W., Esq., Merchant, Calcutta	1875
	Grees Chunder Sing, Coomar, Zemindar, Pikeparah, near Calcutta	1867
260	Gregory, Gallastan, Esq., Solicitor, Calcutta ...	1875
	Grey, E., Esq., Civil Service, Gya	1868
	Grey, Lieut. L. J. H., Asst. Commr., Ranchie ..	1871
	Griffith, Ralph, Esq., Principal, Queen's College, Benares	1870

G.—(*Continued.*)

		Admitted.
	Grimley, J. E., Esq., Supt. Nizam's Garden, Hydrabad	1875
265	Groundwater, R., Esq., Tea Planter, Gowhatty, Assam	1875
	Guise, J. J., Esq., Merchant, Calcutta	1867

H

	Hadefeldt, R., Esq., Merchant, Calcutta ...	1874
	Halford, Charles, Esq., Bill Broker, Calcutta ...	1872
	Halkett,* D. C., Esq., Civil Service	1870
270	Halsey, W. S., Esq., C. S., Humeerpore... ...	1875
	Halsey, F., Esq., Madhopore, Punjaub	1863
	Hall, R. W., Esq., Sylhet	1870
	Hamilton,* T. F., Esq., Merchant	1870
	Hankin, Col. G. C., Segowlie	1864
275	Harlow, Wm., Esq., Manager, Eastern Cachar Tea Company, Cachar	1871
	Harris, G. L., Esq., C. S., Gya	1863
	Harrison, Augustus S., Esq., Principal of the Minor College, Allahabad	1873
	Harrison, H. A., Esq, Civil Service, Futteghur ...	1863
	Harrison, Revd. H. J., Tollygunge	1872
280	Hartigan, H., Esq., Court-Keeper, High Court, Calcutta	1875
	Harwood, H. L., Esq., Waga Laurea Tea Estate, Chitagong	1875
	Hawkins, Capt. E. L., R. A., Morar	1871
	Hazlett,* Dr. H. J.	1873
	Health Officer, Calcutta	1865
285	Helps, W., Esq., Manager Fallodhi Tea Co., Darjeeling	1875
	Henderson, Major P. D., Cashmere	1875
	Henderson,* M., Esq., Merchant	1864
	Herschell, Sir W. J., Bart., Civil Service, Cooch Behar	1870
	Hill, Edgar, Esq., Indigo Planter, Beylah Concern, Benares	1874
290	Hill, Dr. J. H. G., Turcoolcah Factory, Motecharee, Chumparun	1865
	Hill, R. H., Esq., Scraba, Tirhoot	1865
	Hindmarsh, Thomas, Esq., Eastern Bengal Railway, Kancharapara	1866
	Hittoll Messer, Baboo, Zemindar, Mauncoor ...	1864
	Hobhouse, Hon'ble Arthur, Legal Member of the Supreme Council, Calcutta	1872
295	Hobson, E. A., Esq., Merchant, Calcuta ...	1875
	Hogg, Capt. T. W., Asst. Commissioner, Jubbulpore	1868
	Holl, F. W., Esq., Nundeekotee, Hope Town ...	1874
	Hollingberry, R. H., Esq., Asst. Secy., Financial Dept., Calcutta	1874

H.—(*Continued.*)

		Admitted.
	Holroyd, Col. Charles, Barrackpore	1866
300	Home, Major R., Supdg. Engineer, Umballa Cantonment, Umballa	1873
	Home, A. L., Esq., Deputy Conservator of Forests, Bengal	1875
	Homfray, J. N., Esq., Bengal Marine Service, Port Blair	1863
	Hotson,* A., Esq., Merchant	1872
	Howard, Dr. J. S., Civil Surgeon, Oomraotee ...	1870
305	Hudson, C. K., Esq., Dacca	1874
	Hume, A. O., Esq., C. S., C. B., Calcutta ...	1875
	Hurrendhur Kishore Sing, Baboo, Betteah, Tirhoot ...	1870
	Hurst, J., Esq., Mussoorie	1870
	Hutchinson,* Col. A., R. E.	1862
310	Hutchinson, J. H., Esq., Merchant, Calcutta ...	1870
	Hynde, Hy. Turnbull, Esq., Manager, Raneegunge Coal Association, Raneegunge	1873
	Hyslop,* Archibald, Esq., Merchant	1867

I.

	Ingels, Lionel, Esq., Calcutta	1872
	Inglis, A. B., Esq., Merchant, Calcutta	1873
315	Ingram,* T. L., Esq., Barrister-at-Law ...	1874
	Inskip, C. T., Esq., Merchant, Calcutta... ...	1870
	Imthurn, Dr. A., M. D., Civil Medical Officer, Tezpore, Assam	1873
	Irshad Ali Khan Kunwar, Landowner, Sadabad, Muttra	1872
	Irving, Dr. James, Civil Surgeon, Allahabad ...	1867
320	Irwin, Lieut-Col. W., Stud. Dept., Saharunpore ...	1864
	Isack,* Thos. S., Esq.	1869
	Ishore Pershaud Narain Singh, Bahadoor, Rajah of Benares	1854

J.

	Jack, E. A., Esq., Merchant, Calcutta	1863
	Jackson, Hon'ble L. S., C. S., Calcutta, *Vice-President*	1852
325	Jackson, C. E., Esq., Manager, New Mutual Tea Co., Lallmookh, Hylakandy, Cachar	1873
	James,* A. H., Esq.	1868
	Jameson, W., Esq., M. D., Saharunpore ...	1852
	Jarrett,* Capt. H. S.	1871
	Jefferson, W. E. S., Esq., Debroghur, Assam ...	1875
330	Jenkinson, E. G., Esq., C. S., Saharunpore ...	1874
	Jennings, F., Esq., Calcutta...	1874

J.—(Continued.)

Admitted.

Jennings,* C. B., Esq..... 1862
Jerdon, C. M., Esq., Sub-Deputy Opium Agent, Gya... 1872
Johnson, H. Luttman, Esq., Civil Service, Shillong, Assam 1873
335 Johnstone,* Capt. J., Assistant Commissioner ... 1871
Jones, W. H., Esq., Calcutta... 1863
Jotendro Mohun Tagore, the Hon'ble Rajah, Calcutta 1874
Joykissen Mookerjee, Baboo, Zemindar, Ooterpara... 1852
Juggut Sing Koer, Tajpore, *viâ* Bijnour ... 1874

K.

340 KALEE Kissen Tagore, Baboo, Calcutta 1869
Kally Prosono Roy, Baboo, Zemindar, Noral, *viâ* Jessore 1867
Kelherer, J., Esq., Kotahi Factory, Goruckpore ... 1875
Kemp, Geo. Lucas, Esq., F. R. G. S., Calcutta ... 1871
Kemble, W., Esq., Civil Service, Purneah ... 1872
345 Kidd, Dr. H. A., Civil Surgeon, Mundla ... 1871
Kilby, W., Esq., District Supdt. of Police, Pubna ... 1875
Kincaid, Lieut.-Col. W., Bheel Agent, Sirdaspore, *viâ* Indore 1867
King, Dr. Geo., Supdt., Royal Botanical Garden, Calcutta, *President* 1872
Kirkpatrick, Clarence, Esq., Delhi 1874
350 Kishen Chunder, Bhunge, Rajah of Killoh, Mohurbhunge, Cuttack 1874
Kishen Chand, Baboo, Pleader, Beadwarn, Delhi ... 1875
Knox, G. E., Esq., C. S., Kirwee 1875
Knyvett, Major, W. L. N., District Supdt. of Police, Purneah 1864
Komul Krishna Deb Bahadoor, Rajah, Calcutta ... 1874
355 Krauss, Henry, Esq., Rangoon 1865
Krishnadhun Ghose, Dr., Civil Surgeon, Rungpore... 1874
Kristinder Roy, Rajah, Boliehar, Rajshahye ... 1866

L.

LAMOUROUX, F., Esq., Merchant, Calcutta ... 1863
Landale, Geo. A., Esq., Indigo Planter, Turtipore, Maldah 1868
360 Langlois, J. P., Esq., Durrung Tea Co., Tezpore, Assam 1866
Langlois, P. L. F. C., Esq., Barrister-at-Law, Chittagong 1873
Larminie, W. R., Esq., Civil Service, Bancoorah ... 1862
Lawford, H. B., Esq., C. S., Jessore 1835
Lawrie, T. H., Esq. 1872
365 Lazarus, F. A., Esq., Calcutta 1874

L.—(*Continued.*)

Admitted.

Lees, Lieut.-Col., W. M., Under-Secretary, Govt. of India, Military Dept. 1871
Leibert, M., Esq., Tea Planter, Hazareebaugh ... 1868
Leitch, Henry Joseph, Esq., Broker, Calcutta ... 1872
Lepper* Chas. H. 1873
370 Leslie, S. J., Esq., Solicitor, Calcutta 1873
Lethbridge,* T. C., Esq. 1871
Levinge, H. C., Esq., C. E., Arrah 1863
Lewis, Hon'ble W. T., Resident Councillor, Penang... 1840
Lindesay, H. G., Esq., Khobong Factory, Debrooghur, Assam 1873
375 Livesay, C. E., Esq., Asst.-Engineer, Irrigation Dept., Baroon, *viâ* Dehree 1868
Llewhellin, W., Esq., Durbungah 1871
Lloyd, M., Esq., Indigo Planter, Shapore Oondee, Tirhoot 1863
Lloyd, W., Esq., Darjeeling 1869
Lloyd, Trevor, Esq., Narath Factory, Madhobanie, Tirhoot 1857
380 Lockhart,* Capt., W. S. A... 1871
Lovell, Thos., Esq., Deputy Chief Engineer, Lucknow 1869
Lovell, Capt. H. P., Supdt., P. and O. Company, Calcutta 1870
Lowis, Capt. N., Manager, Chota Nagpore Estate, Ranchi 1875
Luchmeeput Sing, Roy Bahadoor, Banker, Calcutta .. 1864
385 Luchmessur Sing, Bahadoor, Zemindar, Mozufferpore, Tirhoot 1861
Lukin, Major F., 3rd Hussars, Mhow, Central India... 1860
Lushington, H., Esq., C. S., Allyghur 1865
Lyall, D. R., Esq., Civil Service, Dacca... ... 1869
Lyall, R. A., Esq , Merchant, Calcutta 1875
390 Lynam, John, Esq., Supdt., Reserve Police Force, Calcutta 1866
Lynch, Dr. Sydney, Supdt. of Jail, Alipore ... 1872
Lyon, W., Esq., Asst. Commr., Sambhurlake, Rajpootana 1875
Lyons, A., Dr., Civil Surgeon, Bogra 1874

M.

Macallister, R., Esq., Merchant, Calcutta ... 1872
395 Macdonald, C., Esq., Dowlutpore Factory, *viâ* Roosa, Tirhoot 1867
MacDonald, M. N., Esq., Pertipore Factory, Sarun... 1869
Macdonald, Æneas J., Esq., Lohurreah Factory, Chumparun 1872

M.—(*Continued.*)

		Admitted.
	Macdonald, James, Esq., C. E., Allyghur ...	1874
	Macdonald, Lt.-Col. John, Survey Department ...	1871
400	Macdonell, Brigadier Genl. A., C. B., Rawul Pindee	1871
	Mackenzie, Dr. S. C., Superintendent, Presidency Jail, Calcutta	1871
	Mackenzie, W. S., Esq., Belsund, Tirhoot ...	1873
	Mackillican, Jr., Esq., Merchant, Calcutta ...	1865
	Mackinnon, Mrs. J., Mussoorie	1874
405	Mackinnon, D., Esq., Merchant, Calcutta ...	1874
	Mackinnon, John, Esq., Merchant, Calcutta ...	1875
	Maclachlan, J. E., Esq., Calcutta	1861
	Maclean, A. T., Esq., Civil Service, Aliporo ...	1858
	Macmillan, J., Esq., C. E., Cuttack	1865
410	Macnaghten, Chester, Esq., Principal, Rajkumar College, Rajkote, Kattywur	1869
	Maconochie,* G. B., Esq.	1873
	Macpherson, Hon'ble A. G., Judge of the High Court, Calcutta	1867
	Macpherson, W., Esq., Civil Service, Cuttack ...	1861
	Magor, R. B., Esq., Merchant, Calcutta	1875
415	Maharajah of Betteah, Tirhoot	1870
	Maharajah of Cooch Behar...	1864
	Mahony, H. C., Esq., Jokai Assam Tea Co., Debrooghur, Assam	1869
	Manager, Balasun Tea Co., Darjeeling ...	1875
	Manager, Bengal Tea Company, Cachar ...	1864
420	Manager, Bishnath Tea Co., Assam ...	1875
	Manager, Borsillah Tea Co., Assam ...	1875
	Manager, Brahmapootra Tea Co., Assam ...	1875
	Manager, Burmah Company, Limited, Rangoon ...	1874
	Manager, Central Cachar Tea Co. ...	1875
425	Manager, Central Terai Tea Co., Darjeeling ...	1875
	Manager, Champdanee, Jute Mills Company ...	1874
	Manager, Chenga Tea Association, Darjeeling ...	1875
	Manager, Chincoorie Tea Co., Cachar ...	1875
	Manager, Chumta Tea Association, Darjeeling ...	1875
430	Manager, Chunderpore Tea Garden, Assam ...	1875
	Manager, Chundypore Tea Company, Cachar ...	1862
	Manager, Cutlee Cherra Garden, Cachar ...	1865
	Manager, Dahingeapore Factory, Assam ...	1865
	Manager, Dessai and Purbuttea Tea Company, Jorehaut, Assam	1874
435	Manager, East India Tea Company, Assam ...	1865
	Manager, East India Tea Company, Cachar ...	1868
	Manager, Giell Tea Co., Darjeeling	1875
	Manager, Goomrah Factory, Tirhoot	1865

M.—*(Continued.)*

		Admitted.
	Manager, Government Garden, Fyzabad, Oudh ...	1871
440	Manager, Government Garden, Gondah, Oudh ...	1875
	Manager, Greenwood Tea Garden, Assam ...	1875
	Manager, Halmara Tea Estate, Assam	1870
	Manager, Heron Cherra Tea Garden, Cachar ...	1874
	Manager, Hoolmaree Tea Co., Assam ...	1875
445	Manager, Hunwall Tea Estate, Jorehaut; Assam ...	1874
	Manager, Jokai (Assam) Tea Co., Assam ...	1875
	Manager, Julnacherra Tea Garden, Cachar ...	1875
	Manager, Joypore Garden, Cachar	1865
	Manager, Kallacherra Tea Company, Cachar ...	1862
450	Manager, Kallian Tea Garden, Cachar	1874
	Manager, Kamptee Gwallie Tea Estate	1875
	Manager, Kanchunpore Tea Company, Cachar ...	1862
	Manager, Kassomaree Tea Garden, Assam ...	1875
	Manager, Koeyah Factory, Cachar	1865
455	Manager, Koomber Tea Garden, Cachar ...	1875
	Manager, Koomtar Tea Garden, Assam ...	1869
	Manager, Lalla Mookh Tea Garden, Cachar ...	1875
	Manager, Local Funds, Betul	1874
	Manager, Luckimpore Tea Co., Assam ...	1875
460	Manager, Luckwah Tea Garden, Assam ...	1875
	Manager, Lutasil Tea Garden, Assam ...	1875
	Manager, Majagram Tea Co., Cachar ...	1875
	Manager, Majulighur Tea Estate, Assam	1875
	Manager, Massempore Tea Garden, Cachar ...	1875
465	Manager, Mesai Jan Tea Estate	1875
	Manager, Monacherra Tea Garden, Cachar ...	1875
	Manager, Moran Tea Co., Seebsaugor, Assam ...	1875
	Manager, Munguldye Tea Co., Assam ...	1875
	Manager, Narainpore Garden, Cachar	1865
470	Manager, New Golaghat Assam Tea Company, Assam	1874
	Manager, Noakacharee Tea Company, Assam	1865
	Manager, Nuddea Ward's Estate, Kishnaghpr ...	1875
	Manager, Panicherra Tea Garden, Cachar ...	1874
	Manager, Pattarcah Tea Co., Sylhet	1875
475	Manager, Public Garden, Bareilly	1868
	Manager, Public Garden, Etawah	1874
	Manager, Roopacherra Tea Garden, Cachar ...	1875
	Manager, Scottish Assam Tea Co., Assam ...	1875
	Manager, Selong Tea Estate, Shillong ...	1867
480	Manager, Silcoorie Tea Garden, Cachar ...	1875
	Manager, Singbulli and Nurmah Tea Co., Ld., Darjeeling	1875
	Manager, Singell Tea Company, Darjeeling ...	1874
	Manager, Springside Tea Garden, Kurseong. ...	1875

M.—(Continued.)

		Admitted.
	Manager, Tarrapore Tea Garden, Cachar ...	1871
485	Manager, Teendarea Tea Company, Darjeeling ...	1874
	Manager, Teesta Valley Tea Association, Darjeeling	1875
	Manager, Tingri Tea Estate, Assam ...	1875
	Mandelli, L., Esq., Tea Planter, Darjeeling ...	1868
	Mangles, H. A., Esq., C. S., Calcutta ...	1875
490	Manook, Dr. S. J., Civil Surgeon, Chyebassa ...	1866
	Markby, Hon'ble W., Judge of High Court, Calcutta	1866
	Martin, John, Esq., Calcutta	1874
	Martin, W. R., Esq., Tea Planter, Punkabaree, Darjeeling	1868
	Martin, C. P. N., Tea Planter, Tezpore, Assam ...	1875
495	McAlpine, Robert, Esq., Futtickcherry Estate, Chittagong	1865
	McFarlane, A. C., Esq., Merchant, Calcutta ...	1870
	McIntosh, A. R., Esq., Merchant, Calcutta ...	1872
	Meiselbach, J. F. R., Esq., Dhurropra Heront, north Bhaugulpore	1875
	Melvile, S. S., Esq., C. S., Mynpoorie	1875
500	Meres,* W. F., Esq., Civil Service ...	1870
	Mengens, J. G. Esq., Merchant, Calcutta ...	1865
	Mewburn, G. F. Esq., Merchant, Calcutta ...	1874
	Michea, P., Esq., Daodehurn Factory, Benares ...	1875
	Millar, Lieut.-Col. F. J., Kurnaul ...	1869
505	Mills,* Lieut.-Col. H.	1871
	Milne, Dr. R. M., Supdt., Central Prison, Benares ...	1873
	Minchin, F. J. V., Esq., Aska, Ganjam ...	1862
	Mitchell, R. W. S., Esq., Emigration Agent for Trinidad	1875
	Moir, Dr. W., Civil Surgeon, Meerut	1872
510	Mohima Rungun Roy Chowdry, Zemindar, Kakinia, Rungpore	1865
	Mohendrolall Khan, Koomar, Narajole, Midnapore ...	1871
	Money, Major R. C., Deputy Commissioner, Julpigori	1860
	Moore, A. H., Esq., Dekai Jalue Factory, Jorehaut, Assam	1875
	Moore, C. W., Esq., C. S., Azimghur ...	1865
515	Moran, F. C., Esq., Woodbine Factory, Debroghur, Assam	1870
	Morris, E., Esq., Manager, Hong-Kong and Shanghai Banking Corporation, Calcutta	1874
	Morris, G. G., Esq., The Honorable, Civil Service, Judge, High Court, Calcutta	1872
	Moseley,* T. H., Esq., Merchant	1862
	Moseley, E. S. Esq., C. S., Durbungah, Tirhoot ...	1875
520	Mowbray,* Arthur H., Esq., Merchant ...	1866

M.—(Continued.)

		Admitted.
	Mullen, Dr. T. Ffrench, Residency Asst. Surgeon, Ulwar, Rajpootana	1871
	Murdoch, A. W., Esq., G. E., Serajgunge ...	1870
	Murray,* Col. J. J.	1867

N.

	Narayan Rao, Maharajah of Deyass, Indore ...	1874
525	Narendra Krishna Deb Bahadoor, Rajah, Calcutta ...	1874
	Neville, Geoffry, Esq., Indian Museum, Calcutta ...	1875
	Newton, Ernest, Esq., Pleader, High Court, N. W. P., Dehra	1875
	Newton, W. H., Esq., Merchant, Calcutta ...	1875
	Nickels, C., Esq., Indigo Planter, Pusewa Factory, Jounpore	1866
530	Nilladhur Sing Deo, Bahadoor, Feudatory Chief of Killa, Sonepore	1874
	Nobin Chand Bural, Baboo, Solicitor, Calcutta ...	1874
	Nobin Chunder Nag, Baboo, Zemindar, Midnapore...	1866
	Noble,* Capt. C. S.	1870
	Nolan Phillip, Esq., Civil Service, Serajgunge ...	1873
535	Notobur Singh, Rajah, Murdraj Bromobur Roy, of Killoh-Khand Padda	1873
	Noor Khan, Huzrut, Minister of Jowrah ...	1871
	Nundlall Bose, Baboo, Zemindar, Calcutta ...	1875
	Norman, C. G., Esq., Broker, Calcutta... ...	1875

O.

	Obhoychurn Goho, Baboo, Merchant, Calcutta ...	1856
540	O'Connor, J. E., Esq., Dept. of Agriculture, Revenue and Commerce, Calcutta	1874
	Odling,* C. W., Esq., C. E....	1871
	Ogbourne, C. H., Esq., Calcutta	1867
	O'Keefe, J. W., Esq., Merchant, Calcutta ...	1871
	Oldfield, R. C., Hon'ble C. S., Allahabad ...	1875
545	Oldham, Wilton, Esq., L.L.D., Civil Service, Gazeepore	1867
	Omesh Chunder Dutt, Esq., Calcutta	1874
	Orchard,* Major M. A. D., B. S. C.	1871
	Orr, Major Alexander P., Roy Bareilly, Oudh ...	1868
	Osborne, Col. Willoughby, F. R. G. S., F. G. S., Political Agent, Gwalior	1862
550	Osborne,* Captain J. H. Willoughby	1870
	Ouseley,* Gore, Esq.	1872
	Owen, Brigdr. Genl. W. G., (12th Madras N. I.,) Bellary	1846
	Paddy, Capt. A. C., Royal Engineers, Mean Meer ...	1871
	Palmer,* Charles, Esq., Medical Service	1848

		Admitted.
555	Peal, S. E., Esq., Tea Planter, Sapakatee, Seebsaugor, Assam	1867
	Peel, Fredk., Esq., Merchant, Calcutta	1871
	Pellew,* F. H., Esq., Civil Service	1863
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	Peppe, T. F., Esq., Chota Nagpore	1868
560	Peppe, W., Esq., Birdpore, Gorruckpore ...	1875
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	Perrin, Monseiur J., Silk Filatures, Berhampore ...	1859
	Peter, James, Esq., Lydiacherra Garden, Cachar ...	1872
	Phear, the Hon'ble J. B., Calcutta	1867
565	Phillips, J., Esq., Manager, Government Farm, Allahabad	1875
	Phipps, S. U., Esq., Custom House, Calcutta ...	1874
	Pickance, Lieut. W. John, Madras Staff Corps, Chutterpore, Ganjam District	1867
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	Pinney, G. F., Esq., Jorehaut Tea Company, Assam...	1871
570	Pirthee Singh, Rajah of Awah, Agra	1874
	Pogose, J. G. N., Esq., Zemindar, Dacca ...	1856
	Political Assistant, in charge Gondal Estate, Kattywur	1873
	Political Agent of Morar, Gwalior	1873
	Ponder,* W. F., Esq., ...	1874
575	Pope, C. H., Esq., Planter, Singhia Factory, Haddjapore, Tirhoot	1872
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	Poorna Chunder Roy, Zemindar, Sarapooly ...	1870
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580	Pratapa Chandra Ghosa, Baboo, Calcutta, *Vice-President*	1869
	Principal, Raj Kumar College, Rajkote, Kattywur ...	1873
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	Prinsep, H. T., Esq., Civil Service, Bangalore ...	1870
	Proprietors, Jugdispore Estate, Beeheea, Shahabad	1869
585	Protheroe, Capt. Montague, Dy. Supt., Port Blair ...	1869
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	Pyne, R, Esq., Neelgunge, Purneah	1867

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	Quinton, J. W., Esq., Civil Service, Rangoon ...	1865

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	Raban, Col. H., Shillong	1858
590	Radcliffe, John, Esq., Merchant, Calcutta ...	1871

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	Radha Persaad Sing, Maharajah Coomar, Doomrah, Shahabad	1875
	Rajah of Kuntil, Mirzapore...	1871
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	Ramanath Tagore, Rajah Bahadoor, Calcutta, *Vice-President*	1842
595	Ramanymohun Chowdry, Baboo, Zemindar, Rungpore	1861
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	Russell,* T. M., Esq., Merchant	1868

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	Sagore Dutt, Baboo, Merchant, Calcutta ...	1850
	Samachurn Law, Baboo, Merchant, Calcutta ...	1855
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	Sanders, Dr. E., 2nd Sikh Infantry, Dehra Ismael Khan	1875
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	Schwendler, Louis, Esq., Calcutta	1875

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	Secretary, Cantonment Public Garden, Agra ...	1865
	Secretary, Government Botanical Garden, Monghyr	1873
	Secretary, Local Funds, Racpore	1874
635	Secretary, Local Fund Committe, Umritsur ...	1859
	Secretary, Local Fund Committee, Ferozepore ...	1861
	Secretary, Local Committee, Jhansie	1867
	Secretary, Local Committee, Hoshungabad ...	1872
	Secretary, Local Fund, Nimar, Khundwa ...	1873
640	Secretary, Municipal Committee, Mirzapore ...	1869
	Secretary, Public Garden, Azimghur	1871
	Secretary, Public Garden, Banda	1855
	Secretary, Public Garden, Jaloun, Oorai ...	1866
	Secretary, Public Garden, Benares	1875
645	Secretary, Public Garden, Nagode	1875
	Secretary, Queen's Garden, Delhi	1873
	Secretary, Recreation Grounds and Gardens, Jamalpore	1874
	Secretary, Road Fund Committee, Jaunpore ...	1867
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	Smalley,* R. B., Esq.	1867
	Smallwood, A. E., Esq., Broker, Calcutta ...	1875

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670	Smith, G. M., Esq., Joyhinga Tea Estate, Luckimpore, Assam	1871
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	Smith, Maxwell, Esq., Hursingpore, Tirhoot ...	1869
675	Smith, W. E., Esq., Sonarie Factory, Sibsaugor, Assam	1875
	Smith, W., Esq., Dorundah Factory, Chota Nagpore	1872
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	Spencer, Harrison, Esq., Tea Planter, Darjeeling ...	1874
	Speid, James, Esq., Tea Planter, Luckipore, Sylhet...	1875
680	Spicer, A., Esq., Tea Planter, Cachar	1869
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	Steel Octavius, Esq., Merchant, Calcutta ...	1874
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690	Stewart, A. N., Esq., Collector of Tolls, Calcutta ...	1862
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	Stewart, James, Esq., Civil Engineer, Umballa ...	1873
	Stirling, Lieut. P., Burnbrae Bowerneh, Kangra Valley	1873
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695	Stone, C. G., Esq., Bokahala Factory, Jorehaut, Assam	1875
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	Stratton, J. P., Esq., Political Agent, Nowgong, Bundelkhund...	1873
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	Sturmer, A. J., Esq., Talooka Kojha, *viâ* Gazeepore...	1866
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705	Sumbhoo Narayana, Rajah Bahadoor, Benares ...	1872
	Superintendent, Public Garden, Dehra Ghazee Khan	1874
	Superintendent, Taj Garden, Agra	1874

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	Superintendent of the Patna Lunatic Asylum, Patna	1871
	Superintendent, Central Prison, Benares ...	1872
710	Superintendent of Jorehaut Tea Company, Assam ...	1865
	Superintendent, Serajgunge Jute Company, Seerajgunge	1868
	Surdhar.ee Lall, Baboo, Zemindar, Bhaugulpore ...	1874
	Sutcliffe, James, Esq., Principal of the Presidency College, Calcutta	1871
	Sutherland, Charles J., Esq., Merchant, Calcutta ...	1838
715	Sutherland, H. H., Esq., Merchant, Calcutta ...	1870
	Sutherland, A. B., Esq., Merchant, Calcutta ...	1870
	Swaine, G., Esq., Ottur Factory, Tirhoot ...	1875
	Swinhoe, William, Esq., Attorney, Calcutta ...	1859

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	TAKILE SEDENATH SING, Zemindar of Kerabally ...	1874
720	Tayloe, J. E., Esq., Merchant, Barrackpore ...	1875
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	Taylor, Frank, Esq., Executive Engineer, E. I. Irrigagation and Canal Company, Hidgelee ...	1868
725	Taylor, S. H. C., Esq., C. S., Beerbhoom ...	1873
	Taylor, Geo., Esq., *Barrister-at-Law*, Bombay ...	1874
	Temple, the Hon'ble Sir R., K. C. S. I., Calcutta ...	1869
	Templer,* Lieut.-Col. H. J., Staff Corps ...	1871
	Tenant,* Major T. E.	1868
730	Tennant, Col. J., R. E., Roorkee	1874
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	Thompson, Lieut.-Col. E., Pol. Agent, Moorshedabad	1864
	Thompson,† J. A., Esq.	1871
	Thornhill, E. B., Esq., Civil Service, Azimghur ...	1875
740	Thorpe, J., Esq., Lucknow	1867
	Thurburn, E. A., Esq., Merchant, Calcutta ...	1871
	Tonnerre, Dr. C. Fabre, Health Officer, Calcutta ...	1862
	Toomey, Geo., Esq., Indigo Planter, Contai, Tirhoot	1870
	Tottenham, L. R., Esq., Civil Service, Burrisal ...	1873
745	Tresham, W. C., Esq., Nujeebabad, *viâ* Bijnour ...	1874
	Tucker, Robert, Esq., Tea Planter, Seebsaugor ...	1867

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	Turner, H. B. H., Esq., Merchant, Calcutta ...	1868
	Twyford, C., Esq., Tea Planter, Adelabannie Garden, Assam	1874
	Twynam, Capt. E. J. L., Executive Officer ...	1856
750	Tytler,* Major-Genl. Fraser, C. B.	1872
	Unwin, Howard Esq., C. E., Cuttack	1869
	Urquhart, E., Esq., Indigo Planter, Rajpore Concern, Tirhoot	1875

V.

	Venayk Rao Gunput Kibia Sahaib, Indore ...	1872
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755	Vertannes, J. C., Esq., Civil Engineer, Contai ...	1865
	Vizianagram, His Highness the Rajah of ...	1847
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	Voss, C. W., Esq., Merchant, Ganjam	1874

W.

	Wagentrieber, W. J. H., Esq., Sonarie, Seebsaugor, Upper Assam	1868
760	Walker, William, Esq., Tea Planter, Scebsaugor, Upper Assam	1870
	Walker, Richd. Chs., Esq., Bohorah Factory, Purneah	1872
	Wallace, Adolphus, Esq., Rungajaun Factory, Golaghaut, Assam	1866
	Wallace, G., Esq., Doria Factory, Golaghaut, Assam	1875
	Ward, W. E., Esq., Civil Service, Dinagepore ...	1873
765	Waterfield, William, Esq., Civil Service, Allahabad ..	1870
	Watling, R. G., Esq., Manager, E. I. Railway Co's Oil Factory, Manowrie, near Allahabad ...	1873
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	Watt, George, Dr., Educational Service, Hooghly ...	1875
	Webster, Alex. L., Esq., Chittagong	1867
770	Weston, John, Esq., Judge, S. C. Court, Magoorah	1863
	Whishaw,† Dr. J. C., M. D.	1873
	White, H. E., Esq., Ex-Engineer, Nowg[illegible]ig, Bundlekhund	1875
	White, Dr. J. B., 42nd Assam Light Infantry, Debrooghur	1872
	Whitney, F., Esq., Merchant, Calcutta	1875
775	Whitty, Irwin, J., Esq., Civil Engineer, E. I. Railway Chord Line, Kurmaton, Assensole	1867
	Whitwell, Dr. Henry, 17th N. I., Mean Meer, Punjab	1874

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	Wilcox, Frederick, Esq., Bengal Police, Poorolia ...	1867
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	Wilkinson, C. J., Esq., *Barrister-at-Law*, Rangoon ...	1870
780	Wilkinson, Revd. W., Arrah, Sahahabad ...	1873
	Williams, G. R. C., Esq., Civil Service, Dehra Doon	1872
	Williamson, Lieut. W. J., Deputy Commr., Garrow Hills, Assam	1867
	Wilson, Major-Genl. H. M.'s Retired list, Dhurmsala, Punjab	1860
	Wilson, H. F., Esq , Serajgunge	1870
785	Wilson, Robt., Esq., Poopree Factory, Tirhoot ...	1875
	Wingrove, Clement, Esq., Gowhatty, Assam ...	1871
	Wintle, Col. E. H. C.	1860
	Wollen, H. W., Esq., Assistant, Indigo Planter, Bulleah Factory, *vid* Arrah	1873
	Wood,† James M., Esq.	1865
790	Wood, Dr. A., Bijnore	1875
	Woodford, Dr. C. O., Calcutta	1863
	Woodman, J. V., Esq., *Barrister-at-Law*, Calcutta ...	1875
	Wright, A.C., Esq., Deputy Magistrate, Jehanabad, Gya	1865
	Wright, W., Esq., Judge, Small Cause Court, Cuttack	1866
795	Wuzeer Ally Syud, Gya	1874
	Wyllie,* H. S., Esq.	1873

Y.

	Yate, B. J., Esq., Station Master, E. I. Railway, Howrah	1874
	Young, Capt. Charles, Meywar Bheel Corps, Kherwarrah	1872
	Young, W., Esq., C. S., Bustee	1868
800	Young, Major Siddons, Commanding at Chunar ...	1871

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	Zander, Leo, Esq., Merchant, Calcutta... ...	1872

ERRATA.

Notes on a visit to Pangi and Lahoul.

At page 101, 12th line from top—for "*district*"—read *summit.*

At page 106 5th line from top—for "*streets*"—read *strut.*

At page 110, 1st line from top—for "*Buhn*" read *Bobu.*

JOURNAL

OF THE

Agricultural and Horticultural Society

OF

INDIA.

Notes of a visit to Pangi and Lahoul in the Valley of the Upper Chenab.

Some few years ago, having been ordered away from my station in the Punjab on account of ill-health and having been recommended, if possible, to get beyond the influence of the rains, I determined to pay a visit to Pangi and Lahoul in the valley of the Upper Chenab on Chandra-Bagga, as it is there called. The following are a few notes of my trip which occupied the months of August and September.

My route lay through Pathankot and so on up to Dalhousie, the queen of the Himalayan Sanitaria. I will not stop to describe the road to Dalhousie, beyond saying, that every yard of the way is beautiful, nor will I say anything of Dalhousie itself. Let those who would find a pure and bracing atmosphere, a dry soil, good drinking water, pleasant walks and rides and lively views over plain and mountain, in close proximity to many places of interest and within full view and easy reach of the snowy range, visit Dalhousie, they will not be disappointed.

The first march from Dalhousie to Kujiar is nearly level and through forest the whole way, and such a forest;—horse-chesnut, oaks, cedars, spruce and silver firs and an occasional *Pinus excelsa;* here and there masses of maple; the under-growth rhododendron, ferns, mosses and flowers in endless profusion: to the right the forest seems to ascend to the sunny clouds floating over head, to the left to fall down to end-less depths. Every now and again a brawling stream comes tumbling down from the mountains above and on its banks, one is sure to find some exquisite specimen of *Lycopodium*, *Begonia* or lily. The distance to Kujiar is twelve miles, but it is a march one wishes would never end. As one emerges from the forest on Kujiar, the scene is still more beautiful. It is a glade in the forest of an irregular oval, perhaps 1200 yards in greatest length by 500 yards in width, slightly undulating with a gradual descent from the sides to the middle, in which is situated a small pond of pelucid water reflecting the surrounding forest and mountain tops. At the furthest end from that at which you enter is a charming little wooden bungalow, kept up for the use of travellers by the Rajah of Chumba, and a few hundred feet off, a picturesque hill temple with its sloping roof of shingles and overhanging eaves. The glade is surrounded with cedar trees, nearly all of them per-fect specimens of their kind, natural pyramids of branches growing from the ground to the final leader: between and beneath them grow wild roses, jasmin bushes and Virginian creepers which here and there climb up these glorious cedars and add to their beauty by veils of tender-hanging tendrils.

From Kujiar to Chumba the road descends until you reach the Ravee, whence, to the town of Chumba it is nearly level. The road, as long as it descends, is uninteresting and hot, being on the south side of the mountain. At the foot of the descent, three or four monarchial cedars are met with, a little temple nestling in their midst. These trees cannot be more than 3500 to 4000 feet above the level of the sea.

Further on, you come amongst cultivation and pass many wild olive trees which, when I saw them, were laden with fruit about the size of a pea. To my mind, there can be no doubt, that the grafted olive, hops, the vine and all the European fruit trees might be grown in the warmer parts of Chumba. Although the traveller be not at a high elevation, he feels himself in a different country; the fields are surrounded with hedges with bramble bushes pushing their way through them and flowers in every ditch, and the crops are quite different from what he has been accustomed to see in the plains of India. Just before entering Chumba, the Ravee is crossed by one of those picturesque bridges peculiar to the Himalayas; beams projecting one over the other from either side until they approach sufficiently near for two very long beams to be laid across from one side of the river to the other. Chumba itself is a charming place, situated on a flat bluff overlooking the Ravee and some three or four hundred feet above it: in the centre is an open space of about one thousand yards long by about three hundred broad covered with the softest and greenest turf; in fact, more like an English village green than anything else, and towards evening, the similarity is still more brought home to one by the sight of hundreds of boys turning out to play at hocky, when their joyous shouts and happy beaming faces soon prove to the traveller, that he is in another land and among another people. The town stands back from this green, and gradually rises up the sides of the hill immediately above the town. On one side of the green is the traveller's bungalow, and on the other, the Superintendent's house, most beautifully situated in charming grounds more like an English country house than anything else. As you look up the valley of the Ravee, towers aloft the great mountain of Man Mahesh, a monarch among giants. The great difference between Chumba and other parts of the Himalayas is, that although so near the plains of India, only a single chain of mountains is between you

and them, you are completely in the mountains, all round you are snowy peaks, and you seem to have left all remembrance of the plains behind you. I have said the traveller finds himself among another people and in another land ; there is some reason for this. Chumba, I believe, has (at any rate by an alien race) never been conquered : added to its natural impregnable position, its people had the sense to send a small tribute to the Pathan, Mogul, and Sikh conquerors of the Punjab, and consequently partly through its position and partly through the common sense of its rulers it has never been visited by a foreign army. In the more inaccessible parts of the valley, the people yet speak a language nearly akin to Sanscrit, and all over Chumba their honesty, love of truth, ever ready smile, and manly bearing, with the respect shewn, and liberty allowed to women, remind the traveller of another well-loved land where, although the law and the ruler be held in high respect and reverence, yet the people find time to enjoy the amenities of life.

From Chumba, the traveller can either go up the valley of the Ravee to Burmaor and Barra Bungal or cross the Chuari Pass to Nurpur, and so on to Dhurmsala and the Kangra Valley; or by a still higher pass come down immediately upon Dhurmsala or cross the snowy-range by the Kukti Pass into British Lahoul, or follow the course of the Sewel, the main affluent of the Ravee to its source, and cross the snows by the Sach Pass into Pangi : there is also another road into Kashmir by the Padri Pass, Badriwan and Kistwan. My road was that over the Sach Pass into Pangi. I will not describe every step of the way, beyond saying, that all was lovely, the road good, provisions and carriage plentiful. The road being parallel to the main drainage of the valley, the traveller has to cross numerous tributaries, some of them of considerable size and nearly all made use of in floating down timber to the Ravee. My advice to those not in a hurry to finish their journey, is to go up these side valleys,

as every one is beautiful, and it is only by following up their courses, that the finest forest scenery can be enjoyed.

In the lower parts of Chumba, the prevailing trees are the Himalayan mulberry (*Morus serrata*) and *Bhaman* (*Grewia elastica*), as one goes higher, oak and holly are met with and in one place I noticed a small wood of *Pinus Gerardiana*, which trees are fortunately too valuable as supplying human food to be cut down or lopped. At Ulwas, four marches from Chumba, the ascent of the pass commences, the same coolies, carrying the travellers' baggages thence to Kilan in Pangi, three stiff marches at first. The forest is composed of horse-chesnut, maple and walnut, mixed with deodars and other pines, until finally the forest consists of nothing but *Abies Smithiana* and *Picea Webbiana*, and gradually one emerges into open glades of grass studded with birch and alder, and as these are left behind, the intense green of the grass and the glory of the innumerable flowers increase. The exact time at which to cross the outer snowy-range of the Punjab Himalayas, in order to see the flowers in their greatest beauty, is the first fortnight of August, and before the sheep return from their summer feeding grounds, which occurs as soon as the frost commences to nip the higher pastures in Pangi. It would require an abler pen than mine to describe the glories of Nature's flower garden, as situated in these Alpine solitudes; the mountain side is one blaze of flowers, and during the time I spent there, I gathered over two hundred different species. And here, or just where the forest ends, I would recommend the traveller to remain some days, as besides the lovely scenery and flowers, sport of no mean order is to be found. It was in this neighbourhood I first saw what in my opinion is the most beautiful of all wild Alpine flowers, the *Meconopsis aculeata*: fancy the wild poppy of our English fields but sky blue instead of scarlet, if such a flower can be imagined without having been seen. There is a remarkable

fact regarding Alpine flowers, which I do not remember to have seen noticed elsewhere, and that is the predominance of blue tints among them; and when one remembers how difficult it is to find a true blue flower in the garden, it can be imagined how the gardener envies the treasures of these mountain gardens. When up at these high elevations, the florist should search for sunny gorges, where, at the edge of the melting snow, he will come upon the most lovely specimens of *Aconitum Nepalensis* and *Delphinium Brunonianum*, with its musk-like scent; and occasionally meet with beds of a very beautiful primula which seems incapable of existing anywhere but under snow, or where the water from freshly melted snow trickles over it. This primula is very lovely and can only be compared to a Kashmir shawl-like mixture of *mysembrianthemum tricolor*, *potentilla* and *portulaca* thrown over a bed of snow. As one sees it pushing its delicate petals through the snow, one grasps how utterly impossible is the florists art to cope with such conditions.

Many gardeners may have discovered how difficult it is to obtain seeds of Alpine plants, and I think the cause is as follows:—Himalayan Alpine plants have a short but glorious existence; commencing from their flowering, it is soon over, and the seed rapidly ripens under the autumn sun, falls and is covered with snow, for any precipitation of moisture which takes place after the first days of September does so in the form of snow. This again melts, and under the action of the hot sun the seeds immediately germinate and the plants attain sufficient growth and strength to resist the pressure of the winter snow which protects them from the biting cold of that season. It is not until well into June of the following year that they again see the sun, but when they do, what with the moisture from the melting snow and the forcing power of the sun, they burst into life and vigour; then very shortly follow the rains, during which, and at the end of which, they flower.

To those who would wish to collect seeds, I would recommend the following system:—To take with them a number of small bottles holding from a quarter to half an ounce, filled with extremely dry and well pulverized leaf mould: when the seeds are gathered, they should be immediately mixed with the contents of one of the bottles which should be quickly corked up again; in this condition, seed will retain its vitality for a long time and can be sent to all parts of the world. The seeds of the most beautiful varieties are nearly all extremely minute.

The Sach Pass presents no very great difficulties. For the last hour before arriving at the district, you pass over a steep slope of snow which requires caution, and should never be attempted in ordinary boots or shoes but with bark or grass shoes which are always to be obtained at the last village before ascending the Pass, and any one who has worn these shoes would never wish to walk in others. They are so constructed that the whole foot sinks into a bed of grass and there is no string to pass between the big and first toes, as with the Kashmir grass shoe, which the white man finds so difficult to manage. The actual pass is a knife edge; a yard or two across the descent on the Pangi side is, except for a few hundred yards, far more gradual than in the southern side. For seven miles, the road leads over a glacier, but to all appearances, you might be on solid rock, so completely is the surface strewed with debris from the surrounding cliffs. These cliffs are of a stupendous height and seem utterly impossible to scale; but they are, however, for when they break back from the main valley, one sees large flocks of sheep pastured about them with their shepherds. The traveller is now in a different climate, no more rain, very few clouds, but there are also very few flowers, although, here and there one does see the lovely blue poppy-like flower, before mentioned. There is not a tree visible for a considerable way down the Pass, and the cliffs appear to rise higher and higher until one seems to be des-

cending into the bowels of the earth. There are, however, some remarkable phenomena on the way down the glacier, namely, the *moulin de glacier* of the Alps which I never saw on any other glacier on the Himalayas, although doubtless they exist. A side stream falling on the glacier, cuts a passage down through the centre of the glacier to the torrent beneath: this passage takes the form of a funnel, and the water pouring in runs round and round in the form of a vortex, until it finally reaches the stream below. I was able to see down one or two of these *moulins*, and a most wonderful sight it was to look down into an endless depth of pure blue and green ice, part of which was lit up where the sun's rays caught the sides with prismatic colours. The funnels were exactly opposite the gorges whence issued the streams which had formed and continually fed them, and I learned from the guides with me that they were always in the same places, and as the angle at which they pierced the glacier was perpendicular, I conclude there can be no movement of the glacier down the valley, and looking at the sides, one can find no signs of erosion, and in the case of this glacier as in most others I have examined in that part of the Himalayas the gorges are so constricted at their outlets, that any direct downward movement is impossible. They may be sinking, but there are no visible signs to shew that they are, while in many cases, on the contrary, there are evident signs, that they are increasing in bulk, as irrigation channels which once fed villages are found buried under the glacier, while fresh channels have been cut from lower down the glacier. There is, however, little doubt, that great changes do take place; a succession of cloudless years causing a reduction in the bulk of the glaciers, while on the other hand several cloudy years causing a considerable increase. In this dry atmosphere, a cloudy year is one of famine, for without the sun the glaciers cannot feed the streams with which the villagers irrigate their fields. But I must leave this topic, interesting though

it be, and get upon my way. The halting place is at the foot of the glacier, whence another long march, through splendid mixed forest, brings one, after crossing the Chundra-Bagga, as the Chenab is there called, to Kilar in Pangi. Here resides a forest officer, and to this place and no further proceeds the post. Further on the traveller plunges into the desolation of perfect freedom from all cares. Cholera may rage upon the plains of India or war may have broken out, but you are beyond recall. The forest officer, in charge of timber operations in the Upper-Chenab resides at Kilar, and pleasant enough his life must be for the summer season among such scenes of grandeur and in so perfect a climate. He has a good house and garden, in the latter all English vegetables grow in profusion and arrive at a perfection I have not seen in any other portion of the world. This is, no doubt, due to the forcing nature of the climate and the goodness of the soil. From the time seed is sown, until the time its produce approaches perfection, there is an uninterrupted growth followed by a decreasing temperature, when of course growth is arrested, and during this latter period the vegetable or fruit gathers flavour. On the plains of India, on the contrary, fruits and vegetables of European origin ripen with an increasing temperature, and although my opinion is merely theoretical, I have little doubt that this is the reason why European fruits and vegetables grown in the plains of India are so flavourless. Strawberries larger than our English *Hautboy;* asparagus, an inch in diameter; broccoli, which never flowers in the plains of India, all grow at Kilar not well but in profusion and of a flavour not surpassed in the most favoured spots of Europe; and no doubt it would be the same with English fruit-trees, for the hill sides are covered with wild cherry trees, apricots, crab-apples and pears, currant and gooseberry bushes. Vines, I did not see, but they would doubtless succeed. Hops were growing luxuriantly.

In Pangi, there are showers of rain, sometimes about three

inches in the summer months, consequently the climate is not of that completely arid nature as is found further up the Chandra-Bagga and on the head waters of the Sutledge. The snowfall in the winter months is very heavy, the gorge through which the river flows, although five hundred feet in depth, being completely filled up with it, and for three or four months nobody can leave the house.

The character of the Chandra-Bagga valley, in Pangi, is simply a deep gorge, through which the river forces its way, the gorges every now and again breaking back, now on one side, then on the other, and where these breaks occur villages are situated. The cultivated lands run up in terraces in the form of a semi-circle; here and there a grove of walnut trees, apricot trees studded about the fields: near the villages a stately wood of cedars surrounding the little village temple with its picturesque overhanging eaves, and upon the mountain sides one hears the tinkling of the cow-bells and the joyous songs of the cow-boys, and the air is saturated with the sweet scent of clover and other fragrant herbs. Altogether they are scenes of marvellous beauty, and one feels inclined to wish one could remain in such spots for ever free from the cares of the world and of society.

Wherever in Pangi you find a village, you may be sure there is a stream coming down from the mountains, above which, if you follow up, brings you to a glacier, some of them being of great size and beauty: you also know that up the stream you will find ibex; on the lower lands are many chikore and snow-pigeons and occasionally quail, so that in this favored land, the lover of nature can combine that of sport of no mean order.

The forest operations are of the crudest nature; all trees, that is *deodars* and *Pinus excelsa*, (for we have left all other pines behind on the other side of the snowy range), which can be approached are cut down, some rot where they lie, others are thrown down enormous precipices and reach the river more like

splinters than timber. In fact, nearly all the timber which can be usefully cut in Pangi has been felled, and now the Forest Officer has suddenly bethought himself of reproduction. To this end, he commences planting out seedling deodars in thousands which nearly all die; whereas, if he would only keep off the sheep from the felled forest, he would find it reproduce itself far more quickly and economically than anything he could undertake.

Some few marches beyond Kilar, the gorge of Chandra-Bagga narrows and the traveller's route becomes a mere track along the face of tremendous clifts, sometimes low down close to the river, at others a couple of thousand feet above. So difficult is the road that no animal but a human being can pass, and even he must be possessed of some considerable nerve and agility. In places, the road consists only of ladders placed against projecting angles of the rock: in others gaps in the path are supported by pegs of wood driven into crevices of the rocks, and over these pegs are laid pine saplings, and again across these loose slabs of slate. Any mistake in walking is death, and in one place the traveller may remark engraved on the cold hard rock how a British Officer lost his life through attempting to allow his dog to pass him on the road. There are many places where no dog can pass, and they must be carried: I cannot say, that all the marches along this road give unalloyed pleasure during their operation, but when the march is finished and the traveller is comfortably encamped and thinks of the stupendous marvels of nature through which he has passed and amidst which he is still resting, the dross passes away, and the refined gold of perfect contentment remains. The road by the Chandra-Bagga river does not continue along one bank of the river, but carries the traveller sometimes on the right bank, at others on the left: the bridges connecting the two banks are occasionally enough to try the stoutest hearts. I believe during the past two or three years, strong permanent bridges

have been erected, but when I made the trip, the bridges were, what is known as twig bridges: a cable of twigs twisted together in which you walk, with another cable on either side level with the hands, connected with the lower cable by streets and kept apart by pieces of wood, over which last one has to climb during the passage across the bridge. The bridges are from 100 to 400 feet across; one near Saor covers a span of 300 feet from rock to rock, the deflection must be 50 feet in the middle and at the lowest point reaches almost to the water, so that the spray of the river breaks over one's legs. The river is running at some 20 miles an hour under you, and the feeling induced during the passage of the bridge is one of rushing violently up the river sideways; some of the bridges are at an immense height above the water: these, however, are really not so trying as those near it.

After leaving Pangi the traveller finds himself first in Chumba Lahoul and finally in British Lahoul, and here the nature of the country becomes considerably modified. Instead of tremendous gorges, the mountains become less precipitous and take the form of mighty downs covered with grass which is so green that it defies description, so vivid is its hue, that it perhaps more approaches a field of mustard first bursting into flower when the green of the leaf seems to melt into the yellow of the flower; the villages become more numerous, and the cultivation more extensive. I should say, that this downlike appearance is the case only in the right bank for on the other side the valley is still bounded by stupendous cliffs, separating Lahoul from Chumba and Burmaor. Timber is now very scarce and takes the form of occasional groves of *Pinus excelsa* in warm sheltered gorges and *Cupressus torulosa* and willow along the glacier streams. At Tandi where the Bagga river joins the Chundra the traveller comes upon the main road leading from the plains through Kangra and Kulu to Leh over the Bara Larcha Pass, and a few miles up this road brings him to Kyelang, the seat of the Moravian Mission, over

which the Rev. W. Heyde has watched with such tender care for the past 25 years. Here again is a British Post Office, the most advanced towards Central Asia, also a Tuhseel, with its attendant satellites. In the Mission garden, one meets with flowers and vegetables again of the same flavour and look as they alone possess in our favoured England. Nothing can exceed the kindness of the Missionaries to all passing travellers, and the traveller would do well to remain some days, as from Kyelang many interesting expeditions can be made. The Mission have a farm of considerable area which they are yearly increasing by bringing in watercourses from the neighbouring glaciers. It was September when I passed through, and they were in the middle of their hay as well as their wheat harvest. This may sound an abnormal state of affairs, but the summer is so short in these elevated regions but at the same time so forcing, that all crops are sown and ripen at the same time. At Kyelang, one meets for the first time the Yak used only as a beast of burden and the half-bred females as milch cattle, and very first-rate milkers they are. Here also *pushm* is found on the goats and sheep and even on dogs. The people are evidently of Tartar origin, the language is Thibetian, monks and nuns exist in happy promiscuousness and say their prayers by machinery. The Moravian Mission, however, is perhaps about to change all this, as also prove that a morality can exist without a religion which is an example which, as a practical means towards improving the spiritual and temporal position of those among whom they are cast, other Missions in the plains of India might follow with advantage. But all Missionaries are unfortunately not so practical as Moravians, nor to my mind such examples of noble and devoted men. For where nature is most unkind, where others dare not penetrate, in the slums of London, on the icy shores of Greenland, in the pestilential swamps of Surinam, on the glacier bound, and avalanche swept slopes of the Central Himalayas, there we find these

devoted Herrenhutters.

From Kyeland, the wanderer after the beauties and wonders of nature, can take several routes: he may go up the Bagga river and across the plains of Lingti to Leh and Central Asia; he may strike off to the west through Zanskar, the most weird and perhaps most severe mountains in the world; he may from the Bara Lâ'rcha Pass return down the valley of the Chundra river and pass over into Spiti, or going lower down examine the wonders of the Shigri glacier with its wall of green and blue ice hanging over the river; or he may ascend the Chundra river and cross by the Hampta or Rotang Passes into Kulu. It was by the last of these routes, I proceeded. Three marches brings one to the foot of the Rotang Pass which is by no means high or difficult (13000 feet only). The top of the Pass is perfectly flat, about one mile long and a quarter of a mile broad. On the top there are several small ponds, from one of which I observed the water flowing in both directions: one drainage falling into the Chundra, and the other into the Beas, waters not destined to meet again until they joined in the burning deserts of the Punjab below Multan. Just as the Pass commences to descend is *Beas Khund*, a tiny little spring from which the Beas takes its first burst into life: so small is it, that the thirsty traveller can nearly empty at a draught the tiny reservoir which contains its first life drops. As one stands on the Rotang Pass looking back over Lahoul, particularly as the sun is rising, the scene is one of extraordinary grandeur: grassy slopes leading up to still more verdant ledges; peak upon peak covered with their mantles of riven snow, tinted with every colour of the spectrum by the "first faint flush" of the rising sun; glacier after glacier; and at your feet flowers of every hue shaking off the sparkling dew as a gentle wind comes wafted, laden with the sweet scent of the spicy mountain herbs. Let the traveller turn round and below him lies the valley of Kulu. No dissolving view that the art of man has ever painted can give any idea of the manner; two

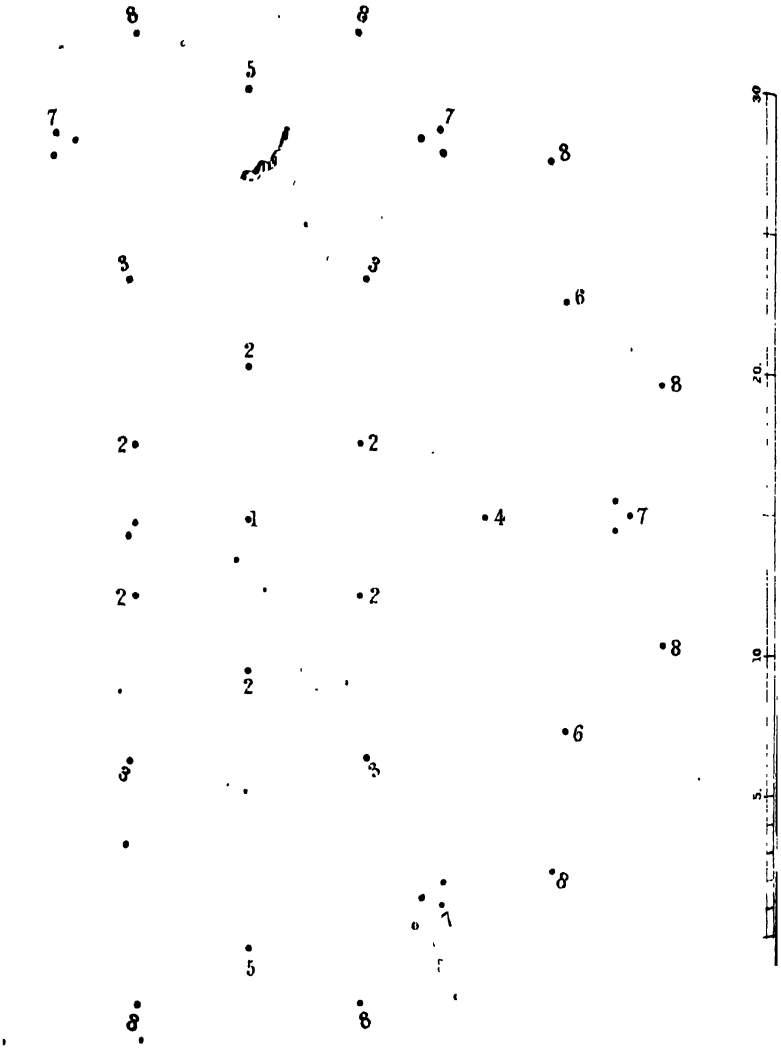
utterly contrasting scenes of absolute loveliness, melt into one another both perfect of their kind; the one severe, the other soft and delicate-looking. Over Lahoul, not one tree is visible; looking over Kulu forest all its forms of sylvan beauty, and luxurient vegetation lies below one. The descent from the Rotang Pass on its southern side is long, although not difficult, the resting place being at a little blockhouse at the foot but still some 8000 feet above the sea: but I would strongly recommend travellers to halt for some days, half way down, where he first comes upon the forest: here are open meadows of sweet scented grasses with flowers in such profusion that the eye is simply dazzled with their loveliness. About a quarter of a mile below Ralla, at the foot of the Pass, is perhaps the most beautiful spot known to travellers in the world. I know of only one man who has seen both this and the far-famed Yo-Semite valley in California, and he unhesitatingly gave Ralla the preference. The gorge opens out and is perhaps half a mile across from rock to rock; down the middle rushes the no longer infant Beas but a roaring mountain torrent in a chasm so deep, that the eye cannot penetrate its depth, so narrow that one can spring across it: on either side the cliffs are 3000 to 4000 feet high, in places absolutely perpendicular, so much so as to permit the water which falls over them in five places to reach the ground on which the traveller stands without an interruption in its descent: in others the cliffs are terraced, and on these terraces are deodars and other pines ending with the white stems of the birch on the highest, and it is only from observing the different trees growing in regular zones of elevation that one can estimate the height of the cliffs. From Ralla, the road leads down the valley on both sides of the Beas, passing Minali and its groves of ancestral cedar, past Raisan, probably the most elevated tea garden in the world, and on to Sultanpore the capital of Kulu. From Sultanpore the traveller can march along a good road with bungalows all the way over the Jalowrie Pass

to Simla or over the Buhu Pass through Kangra to the plains of India. Both are beautiful routes, but are known to so many that it is unnecessary to describe them.

I have not entered into much detail regarding the flora along the route; it would have occupied too much space, and perhaps have taken away the impression of the beauties of the march with which I hope to inspire future travellers. But in case the collector of wild Alpine flowers and plants wishes to make the trial, I can promise him a treat more varied than is perhaps to be met with in the same distance or time in any other portion of the globe; and when resting at Kyelong, he can have the pleasure of comparing his specimens and naming them after the most perfect *herbarium* of Himalayan plants which the good Moravians are always delighted to place at the disposal of all those who enjoy such gentle pleasures. To the sportsman, the route I have glanced along is full of interest, but he must go earlier in the year than August and September, before unfortunately the short summer of those regions has clothed them with her brightest colours. There is one misfortune, however, attending the route, and that is, the fairer and more gentle sex, let their nerves be strong on the boldest curves, cannot pass: there are two marches on the Chundra-Bagga river which are not passable to women-kind, and I fear many years must pass before the road becomes fit for them, if ever. However, this lovely country can be entered from either end with ease.

Of the human form divine along the roads I have said but little, but I can assure my readers that they will meet perhaps the most hideous and also the most lovely specimens. Of the whereabouts of the former, it is unnecessary to speak; but for the latter I would refer them to the shepherd's wives and daughters in Chumba and to the fair maids of Kulu.

F. H.



Following is list of kinds and number of Palms to be planted.

1.	Arenga saccharifera	1 plant.
2.	Areca catechu	6 plants.
3.	Cocos nucifera	4 „
4.	Caryota urens	2 „
5.	Oreodoxa	2 „
6.	Enterpe oleracea	4 „

Grouping of Palms on Lawns.

A Member of the Society writes as follows :—

I am anxious to plant a group of palms in the centre of a lawn in front of my house. As I have never cultivated palms, I should be much obliged if you would plan a group for me and give me the names of those most suitable and at the same time not very expensive kinds. The plot of ground I wish to plant would be circular, say 30 or 35 feet in diameter. The palms should be tall growing ones in the centre and those of shorter growth towards the outside.

If you would draw a circle and place figures on the spots where the palms are to be planted, and in the margin give the names of the palms corresponding to the figures I could easily carry it out.

Mr. John Scott, an Honorary Member of the Society, has obligingly assisted in meeting the above request. Under the impression that the plan furnished, and the kinds of palms to be introduced, would be interesting and useful to many, now that the culture of this handsome and useful family has so considerably increased, they are now introduced for general reference.

Extract of Mr. Scott's letter.—Pray excuse the rough sketch I send you with a view to meet Mr. Gordon's request. I have no drawing instruments by me. Rough as it is however you will make it out by the *scale* and figures.

I am quite out as to palms available with you, and I have thus been unable to give great variety. I have confined myself, as you will observe from the subjoined list, to the *wing-leafed* sorts, as I think, in a small group like the one proposed, the broad fan-like leaf is quite out of place. I mean such sorts as *Livistona*, *Corypha*, &c., Again, I have confined myself to sorts which give off their fronds at very acute angles, the upright growing sorts in a word; avoiding such for example as the wild date, oil-palm, &c., in which

the fronds form almost a right angle with the stem. I give you these explanations; now for the list. The consecutive numbers of course correspond with those in plan:—

Wing-leaved Palms.

1. *Arenga saccharifera.* Central Plant.
2. *Areca catechu,* 6 plants. As a temporary arrangement until the others fill up.
3. *Cocos nucifera,* 4 Plants.
4. *Caryota urens,* 2 „
5. *Oreodoxa regia,* 2 „
6. *Euterpe oleracea,* 4 „
7. *Areca catechu,* 18 „ in groups of 3.
8. *Phœnix acaulis,* 12 „ This with its slender and graceful fronds, and dwarf habit, will form a pretty border for the group.

The Banana: a Pomological contribution, by S. Kurz.

It must be admitted that Pomology is still in its infancy in tropical countries despite the great variety of fruits cultivated or wild. In India (in an extended sense) we have about eight varieties of Ramputan (*Nephelium*), a good number of pine-apples but possibly reducible to about 12-15 kinds only (Beer has as many as seventy kinds), about twenty varieties of cocoa-nuts, rather more than fifteen varieties of catechu nuts, nine kinds of jack-fruits, as many as twenty kinds of Durian (the favourite fruit of the Malays), a good number of citrons, limes, shaddoks and oranges, which, however, are in great need of a sound revision, six kinds of jambu-apples, three of tamarinds, only three kinds of Duku (*Lansium domesticum*), a great number of melons and other cucurbitaceous fruits, seventeen or eighteen kinds of Spanish pepper, eighteen or twenty kinds of egg-fruits (*Solanum melongena*), &c. The

mango shews the greatest variety of fruits on the Indian continent, but still is far behind in comparison with the forms produced in cereals, for we know of more than eighty varieties of rice and more than twenty kinds of sugar-cane. Turkish corn (*Zea mays*) and *Sorghum* have proved also prolific in varieties. But of all the plants cultivated for the fruit sake, it is the banana which numerically is strongest represented, and we know at present near to 100 varieties of it and many more shall have to be added as soon as the chaotic state of literature on this subject shall have been removed.

Numerous are the native names for banana generally, and are better looked for in the dictionaries. Some of them, however, are more frequently used in this paper, and these are :

Kela, Bengali.	Pisang, Malay.
Palan, in Malabar.	Kedang, Javanese.
Aretti, Telinga.	Tjou, Sundanese.
Tshyo, Chinese.	

The Sanskrit names for the banana may be consulted in Vol. I. of Roxburgh's Flora Indica.

The English name "plantain" is derived from the Spanish "plantano," a name which has been corrupted by Joseph Acosta (Libr. IV. Cap. 21) and subsequent writers into "platano." "Plantain" is rather an awkward introduction into the English language, considering that the very same name is applied to a perfectly different English plant, *viz.*, *Plantago*. I have for this reason adopted in this paper the name of "banana." I could do so the more readily for reasons presently to be discussed. It is also at the same time the name by which the fruit is called in other moderu languages.

Some people break their head about the distinction between plantain and banana, and some believe, that the fruits of the banana are usually more round and plump, while others call the edible sweet fruits by the name of banana, and plantains those that are inedible unless cooked. Again, others find the

distinction between the two in the size only. In the West Indies the bananas are similarly divided into :

1. Pacovas, the smallest kinds, which the Spaniards in Malabar called Cenjarins.

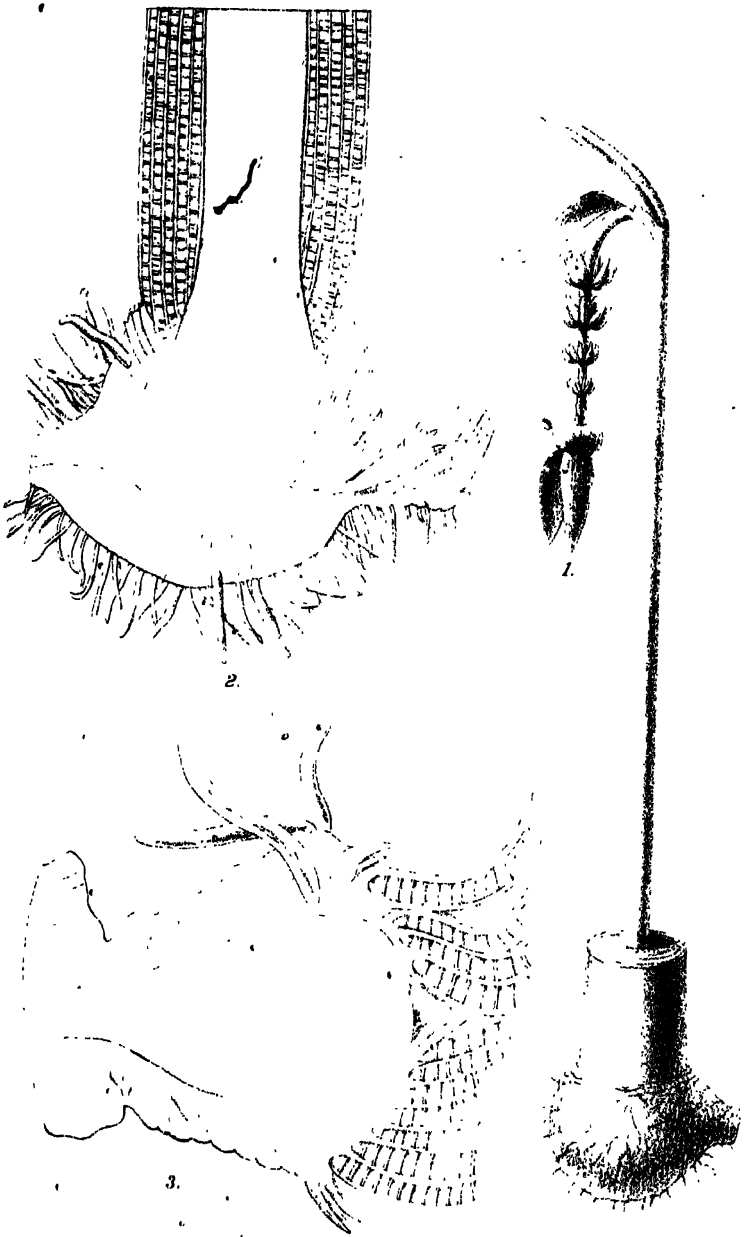
2. Bananas, the large kinds, formerly called chinkapalones, by the Spanish in Malabar.

This distinction is first given in the Historia Rochefortii Antillarum Cap. 9, thus : "The fruit bananas is twelve or thirteen inches long and nearly as thick as the arm. The bacovas is half the size and only six inches long. The banana-tree bears only 25 to 30 fruits on the raceme and these are rather laxly placed ; but the bacovas bear 100 to 126 fruits which are so closely packed that they press upon one another. The bananas have a dry and hard flesh fit only for cooking or for being roasted in ash ; while the bacovas cannot thus be treated on account of their sappiness. Its fruiting spadix must be supported unless it should break on account of its own weight."

In the present state of our knowledge of *Musa* generally such a distinction is not only insufficient, but indeed superfluous.

The banana which forms the special object of this paper, is one of the most ornamental and characteristic plants in tropical countries. Already Rumph has correctly looked upon both East Indies as the true native country of the banana, and as correctly he has added (although doubtfully) the Eastern parts of Africa, citing Pliny. "In a wild state (taking all the species collectively,) it is found not only in the plains but still more so in the mountainous parts all over India, from the Malay Archipelago up to the Himalayan Alps, and extending from the Oceanic Islands of Australasia to the Western Coasts of Africa. Australia, too, possesses several wild species of banana.

America alone has been destitute of bananas before the advent of Columbus, although a few disbelieve it. At present,


1.
2.
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the banana is there extensively cultivated and as conspicuous a feature as in the old world, freely disseminating and often found half-wild in the jungles.

Geologically the banana tribe appears early in the carboniferous age, of which two species of *Musocarpus* have been described, and the only species of *Musæites* has been found in the coal-measures of Bohemia.

*I.—General Character of the Banana.**

The banana plant is often called a tree, but virtually it is nothing but a gigantic herb which has not unappropriately been compared by Meneghini and Achille Richard to a huge leek (*Allium Porrum*). Figure 1 of plate I exhibits a flowering scape of a cultivated form of *Musa sapientum* after the sheaths of the leaves surrounding it have been cut away from the base. This figure will give an idea how a flowering banana would look if it were a bulbous plant that produces flowers and leaves at different periods. A section of the basal part on the same plate (fig. 2) shews us, that the bulblike rhizome consists of a dense fleshy but rather hard pith forming the central portion and a peripherical cortical portion which surrounds it and which is most marked in the young plant. Vascular bundles leading into the leaves and into the roots irregularly arise chiefly around and from the central portion. Numerous strong but comparatively short roots arise in every direction from the circumference and also from the axils of the marcescent bases of the leaf-sheaths. A tap-root is not present and the lateral production shewn is the cut end of rhizome that stood in connection with its mother plant. In several species this rhizome is simple without emitting shoots, but by far the greater number of bananas send forth (like

* On this subject should be consulted also L. C. Richard, De Musaceis Commentatio Botanica in the Nov. Act. Acad. Nat. Cur. Vol. xv. Supplement; L. Colla, Memoria sul Musa, in the Mem. di Torino xxv, pp. 333—402; and more especially L. Wittmack, Musa Ensete, Ein Beitrag zur Kenntniss der Musaneen, in the Linnaea, Vol. xxxv. 209—290; also Payer; Traité d'organogénie comparée de l. fleur 670-673.

in the plate) more or less numerous shoots. This sobolification is pretty constant, but I remember a plant of *Musa glauca* in the Botanical Garden of Java which threw out two shoots, and if accounts are correct, the *M. Ensete* of Africa is said to make many shoots (I suppose if the whole plant is cut down before flowering). What is commonly called the stem or trunk of the banana, is chiefly formed of the sheaths of the leaf-stalks which, one rolled round the other, are densely enveloping the flower-scape. It is only in *Ravenala*, a Madagascarian Musacea, where a palm-like trunk becomes developed and elongates up to 35—40 feet by a girth up to 2½ feet. The leaf-sheaths which surround the scape, grow very rapidly but also unequally, the outer older ones growing more slowly than the inner new-formed ones. This can be very nicely seen if a stem is transversely cut through, when we see the following day the inner layers (leaves) exceeding the outer ones and forming a sort of irregular staircase towards the centre. Such stems formed of concentrically enveloping sheaths of leaf-stalks are called by botanists a corm. These leaf-sheaths elongate in consonance with the elongation of the scape, but arise always from the neck of the rhizome, and as there are bananas with 20-25 feet long stems so are also the sheaths of the same length. At their termination they become narrowed into the petiole, which in sorts is slender and long, in others short and stout, concave at the inner side and often more or less leafy-bordered on account of the decurrent leaf-blade, of a dark purple to green colour and often more or less pruinose. The leaf-blade offers but little variety of form, being in all kinds oblong to oval-oblong, very often narrowly so, with the cordate rounded to acuminate base often more or less unequal and decurrent, of a firm or very firm texture but easily slitting in the direction of the parallel veins which very numerously and crowdedly arise at a right angle from the stout midrib. In a developed state the blade is usually blunt or rounded at the tip, rarely acumi-

nate, but in the young state, it is more usually cuspidate, and the narrowly hyaline margins either beautifully crimson or white. In the centre of the leafy envelopes is concealed the flowering scape, which is leafless and nude, only slightly tapering upwards and directly arises from the rhizome. Only the uppermost part of it becomes exserted from the leaf-crown, and it is often furnished here with comparatively diminutive cauline leaves, which more or less abruptly pass into the floral bracts forming the flowering raceme or spike. This raceme is either erect, or more often nodding or decurved, varying greatly in size and length, not only according to species, but as much also according to soil and treatment under cultivation. The rachis, the lower part of which is very unappropriately termed the peduncle, is as often shortly tomentose or puberulous as it is glabrous, and such variations occur in the same variety of banana. It is also furrowed although the furrows are often only very obsolete. The bracts are most conspicuous and large in all bananas and are important in the discrimination of species, offering not only a constant vernation and aestivation, but also other characters. They entirely cover the half-whorls of flowers and are so densely laid one upon the other or enveloping each other, that they form a sort of flower-cone which the Malays call djantong (motha in Bengalee). They open successively from below upwards. Twofold is the vernation of these bracts, either they do not entirely embrace each other and more especially are upwards imbricately laid one upon the other, and in this case the outer ones are always shorter than the following inner ones, thus forming the imbricate flowering cone (especially marked before the development of the male flowers); or the bracts are equally long or rather successively elongate and overlap each other along their whole length, and in this case no imbrication can be traced (not even at their tips), and the flowering cone is then said to be convolute, Upon this character (in conjunction with minor differences) several

very near allied species have been separated by me which formerly were supposed to be all forms of *Musa sapientum.* The lowermost bracts are always larger and more elongate and bear usually no flowers in their axils. In *Musa corniculata,* a very abnormal and evidently monstrous form, only the lower bracts (now very large) are developed and the rest (and also the flower-whorls) are aborted or reduced to mere swellings on the deformed nude end of the rachis. The nature of the outside of the bracts, whether furrowed and variously pruinose to mealy, or smooth and glossy to almost polished, furnishes in a broad sense also good distinctive characters. The colour, too, is of value, although great variations do occur. We have dark-purple to dirty purple, dull-red, pale lilac, green, yellow, orange, and rose-coloured bracts, and these are all more lively coloured outside than inside, but some have the inside scarlet or yellow and the outside dull purple. Their tips are usually blunt or bluntish, usually with an infra-apical cucullate point. In most species the bracts are all successively deciduous, but in others (more especially in the non-soboliferous kinds) they are marcescent persistent. The flowers are arranged in half-whorls and inserted on more or less crescent-shaped protuberances of the rachis, sessile or stalked, and usually placed crowdedly into two rows, or (in the smaller erect-racemed species) they number only 3—2 in a single row. Those of the lowermost whorls (and the number of these varies not only in the different species but as much in their varieties) are hermaphrodite-female, *i. e.*, the male organs are reduced or castrate, while those further up consist of hermaphrodite-male flowers which have the male organs fully developed, but the ovary or stigma is in some way or other impotent although well-developed but smaller. Fecundation is chiefly effected by pollen (which is spherical and smooth) carried by the action of wind from the male flowers of the neighbouring plants, but there are many exceptions to this. True

hermaphrodite flowers with a large well-developed ovary and equally well-developed anthers are met with in a few varieties and their half-whorls are usually situated just above those of the hermaphrodite-female ones. In others the flowers towards the extremity of the raceme become truly male or even quite a sexual and rudimentary. Some varieties, and a few species, produce only hermaphrodite-female flowers, and in this case the raceme becomes covered with fruit from the base to the tip. But the normal state of a raceme is to have only a few fruit-whorls at the lowermost part, while the male hermaphrodite-flowers and their spathes drop off successively leaving a long noddy nude rachis which terminates in a flower-cone formed by the innermost bracts of the male flowers.

The corolla of the banana-flower consists of two parts, usually called lips, the upper or outer lip, and the inner lip. They are formed by the consolidation of the six petals, of which the three outer ones form the outer lip and are still recognisable in the three lobes that terminate it, and with which are more or less completely consolidated the two inner upper petals, usually indicated on the inside of the lip by two small lobes which alternate with the three outer lobes; while the sixth anterior inner petal remains free and forms the inner lip. In several species, however, and more especially in the hermaphrodite-female flowers, the two inner petals are distinct to, or near to, the base; on the other hand they may become so fused with the outer lip that this appears simply three-lobed at the tip. In cultivated varieties cases occur where all the three lobes of the outer lip become free and distinct, and thus form with the inner lip a normal six-phyllous perianth. Tun-bloi-kay, a Siamese variety of *M. sapientum*, sometimes has all the perianth-lobes united into a tubular perianth. The tendency towards abnormalities in the banana-flower has already been commented upon by botanists, and L. Witmack mentions a case of consolidation of the two adjoining flowers into one furnished

with a single eight-lobed perianth, 9 perfect stamens, 3 staminodes and 2 styles. The outer lip is usually white or watery white, but often also yellow (especially the lobes), yellowish, purplish to flesh-coloured; in the small erect-racemed species, however, it is lively coloured, orange-red, bright yellow and (*M. Salaccensis*) beautifully grass or emerald-green. It is usually glabrous, but in a few species it is papillose-velvety. The inner lip is of a more or less hyaline texture and is either as long as, or shorter than, the outer lip, sometimes very short, acuminate to cuspidate, or crimpled-truncate with or without a point, or (in non-soboliferous species) obversely sagittate with a longer or shorter subulate-linear point in the notch. Only one form (pisang djanten) has occurred to me in which I found the inner lip constantly and entirely aborted. The normal number in the male flowers is five, the anterior sixth one opposite the inner lip being entirely aborted or more or less rudimentary, but also sometimes (in a few forms regularly) developed. Abnormal flowers are sometimes found with 7-8 stamens. In the female-hermaphrodite flowers the stamens are also often developed although without fertilizing pollen, but more usually they are more or less reduced or quite rudimentary. The filaments are more or less flattened and elongate-ligulate. The anthers are two-celled, the cells more or less linear, parallel and separated from each other by the broad and usually blunt connective. The pollen is spherical and smooth, except in *Musa Ensete* which has tubercled pollen. The ovary in the female-hermaphrodite flowers is always larger and more developed than in the males and in one variety (pisang tanduc) as long as 5 to 6 inches. The style is stiff and stout, terminating in a more or less irregularly three to six-lobed capitate stigma, but in a few varieties the stigma divides into six linear lobes. The placentas arise from the internal angle of three cells into which the ovary is divided and are very short, or in varieties of *M. sapientum*, (especially the wild form) they

are so much elongated that the fruit appears six-celled. The ovules are attached in two longitudinal rows to the placentas, but in some species only few become fertilized, while in most cultivated varieties they all or nearly all abort. The banana-fruit is a sort of berry, elongate or short, variously shaped from oblong and obovoid to elongate-cylindrical, terete or cornered, often produced in a beak, sessile or stalked, and covered with a thinner or thicker pericarp usually called the rind or skin, many-or few-seeded, or (in the cultivated forms) seedless. The skin is permanently green or turning yellow, rarely leather-coloured, reddish, purplish to purple or blotched, smooth or roughish, opaque or glossy. The banana-fruits vary as much as do apples and pears, but their forms are less constant in shape and size, indeed the same stock of banana produces now large now quite small fruiting racemes. Notes on the size (of course within certain limits) and on the number of fruit-whorls are therefore only approximate and of no particular importance. The sharpness and distinctness of the corners of the fruit depend upon the amount of pressure to which the fruits are subjected in the whorls and consequently the angles are sharper in the degree as the fruit whorls are more crowded and compact; and fruits very laxly disposed will be more or less terete. As the fruits are usually placed in two rows it follows that the two outermost lateral ones will be three-cornered, and the others between them more or less 4-5-cornered. In a similar way are the lateral fruits of a whorl often strongly, the central ones little or not curved; but I must note here that there occur also permanent directions of the fruits, and so are, for example, the fruits of kole boddas always horizontally diverging. The seeds are usually black and variously shaped, in the non-soboliferous species they are large and smooth and often few in number; in the soboliferous species they are small and very numerous in the wild-growing kinds, and assume a turbinate polyedrous, irregularly globose or depressed, patelliform or

rarely an obversely conical shape, usually with a more or less depressed umbilicus and a circular concave hilum. The surface is smooth or more usually variously tubercled or rough.

II.—Uses of the Banana.

The uses of the bananas are many-fold, but in the first place their fruits serve for food. Man in the Indian Archipelago (epecially where rice is not so plentiful as in the East Indies) begins life with bananas, and Rumph naively writes: "For this purpose (feeding of the child) is used chiefly pisang kroho, which is first roasted in ash (for which it is best adapted), and then the mother takes a small piece of it into the mouth, and having chewed it, smears the pap into the mouth of the child. If the child is sleepy, then she causes it to cry. If the pap still will not slip in, she gently squeezes the child's mouth from the sides, and if it then still refuses to gulp the pap, the child is forced to swallow a whole morsel. This is the cost which the Malay child gets for the first seven or eight months until it gradually adopts itself to rice and other food. What do you think, reader? May these natives not say "Musa mihi principium," or with Oviedo Trist. Lib. IV. eleg. 10 "Gratia Musa tibi quid vivo." And if it is true, as the ingenious Franciscan monk Garcias meant, that the banana-fruit has received its name from the goddess Musa, then these natives ought to be educated from childhood in the Muses." (Rumph. Herb. Amb. V.)

The nourishing qualities of the banana have been much exaggerated, and I will only cite Rev. Dr. Mason (Burma p. 449,) who writes: There is perhaps no plant of which so many preposterous things have been carelessly written in books of travels, and then copied into works of graver character, than the banana. Amongst other things equally veritable, it is said in Loudon's Encyclopedia of plants (under *Musa paradisiaca*), "Three dozen of plantains are sufficient to serve one man

for a week instead of bread, and will support him much better." A Karen by me says he often eats ten at a time, and a hundred would not be sufficient for a man one day if he had nothing else, unless they were very large.

The taste and flavour of the banana-fruit is very various; some are acidulous, others acid-sweet or sweet like sugar, again others are acerb or mawkish, &c. The banana is not cut with a knife in the Indian Archipelago as the steel produces a disagreeable stringiness. Linschoten, in his travels, cap. 55, writes, that the Portuguese avoided to cut the banana fruit with a knife in order to prevent the cross (*i. e.* the cell-walls) to become too visible. The Dutch in the Archipelago consider it offensive to offer at a dinner-table bananas to a lady.

Not all sorts are adapted for being eaten raw, but many are chiefly used cooked. Unripe they are generally roasted or otherwise cooked or stewed, and (as in the case of apples and pears) those least good for raw-eating are also those best tasting if cooked, when they assume various flavours, some more tasting like stewed apples, others like pears, &c. Bananas are also eaten by natives with cow's milk and sugar. Slices of the fruit are fried as fritters, or when unripe cut lengthwise and dried in the sun. Bananas are also wholly dried as a confection, when they taste like figs (see Wallich in Trans. Agr. Hort. Soc. India VIII. 58); in Mexico these are called platano passado. Plantain-meal is prepared by simply reducing the dried pulp to powder. It is palatable, digestible, and nourishing.

The skin of the fruit is generally used by the servants in Dutch India for blackening their masters' shoes, &c. The milky juice which flows from all cut parts of the banana is rich in tannin, and it is of such a blackening nature as to be fit for being used as indelible or marking ink, the marks becoming black and visible only after washing. One rarely emerges from the cloudy regions of the vulcanoes on Java (where the undergrowth is chiefly composed of wild bananas

and Elettarias) without seeing his white clothes all spoiled for ever owing to the juice that exudes from the injured parts of the banana plants. With addition of iron it rapidly becomes black like ink. This juice fermented is made at Cayenne and on the Antilles into a good wine called "Vino di banana." It is also used by some natives for medicine and is said to be slightly astringent and diaphoretic.

The djantongs (the sterile flower-cones) of most varieties are used in sayurs and kurries, and so are also the flowers themselves in some parts of India.

The inner portion of the banana trunk (the scape) is also eaten and is brought into the Calcutta bazars to the amount of half a ton to a ton daily. It is largely used by the fisher caste after being boiled. The Chinese in the Malayan countries use it also for feeding their swines. The outer sheaths are good for packing therein living plants or sirie, destined for being sent abroad. Elephants are very fond of them and one continuously meets in the jungles with banana trees destroyed by these animals. In the Indian Archipelago the banana-trunks are cut into several pieces which serve as hearths during festivities in open air, and in Siam they are in use for clarifying sugar.

The leaves play a great rôle in the packing of all sorts of small goods in the bazaars, and every shopkeeper in Malaya keeps constantly a supply of them, using them for this purpose just as we use paper. They are also used for temporary thatch for huts, &c.; they serve also as dishes and plates. The earthen pot or bamboo, in which rice is boiled, is tightly closed with a banana-leaf so that only a small quantity of water suffices for creating steam enough for boiling the rice. On the Viti Islands they are used in a dried state instead of paper for cigarettes called suluka. In some parts of America they are woven into mats for many purposes, or worked into baskets.

The spiral vessels are found in such abundance in the sheaths and petiols of the banana as to be capable of being pulled out by handfuls, and actually collected in the West Indies and sold as a kind of tinder. All larger kinds of banana yield strong fibre, and v. Siebold also writes that the fibre of *Musa basjoo* is used in the Liukiu and other islands to the south of Japan, and he believes that it is equal to the Philippine nippis. However, the manilla-hemp or abaca (*Musa textilis*) is the sort which is almost exclusively used for this purpose, (see Scherzer, Reise der Novara um die Erde II. 228, and F. Jagor, Reisen in den Philippinen). I extract from Jagor's account the following notes on this subject.*

The Manilla-hemp, which is often called vegetable silk by the French, is called bandála by the natives of the Philippine Islands, but in commerce it usually goes under the name of abaca. It is exclusively produced in the south-eastern parts of the Philippines, and the provinces South Camarines and Albay, the islands Samar and Leyte with the surrounding islands, also Cebu, are specially adapted for the culture of the abaca. On Negros the abaca thrives only in the South, and Yloilo which produces the greatest quantity of abaca textures (guinaras), is compelled to draw its raw-produce from the more Eastern Districts for the reason that the plant does not thrive on the island Panay. All attempts to successfully cultivate the abaca in the western and northern provinces have hitherto remained abortive: the plants grew barely two feet high, and the produce did not cover the outlay. The cause of these failures is attributed to the dry season which continues there for several months (in the eastern provinces there is a copious supply of rain all the year round).

According to Royle, the abaca-fibre excels the Russian hemp in respect of firmness, lightness, strength and cheapness and is inferior to it only in this point that the ropes

* See also a paper on Manilla-hemp in the Transactions of the Agri-Horticultural Society of India, Vol. VIII., 76-89.

made of it become stiff in rainy weather, which is ascribed to the manner of spinning. At present it can no more be said to be cheaper, for the demand of it has exceeded the supply. Its value in London was in 1859 22-25£ per ton, and in 1868 the price has been raised to 45-50£, while that of Russian hemp was only 31£.

In Albay are about twelve kinds of albaca bananas under cultivation, which are selected according to the quality of the soil. The culture of them is extremely simple and independent of the season. They thrive best along the slopes of volcanic hills and in clearings of jungles where shady trees are left standing at distances of about sixty feet. In the open plains they succeed not so well, and in swampy lands not at all. The young shoots are usually planted at distances of at least ten feet in a good soil, and in less fertile soil they are placed at six feet apart. The whole work hereafter is restricted to weeding; latter on the young plants grow so vigorously that they suppress all other plant-growth around them. At this stage of development they require no more shade. Only in rare cases the plants are grown from seeds. For this purpose the fruits are cut and dried, but these must not be overripe, for in that case the seeds do not germinate. Two days before sowing, the seeds are put for a night in water and the next day dried in the shade, when they are sown on the third day in shaded recently ploughed soil in holes an inch deep, leaving half a foot space between the plants. After a year the plantlets have reached about two feet in height and are taken out and planted in the same way as the shoots. It takes three, and only under the most favourable conditions, two years until a plant grown from shoots is ripe for fibre, and four years when grown from seedlings a year old. The first harvest is restricted to simply cutting the main-stems, afterwards they grow so rapid that they can be cut every few months. After a few years more the plantation becomes so dense that it is almost impossible to penetrate through it. The fibre is best just at

the time when flowering commences, but this period is not always waited for in cases when the price is high. Plants that have passed flowering are no more used for their fibre which is said to be then too weak, but the real reason may be that the fibre is then more difficult to work.

A Prussian acre yields annually as much as 30 cwt. of fresh banana-stems. It happens sometimes that a single plant gives as much as two pounds of fibre, but the most favorable average is rarely one pound, and only $\frac{1}{3}$th of this on bad soil. The margins of the leaf-stalks, which contain much finer fibre, are separately slit into stripes of an inch breadth, and this kind of fibre is called lupis which is highly prized on the Philippines and only used for fine native textures. The bandala hemp is coarser and serves more for ropes. Four classes of lupis are distinguished, *viz.*, binani, totogna, sogotan, and cadaclan. The fibre of the inner leaf-stalks which are softer, is not so strong as that of the outer ones, and is called tupus.

Export of Abaca (in piculs.)

England . . .	198 954	226·258	96 060	125 510	131·180	143·498
N. America (Atlantic sea Ports)	158·610	249·106	280 000	294·728	327·728	285 112
California .. .	6600	9426	..	14·200	15·900	22·500
Europe (Continent) ..	901	1131	..	200	244	640
Australia	16	5191	...	21·144	11 434	6716
Singapore	2648	1934	..	3646	1202	2992
China	5531	302	..	.	882	2294
TOTAL ..	273 269	493·352	406·068	460 558	488 560	463·752

The consumption of this fibre on the Philippines themselves is not exhibited in the above table, but must be very large for the natives of whole provinces are dressed in guinara, which are usually home-made.

The leaves of many varieties of bananas are covered on the underside with a white minute powder, but none so much so

as those of the wax-banana of Java. Junghuhn (Java I. 245 with figure, of the second German edition) relates the following regarding it: In the southern parts of the regentship Kuningan (Residency Cheribon) and in the districts Dayu Luhur and Madyenang (in the Assistant Residency of Jjelatjap) occur immense quantities of a wild banana called pisang karet or tyu kelelet, *i. e.* wax-or resin-banana, which grow by millions between shrubbery and in light jungles not only along the slopes but also in the valleys, at elevation from 300 to 1500 feet.

The undersurface of its leaves (6 feet long by two broad) is covered with a white meal-like rime which the Javanese use to scrape off with wooden knives after they have cut down the whole plant which bears usually about seven leaves. The lower portion of the concave petioles (the sheath), which embrace one another and form the stem of the plant, serves as a vessel wherein the waxy meal is collected. Having filled this sappy gutter, they put it in a somewhat sloping position over a burning fire and thus melt the wax which now flows off into a pot or the half of a cocoa-nut placed at the lower end of it. The stream of wax is usually conducted through a bundle of areng fibres (idyo) and fastened at the lower mouth of the gutter with a view of cleaning the fluid of impurities, plant-fibres, &c.

The wax thus obtained becomes very clear, hard and whitish after being cooled down, and forms an important article of trade in middle Java. Bleaching renders it very white. A banana tree yields two ounces (apothecary weight) of wax. As the banana-plant shoots again and thus can be cut twice in the year and besides as there are thousands over thousands of them available, the manufacture of wax is a remunerative enterprize for many of the inhabitants there.

III.—Culture of the Banana.

The banana plant is of easy cultivation. It likes good and deep ploughed grounds, and, like most other plants, good

drainage. Ash is also often added in the hole wherein the plant is planted, and some add also lime which causes quick fruiting. Around habitations they grow best in those spots which serve for the refuse and grow here more luxuriantly than elsewhere unless manured. They begin to fruit usually in the tenth month after planting the shoot, some already in the sixth, other small ones in the fourth month, while again others require much longer time (up to 1½ to 2 years). After the trunk has fruited once, it is cut down in order that the shoots may grow more vigorously, but if the latter become too crowded they have to be thinned. The old trunks are then usually cut into pieces and serve as natural manure for the plant. Transplantation of the shoots improves the quality of fruit. The fruits are not left on the tree until quite ripe, but are taken off while more than half ripe, for bats and birds would devour them. The lowermost fruit-whorls are first taken off as they begin to ripen from the base upwards, or more usually the whole fruiting raceme is cut off and left to ripe.

The propagation of banana is almost entirely restricted to shoots, which the Malays not inappropriately call children (anak), for the edible kinds produce mostly no seeds at all. Those bananas which make no shoots have to the contrary large seeds, their cycle of life is only 3 to 4 years when they die off after once fruiting. Therefore the quality of their fruits cannot be improved, and, for this reason, are only rarely seen planted. The varieties of banana are all produced by the mode of culture and the influence of soil and treatment. Artificial selection by seeds is never resorted to by natives but it is not easy to say how much cross-fertilization has influenced variation in the banana.

IV.—Sorts of Bananas hitherto known.

I have until now treated the banana only in a general way, and we have now to inquire into the various kinds of banana, whether species, variety or form. But how I should arrange

this matter best in the present state of confusion of this subject is a difficult question. After some deliberation I think I can only escape the gaol by giving first of all the whole indigested matter as far as I find it published in works accessible to me, and I shall hereafter try to separate the wheat from the chaff as far as the material at my disposal allows me to do so. For this purpose I must treat the reader with no end of vernacular names, with or without some notes appended to them, and have the matter arranged according to the principal geographical regions, veering from east to west.

A.—Bananas of Australasia and Australia.

According to the late Dr. B. Seemann, there are about 18 different kinds of plantains on the Viti islands, which all have distinct names. They are said to belong chiefly to *Musa uranoscopos*, Rumph.; which bears erect dense bunches of orange coloured fruits. The Samoans have a tale to the effect that all their bananas had once a fight together in which all their soaqua (*Musa uranoscopos*) got the best of it and, flushed of the victory, raised henceforth their heads, whilst the vanquished became so humilitated by the defeat, that they never raised their head again. Vudi-ni-papalagi (*Musa nana*) is a recent introduction by the late John Williams, and has propagated on the islands so much that it is the sort most commonly cultivated. Besides the above two kinds, he gives us the following native names for digestion:

Balawa-ni-rakiraki.	Tumoutala.
Bati.	Ura.
Dreli.	Vudi-dina.
Buli.	Vudi-Kalakala.
Droledrole.	Vudi-ni-toga.
Gonegone.	Wawai-leka.
Leve-ni-ika.	Wawai-salusalu.
Mudramudra.	Wawai-vula.
Soquo.	Sei.

Of the bananas of the other Australasian islands I have found no accounts except stray names possibly meaning no more but banana. According to the accounts in Scherzer's Reise der Novara, "*Musa rubra*" (which I suppose to be the same as *M. uranoscopos*) seems to be the principal kind in cultivation, but others with nodding fruit-bunches are also met with. Australia does not yet cultivate the banana, and hence we are spared the doubtful pleasure of learning amusing names of aborigines or colonists from this quarter of the globe.

B.—Bananas of China and Japan.

Bananas are cultivated in China as far north as 30° N. Lat. and one species is said to grow also wild in the ravines of Hongkong. *Musa nana*, and ou-ang-chok-chee (*M. coccinea*) are wild there. In Japan the latter seems also to be cultivated and is called hime-basho, and in the southern parts of that Archipelago it is basho (*Musa basjoo*) that is much cultivated. This kind grows not wild here but is introduced from the Liu Kiu islands to the south.

C.—Bananas of the Philippines and the Indian Archipelago.

This large region may no doubt be looked upon as the one richest in bananas, and we may fittingly open this chapter with Father Blanco's researches of the bananas on the Philippine islands. He divides them all into two classes, the first one containing those that have a fruit with a "corteza gruesa," and the second those with a "corteza delongada," which I must understand to mean thick-and thin-skinned banana fruits, a distinction which Father Blanco seems to have derived at the dinner-table, for when he went to write his book he came to grief and had to put his *Musa paradisiaca* into both his classes. He tells us that there are 17 varieties on the islands, of which he enumerates only 18, and arranges them thus:—

Musa paradisiaca, with thick-skinned fruits to which he refers:

1. Saba-bisco or obispo of the Tagalese; fruit 3 inches long by one thick, 3-5-angular; seeds none; most esteemed. Imbricate spathes are ascribed to this.

2. Ternate, gloria; fruits 3-5-angular, more than 5 inches long; seeds few.

3. Lacatan; fruits obtuse and angular as in preceding varieties, crowned by the persistent corolla. Introduced from Pampanga.

4. Tampohin; fruits like bungulan, but not so palatable, green.

5. Bungulan. Fruit larger than that of lacatan, always green like the tampohin, the angles are less conspicuous than in the other kinds. The pulp and taste is very sweet. It is one of the most esteemed bananas.

6. Tondoc. Fruits three or more cornered but the corners disappear with ripening, more than a foot long. The raceme bears only few fruits. Roasted it has the taste of apples and, therefore, is much esteemed. Fibre is obtained from the shoots, but it is not so good as that of abaca.

7. A purple variety called *Musa paradisiaca violacea.* The fruit is round and as thick as the wrist and of the size of a good ternate, and has the appearance and taste like it. It is a new introduction to Manilla, but from whence introduced Blanco does not know.

8. Platano de la costa. Fruits of the shape of ternate, with corners, somewhat flesh-coloured, and its taste also resembles a little that of ternate, but cooked it tastes like tondok.

9. Galamai Senora or Dinugoan of the Tagalese. Fruit as large as the saba, straight, with angles, of a light violet colour; not very savoury.

10. Batavia, Matavia or songai Anuang of Tagalese. Fruit very long and thick and of firm pulp, but not very savoury.

11. Quinauyan. Fruit tapering at the end, long and not very thick, of good taste when fully ripe.

12. Tinumbaga or Goyoran of Tagalese. Fruit of a regular shape. The pulp has the colour of "tumbaga" verging into flesh-colour, but is not so savoury.

13. A variety called *Musa paradisiaca ulnaris*. This is only known to the negritos inhabiting the hills of Balanga, who brought down the fruits to the people below. Those that have seen and eaten the fruit, say that it is as thick as the human thigh and a yard long, and bears seeds. If cooked it resembles in taste to that of tandok. Blanco believes it to to be a romance, and adds that the nigritoes say that the raceme produces but one fruit.

Musa paradisiaca with thin-skinned fruits.

14. Bingticohol or tinalong of the Tagalese. Fruit small, oval, blue (garzo) with very thin skin, 2 inches long by one thick, cylindrical, obtuse at both ends. Pulp of a taste between sweet and sour, delicate and savoury.

15. Letondal. Fruit of the shape of ternate, thin-skinned, grey, with thin skin, without prominent corners. Pulp delicate and of ashgrey colour. Introduced from India to Manilla by a French clergyman called Mons. Letondal.

Musa troglodytarum of Blanco, with thick-skinned fruits.

16. Botohan or botoan of the Tagalese. The spadix in fruit is nodding, but prior to fruiting it is erect like that of the following kinds. Fruit like that of Ternate, of a regular shape, bearing round seeds much depressed with an umbilicus. The most common banana bearing always perfect seeds, hence the name. A buffalo fed for several months without other food, lost all his teeth.

17. Saguing machin or saguing na ligao of the Tagalese. Fruit with 3-5 ribs, not much larger than the middle finger, and cannot be eaten on account of its bitterness unless fully ripe, bears perfect black seeds. Of the height and habit of the other varieties, indigenous but rare in the jungles. Spadix a yard long, the spathes are green, not coloured. Inhabits the mountains of Jala.

18. Abaca. Fruit very small, up to 2 inches long, full of seeds, 3-cornered. The uses, &c., of this kind which occupy 2½ pages in Blanco's book, I pass over.

Nee observed 27 varieties of banana on Lucon, but he has not given their names or any remarks on them.

We next come to Rumph,* who really may be said to have known more about the bananas than any one before and after him. He has first given a correct account of the banana-tree, and divided the kinds into three "genera," *viz.* :

1. The tame pisang (*Musa sativa.*)
2. The Alphurian pisang (*Musa Alphurica.*)
3. The wild pisang (*M. silvestris.*)

These three divisions, however, do not well coincide with the species as at present distinguished. He enumerates the following kinds :

1. Pisang tando (horn-like banana,) which is no doubt the same as the one so-called to the present day ; the thickness (that of an arm) appears to me a little exaggerated. To this he reckons the pisang karbouw or pisang oki-oki, more than ½—1 foot long, remaining usually green, while the flesh is white, slimy, austere and flavourless. If the sikat (fruit-whorl) is reduced to a single fruit, it becomes as thick as the human thigh and usually bursts. Often two or three fruits grow together. The whole spadix has only two, three or at the outset four sikats just as is the case with all true pisang tandos.

2. Pisang gabba-gabba, differs not much from the preceding kind, but is smaller, not thick, longer, becoming white yellow in ripening and has the driest pulp of all, which is like the spongy pith of the branches of the sago-palm called gabba-gabba. It is not eaten raw, but only fit for roasting. He divides them into males and females, the former being longer and more green.

* In the following notes I have used the Dutch text only for the reason that Burmann's translation into Latin frequently contains misunderstandings, owing chiefly to the peculiar and naive expressions of Rumph, so, for example, been (bone) which Burmann translates by "foot," &c.

3. Pisang croho or cro (pisang ubi in Banda,) is of middling length, *viz.*, about a span, not cylindrical, but usually angular or 4-cornered, grass-green, slowly turning yellow, the pulp is whiter than that of all others, rather hard, of sourish taste. There are three varieties of this, *viz.*, the croho parampuam, the common one or female; the croho laki-laki, the male one, which is longer and always remains green, and the croho batu, which is also green, but becomes yellow when ripe and the pulp hard. The young foliage is marked with a few brown blotches or stripes.

4. Pisang djernang (the needle-banana,) is shorter than a span, nearly trigonous, terminating in a long snout which is crowned by a thread-like appendage (the marcescent style,) hence the name. The skin adheres rather firmly to the reddish pulp which glitters like sugar when transversely broken. The ripe fruit becomes very soft and of the taste of pisang medji, but more sourish. This kind bears racemes seven feet long, with seventeen sikats and about fifty fruits.

5. Pisang culit tabal, or pisang boratsjo, more correctly cojo coratje in Ternatic, which means golden banana; also pisang warangan or pisang bolvanger. The fruit is 5-cornered and has the thickest skin of all bananas; the flesh is pale reddish and melts like wax, can be eaten raw, but is more usually roasted or fried.

6. Pisang medji, also pisang radja on Banda and byo cohihu in Baley (the *Musa mensaria* or dessert-banana of Rumph) is the best of all bananas, about 4—6 inches long, usually cylindrical but obsoletely 5-cornered in such a way as to appear more triquetrous. It ripens quick, is yellowish, and the skin is easily removed. The flesh is whitish and softer than that of the others, when broken glittering like bread-sugar, sweet and delicious as if some rosewater were admixed, but soon rots. Must be eaten raw, and is therefore chiefly used as dessert-fruit, hence its name. It cannot be used for cooking unless in a half-ripe state.

7. Pisang radja (*Musa regia* of Rumph) is similar in quality and shape to the preceding but much smaller, hardly the length of a finger and an inch thick, smooth, with a thinner skin, and sweeter and more delicious, on which account this sort is the most prized as dessert-fruit at Batavia. It is not cultivated on Amboina where it is replaced by the preceding kind.

8. Pisang mera (pisang cutsjupan or more properly put-joe-pan) is in shape similar to pisang medji, purplish brown, and when fully ripe brown and yolk coloured variegate. The pulp is white, of sourish taste and can be eaten raw. It derives its name from young mango-leaves and from a texture of the same purple-brown colour and of the same name. The stem, underside of leaves and the rachis of the racemes are all brown or brown-green.

9. Pisang salpicado, is shorter and more round than the pisang medji, yellow, blackish spotted like a certain native dress called "salpicado." It is grown chiefly in Ternate, but little in Amboina, and the fruit is eaten raw.

10. Pisang swangi, is short and thick, ½ feet long or shorter, and 2 inches thick, irregularly angular-ribbed. The pulp is deep yellow or red, rather hard, smeary, and of sourish and somewhat austere taste. Cannot be eaten raw, but is good for roasting. The djantong or heart is shorter and thicker than that of other kinds. It is considered the most inferior of bananas, although (along with pisang croho) the one most used for childrens' food. The stem is higher, and the raceme has only few sikats.

11. Pisang batu, or pisang bidji, resembles in shape the preceding, but not so thick and rounder, and remains green; the pulp is smeary, but sweet and mild, and quite filled up with black seeds resembling those of *Paeonia*. It is not much eaten raw, but roasted or used as medicine. The plant is stout and grass-green, and very soboliferous.

12. Pisang abu, pisang soldado, and pisang alphuru, are small, short and thick bananas, rather flat and compressed,

one finger long and hardly three fingers thick, white yellow playing into grey, the pulp smeary, of mawkish taste. Very good for roasting and cooking.

13. Pisang bombor (kula keker and ure-rerel in Amboina,) has the shortest fruits, the size of a hen's egg, the length of a finger or of the fruits of *Pandanus littoreus* (which is called keker,) smooth and even, but 4-cornered, blunt at the apex when fully ripe. Good for eating raw, otherwise it is sourish and acid and must be boiled.

14. Pisang canaya putie, has fruits somewhat smaller than those of pisang medji, hardly an inch thick, papillate at the apex like a nipple, and for this reason also called pisang susu, slightly angular, pale yellow. The pulp is rather hard and of sourish taste. More fitted for roasting or baking than for eating raw, and is reckoned amongst the most inferior kinds. The leaves differ from those of others in being like powdered, and their underside, after the meal-like powder is removed, is brownish like the stem. Byo lutton or black-monkey-banana of Balie seems to belong here or to the next.

15. Pisang canaya ketjil, (tena talfle of the Lahunese,) has the shortest stem and smallest leaves and is only about as high as a man. The fruits are round, as thick as a finger or thicker, yellow, smooth, the skin very thin, fragile, and can hardly be removed entirely. The pulp is like that of the pisang medji, but harder, of a sourish but good taste and tasting like figs when boiled in water. The fruits grow so low on the stem that they can be taken off with the mouth, and grow so crowded on the raceme that as many as 200 have been counted. It bears fruit in the 4th or 5th month, but is little soboliferous.

16. Pisang bulang-trang, has the stem and foliage of a light yellow-green colour, the fruits are whitish and assume during night the color of the full-moon (hence the name,) bye-and-bye (as Rumph adds) if the full-moon shines upon them.

The above, says Rumph, are the best-known kinds, but there have been gardeners at Batavia who boast that they could shew as many as eighty kinds of bananas in their gardens.

Of other kinds, Rumph mentions and describes:

1. Pisang tonkat-langit (*Musa uranoscopos* of Rumph) or tundjo langit, tuca duffa, of the Ternatese, tema tenalla lanit on Ceram, names which all mean the same, *viz.*, heavenwards pointing, so called as it has upright flower-racemes. The fruits are small, plump, thick and more thickened upwards and usually round like a Chinese trong or cucumber, of a red colour, and black-striped. The pulp is golden-yellow, smeary and somewhat acid, but pretty sweet when fully ripe and of a wild odour. The few seeds are imbedded lengthwise in five or six places, brown and flat. The djantong is much longer than that of other bananas, *viz.*, a foot long, and not thick in comparison, nor brown as in the other kinds, but quite green and smooth. The stem and leaves are green and firmer and stiffer.

2. Pisang alphuru (*Musa Alphurica, s. Ceramica* of Rumph,) also called pisang ceram (kula hatuan of Hitoe.) Similar to the common banana-tree, but the fruit-racemes are somewhat peculiar on account of bearing leaves on the peduncle, two of which are at the base and similar to those of the stem but shorter and rounder, then follow the other leaves which are small and narrow, and from each of them arises a thick green stalk on which grow a few fruits of which, however, only few come to perfection. These resemble in shape those of pisang batu or pisang swangi, but become sometimes a span long and as thick as a bone. The pulp is whitish, of a more sourish taste than pisang medji, and more smeary. The skin is thick, pale yellow and usually rupturing. The rachis of the raceme is angular or striped, the fruit-whorls somewhat remote. The raceme does not end in a djantong,* and

* But strange to say, Rumph distinctly figures not only a terminal djantong but very distinctly gives also the imbrication of its bracts. Colla, who rechristens this banana *Musa Berterii*, simply copies Rumph without noticing this and other serious discrepancies between the figure and the description.

in this regard resembles pisang tanduc or pisang karbouw. It bears many black seeds like pisang batu, and usually two or more neighbouring fruits consolidate into one.

3. Pisang jacki, the monkey plantain or *Musa simiarum* of Rumph (Kula bey in Ambon; Byo lutton in Bali.) This is the smaller wild kind indigenous in the Moluccos. The fruits are only 2 inch long and 1 inch thick, almost terete or only little cornered, closely packed, terminating in a snout like pisang djarong. The pulp is that of pisang medji, without seeds, of sweet taste, but the skin is rather difficult to take off.

4. Pisang utan, the *Musa silvestris* of Rumph (Kula abbal on Amboina; fana in Ternate; coffo in Mindanao). This is the larger kind of wild banana, and Rumph divides this again into two varieties, *viz.*:

a. The Mindanao one, which has the stem as thick as that of the cocoa palm, and as high as a *Sagguerus*, usually black (but a variety has it also green or whitish as in other bananas), of a more firm consistency; also the leaves are larger, darker green and stiffer. The fruits are like those of pisang batoo, but smaller, never turning yellow, full of seeds, disagreeable of taste and not edible, but still sweet if sucked. The wild form of this remains lower. This is found in the Southern Islands of the Phillipines, also on Menado and Gilolo, but it is unknown on Amboina.

b. The Ambon variety is much smaller and slenderer, the stem white and black variegated, the raceme long and curved at the end. The fruits are disposed in only four sikats, not above a finger long, very hard and full of seeds, black when fully ripe. It occurs here and there in the sago jungles of Amboina.

Mr. Rigg, in his dictionary of the Sunda-language, gives a list of the plantains found in Western Java. They are the following:

Djauw (the sunda word for pisang).

1. Ambon (Amboina.)

2. Badak (rhinoceros)

3. Banteng (wild black bull), fruit short and thick, with a darkish skin; is good for Kwé (sweetmeats) or cooking.

4. Buhaya (alligator), has very long djantong reaching almost the ground, being ripe at the top and unripe beneath.

5. Djauw beauleum (roasting banana) must be either toasted or else steamed (di seupan) before it is fit for use.

6. Beusi (iron). Tree short and thick, spotted and dark; fruit large and green.

7. Burut, the "hydrocele" banana.

8. Churuk (fore-finger.)

9. Gadieng (ivory).

10. Gembor, a common variety.

11. Hanggasah (name of a scitaminous plant).

12. Hihid (name of a cooking fanner.)

13. Hoih (rattan),

14. Honjeh (name of a Scitaminous plant),

15. Hurang (shrimp).

16. Karok, one of the most common wild sorts; stem reddish.

17. Kapas (cotton). Common, must be steamed.

18. Kollé, the fruit is called Keu-eus.

19. Kollé monyet, the monkey Kolle, is a variety of the preceding.

20. Djauw kapokan. Fruit small and short, must be steamed.

21. Kosta, properly from the Coast of Coromandel.

22. Lémpénéng, of yellowish skin, long and thin.

23. Lubang (eel). A very rare variety: the fruit is said to ripen in the stem before it is protruded, hence called the eel from being in a hole.

24. Djauw lumut, the pulpy.

25. Lutung (black monkey).

26. Mangala, batu, siki radja gendeng or kulutuk, five names for one sort; common, but not edible.

27. Mas (golden). This is the most common of all bananas. The fruit is small and sweet.

28. Palembang; common.

29. Pinang (areca-nut).

30. Poké; wild and like kollé.

31. Raja (king), has a ruddy skin and is rather large.

32. Raja-beusi.

33. Raja-pandan.

34. Raja-pakuan. Small tree and fruit which is acidulous.

35. Rangrang.

36. Ruju. Tree low; fruit long and thick.

37. Sambatu, has "hoyas," but the individual "pulp-pods" are grown together as if the fingers were glued to one another.

38. Sepet. Green stem, the tree middling-sized; very common and acrid.

39. Sówu (thousand), very small and insipid.

40. Sukun.

41. Susu (milk), one of the most delicate of bananas.

42. Tanduk, or galek (horn). Long fruit curved like a horn; very common, but must be toasted or steamed.

43. Djauw warangan (arsenic).

44. Kipas (pisang ayer of Malays). *Ravenala Madagascariensis.*

Marsden, in the 3rd edition of his History of Sumatra, writes that there are twenty varieties cultivated on that island, of which pisang raja, pisang dinger, and pisang kalé are the best.

I will now only give the names of the bananas which are found in Java and other Malayan islands, as I have been able to study most of them, and these, therefore, will be treated in the special part of this paper. They are the same as those enumerated by Hasskarl, Teysmann and Binnendyk in their catalogues, *viz.*:

Pisang sirandoh or p. badak, p. batu or p. mangala, p. batu bezaar, p. betjidjie, p. boeroet, p. kapok, p. kapok balie, p. kapok mera, p. kapok poetie, p. mengala tjina, p. soekoen banten, p. kosta, p. taäl, all these referred to *Musa Cliffortiana*; pisang bidak (*Musa glauca*; pisang kembang woengoe or sohleh (*Musa ornata*); sohleh (*Musa coccinea*). Kohleh boddas, kohleh burrum, kohleh heedjoh, pisang karang, p. kohlintang, p. maas ketjil, p. octan, p. hoerang, p. tembaga, p. oedang, p. kidang, p. ietam, p. rassoen (Sumatr.)=kohleh mas of Java, p. djarie, p. gadieng bezaar, p. gadieng ketjil, p. maas, p. maas sereh, p. maas tongkang, p. palembang bezaar, p. palembang lampong, p. palembang luhtick, or p. prellek, p. pinang, p. seketie, p. seripiet, p. soedjie, p. ambon anklong, p. ambon gedjoel, p. ambon heedjoh, p. ambon koenieng, p. ambon loemoet, p. ayam p. bakkar, p. djaheh of Sumatra or p. lalakki of Java, p. gembar, p. lampenneng, p. kladdie, p. sanienten, p. longlong, or p. geulies tiies, p. moeloet behbek, p. radja, p. radja pakoean, p. radja-sereh, p. rendah or p. sepat, p. seboelan, p. soesoe or pisang Dacca of Bengal, p. soesoe-bener or p. boggoh, p. honjeh, p. rottan, p. sehwoe, p. boeraijut, p. galek, p. galek bakdja or p. gebiar, p. gandoel or p. raijoenan, p. tanduk besaar (all these referred to *Musa Rumphiana*, kurz); pisang riemboe of Sumatra or sohleh of Java (*Musa Salaccensis*); pisang tongkat langit (*Musa uranoscopos*, Rumph.)

D. Bananas of Indo-China.

Father Loureiro, in his Flora of Cochinchina, enumerates the following bananas as found in that country:

1. Chúoi dá, fruits oblong, many-seeded; the stem very high, blackish. A wild form.

2. Chúoi sú, a cultivated form, also very high, but greenish, the pulp sweet, with many seeds.

3. Chúoi mât, cultivated, middling sized, the stem whitish, the pulp very sweet; seeds very few.

These 3 sorts he refers to his *Musa seminifera.*

4. *Musa odorata* of Loureiro. Fruit long, without seeds.

5. Chúoi-bà-huong, cultivated, very high; fruit large, terete, odorous, curved.

6. Chùoi tieo, cultivated, middling sized; fruit slender angular, tortuose, odorous.

7. Chúoi moi, cultivated, middling sized; fruit slender, purplish, odorous.

8. Chúoi duii (*Musa nana* of Loureiro), fruits ovate oblong, angular, sweet, seedless.

9. Chúoi boi (*Musa corniculata* of Loureiro), fruit very large, one foot long, curved, almost terete, thick, yellow or ruddish, seedless.

10. Chúoi tàu (*Musa uranoscopos* of Loureiro), a small kind with erect spadix.

Of the bananas of Siam we know very little, and for the little we are indebted to Mr. Teysmann, who introduced several varieties into the Botanical Gardens of Java when he accompanied the Dutch Embassy to the Siamese Court. The banana is called there tun-bloi or kloh-elf, and he has brought:

Tun-bloi-hamuk.
Tun-bloi-nam.
Tun-bloi-nangwah.
Tun-bloi-kaij.
Tun-bloi-daij.
Tun-bloi-dok-kentjet.

He tells me also that there is a banana cultivated which bears red fruits white-powdered all over.

The Burmese bananas, too, remain quite undigested, and I am sorry to say that I entirely neglected the cultivated forms when in that country.

I have been informed that there are eight kinds cultivated in the plains of the Irrawaddi. Of the wild-growing ones I noticed tau-hnek-pyau (*Musa rubra*); nat-hnek-pyau (*Musa glauca*) and tau-hnek-pyau saip-cho and ya-khaing (*Musa sapientum.*)

Rev. Dr. Mason states, that he has collected the names of 25 varieties of banana in Burma, but he has published none of them, nor has he offered any remarks thereon. Mr. Eugene Oates, C. E., obtained for me 14 kinds of bananas, *viz.*:

1.	Det-ma-lwoot.	8	Shan-gaizan.
2	Pee-gyan-byoo.	9.	Shway gnet-pyau.
3.	Malettò.	10.	Nonsaboo.
4.	Pee-lis-mway.	11.	Koyinghee.
5.	Yakhein.	12.	Chet kyee.
6.	Pee-gyan-nee.	13.	Thadah.
7.	Yedône.	14.	Theelwah.

Besides the above, two other kinds are known to him.

We have notes of the bananas of Arracan, by Capt. F. W. Ripley (Proceed. Agri.-Hort. Soc., Ind., 1859 X 50-51). He gives the following:

1. Hnet-pyau-meng (royal plantain). He has seen fruits of it up to fifteen inches in length and as large and round as the fist. It is generally eaten roasted in the skin.

2. Hpee-gyan, has a thick rind of a darkish-brown, and is a very pleasant fruit, being of a mellow subacid flavour.

3. Thenaisa, this is a small-sized fruit, but of excellent flavour and considered most wholesome both for adults and children—it is called the children's fruit.

4. Beela, a good plantain.

5. Nathaboo, a very rich luscious fruit.

6. Byat-taus, a large, well-flavoured fruit.

7. Tsengan (elephant-tooth,) a very large plantain but coarse.

8. Gyee-swé (hogdeer's tooth,) a long thin plantain of good flavour.

9. Magalee, a good fruit, but very mealy.

10. Moung-bya, this is much liked; it has a subacid flavour, the skin is of a dead white, and very thick.

11. Peem-wé, is also a sweet, well-flavoured fruit.

12. Thee-la-wa. This bears a very handsome bunch of large-sized fruit, but it is not much worth as an edible plantain.

13. Wet-tsway (boar's tusk) is an excellent, flavoured handsome fruit.

14. Rakoing-hnet-pyau-bhee, the Arracan plantain (*Musa Arakanensis* of Ripley), of which he says that it was the same which he previously forwarded to the Agri-Horticultural Gardens at Calcutta on account of the fibre. The plants were sent from his own garden, the old trees yielding particularly fine fruit.

15. Moung-net. This is much the same as hpee-gyau, only darker in rind.

16. Kyet-kee. This is a very long and large-sized plantain, but coarse eating.

17. May-dau-letthó. This is a long narrow plantain, it grows in handsome bunches and is a luscious fruit.

18. Tsa-pouk, a sweet fruit, but full of seeds.

19. Moung-ne. This is another thick-skinned plantain of good flavour.

I know nothing about the bananas cultivated in Tenasserim, but Dr. Helfer states that twenty kinds are cultivated there.

The bananas of Chittagong are also little known, although we may surmise that they are generally those grown also in Bengal. Roxburgh mentions Ram-kulla, walli-kulla, and ram-jakialia-kulla as growing wild in this province. A small kind, called ramanigee-kulla (*Musa ornata*) is also wild.

Mr. G. Mann has given me the following account of the bananas of Assam:

"I only know of four wild plantains in Assam, but I cannot tell their names. In Cachar there are five kinds of wild plantains as far as I know; they are the following:

Changpai.
Changai.
Sai Solong.
Changrop.
Changpui, (in the Loshai country).

The native names of the cultivated plantains are as follows

Assam.	*Sylhet.*	*Khasi Hills.*
1. Malpo.	1. Champa.	1. Kaishim.
2. Sajee.	2. Sali.	2. Kaisan.
3. Sunda.	3. Kullibut.	3. Kainniang.
4. Poora.	4. Dingamani.	4. Kaikoon.
5. Monnuhor.	5. Gerassunder.	5 Kai bonnuon
6. Attiah.	6. Burtmani.	6. Jajee.
7. Bajiriah.	7. Attiah.	7. Kaikulli bai.
8. Jati.		
9. Digiia.		
10. Senisomba.		

E. Bananas of India Proper.

One might expect such a vast empire as India to possess the greatest variety of bananas, but still such is not the case. Ceylon is richest, but the number of the varieties decreases rapidly as we proceed from there northwards. Roxburgh states that he obtained in India only three varieties of the "plantain," and about thirty varieties of the "banana."

A correspondent, signing himself J. R. J., has given notes (in *Gardener's Chronicle* 1875, p. 567—568) on the plantains grown in Bengal, and enumerates the following "varieties and sub-varieties":

Variety ... Kanchkalla.
1. Kanchkalla proper.
2. Bhoosna, greenish fruit with white bloom.
3. Loombee, yellow fruit.

Variety ... Kantallee kela.
1. Kantallee proper.
2. Chinee kantallee. This often has seeds.
3. Bichee kantallee. A variety with seeds.
4. Kalleeban.

Variety ... Martaban kela.
1. Martaban proper; large fruit.
2. Sabree; medium.
3. Chatun; small.

Varietv Champa kela.

1. Champa proper.
2. Chinee champa; smallest.
3. Kanai banshee; Krishna's flute. Fruit often 15 inches long.

Besides these, there is the Dacca plantain or girto kauchau, and the Ram kela, a red-fruited kind.

Further he rather inconsistently speaks of two varieties of seeded plantains being distinguished. The first, known as Bichee kella, is described as having scanty pulp and numerous seeds, a thin stem, the central part of which is eaten. The inflorescence is boiled whole, and the flowers eaten with salt as a vegetable. The entire fruit is cooked as curry by poor people, and the pulp is also eaten raw.

The second is the Dayrea or daura kella. In this the seeds are less numerous than in the last, and the pulp correspondingly larger. It is best distinguished from the last by its very much thicker stems and larger inflorescence, the pulp is sweet and is eaten, and is of a cooling nature; the entire fruit is also cooked and is eaten as curry.

In the Eastern Himalayas five kinds occur, mostly wild, one is the reling of the Lepchas, another is one like the preceding but has very large seeds (*Musa Sikkimensis*,) further the wild form of the Bengalee Kentallee kela, and a red-fruited kind. Some of these ascend up to 4,500 feet elevation. Newargompoo-kula (*Musa Nepalensis*) is apparently restricted to Nepal.

In the Punjab, kela (*Musa paradisiaca*) is largely grown in places towards the east of the plains of this province, in the Siwalik track and in the outer hills of the Punjab Himalaya (in the Sutlej it may be seen up to 4000 feet.) It becomes there very scarce towards the north-west. There are fewer varieties, and the quality of the fruit is less good in the Punjab than to the east and south. (Dr. Stewart, Punjab Plants), Mr. J. F. Duthie, M. A., Director of the Saharunpore

garden, informs me that only three kinds of banana are cultivated in Massuri, *viz.*, Rai kela, Bara kela, and Chota kela. Lieut. W. H. Parish (Proceed. Agri-Horticult. Soc., India, vi. p. 1) has found two or three banana-plants cultivated in an enclosure at an elevation of 5,400 feet on the Chumba range (N. W. Himalaya) and (considering the high geographical latitude) this is the highest limit to which the banana ascends.*

Dr. Bonavia, of Lucknow informs me, that the only plantain that flourishes in Oudh is a large-fruited one—produced in large bunches—some of the fruits being 5 inches long. It is as tasteless as a pumpkin—natives call it "Desee Kela"; when ripe it is of a dirty yellow ridged with black. Another kind is small and sweet, called "Jmritban" (a corruption, as Dr. Bonavia suggests, of Martaban). There is also in cultivation the "Chini Champa"—the red Bombay—a kind from Madras, and a dwarf one probably *Musa Cavendishii*, but none of these thrive well.

Rheede is the first authority that intelligibly wrote on the Indian bananas, in the first volume of his Hortus Malabaricus. He enumerates the following as growing in Malabar:

1. Nendera bála, which has more oblong red fruits, the pulp is reddish. Of this he distinguishes nóra-nendera, which differs by larger fruits, and curvò-code, of which the fruits are less oblong.

2. Caduli-bála, has a thin skin and the pulp is of pleasant taste; shéru-caduli has smaller fruits, and eradà-càduli is of better taste.

3. Puàm-bala has quite terete fruits, which are more oblong and thicker than those of caduli-bala; taste very good. Turenale-bala differs by larger fruits.

4. Mánnem-bála, has 4-cornered fruits, and thick skin. The pulp is somewhat oily and fat and of sweeter taste. This

* On the Nilghiri Hills, a small wild banana grows on the grassy plateaus at 7000 feet elevation.

has also broader and more oblong leaves of a thicker texture.

5. Cinga-bála, has oblong fruits like nendera-bala, but not so thick, when ripe they are quite green.

6. Canim-bála, has much smaller fruits than any of the preceding, and these become almost yellow when ripe. Schundila-canim-bála is a variety of it, has the smallest fruits and produces no other flowers but fertile ones, which cover the whole spadix up to the end.

7. Calém-bála, has the fruits full of black seeds and a rather thick skin.

8. Bangala-bála, has the flowers of a bluish-fuscous colour.

Drs. Gibson and Dalzell, in their Flora of Bombay, give no other information on the Bombay bananas, besides that there are many varieties of *Musa sapientum* cultivated in that presidency, and that the most esteemed amongst them are the red (banana), the sonneree (small plantain) and others.

Mr. J. Cameron, the Superintendent of the Botanical Garden at Bangalore, Mysore, has kindly furnished me with the following list of bananas cultivated there, and added valuable remarks :—

1. Rasa bále, (Medicinal Plantain.)

   The fruit which is medium sized and yellow, has also yellow custard-like pulp. The natives hold this variety in very high esteem on account of its medicinal properties. Half an anna is occasionally paid for a single fruit.

2. Raja rasa bále.

   This variety only differs from the last in having larger fruit.

3. Putta bále.
4. Putta Sugandha bále. } (Guindy Plantain.)

   These are both small, sweet, thin skinned vars., but there is a perceptible difference

between them, No. 4 being slightly larger always. Fruit roundish.

5. Madhusapga gujja china, (Butter Plantain.)
   This small plant produces its large clusters of small fruit, 6—7 feet from the ground. The flavour is peculiar and rather nice.
6. Gulur bále, (Butter Plantain.)
   A larger plant with similar fruit, excepting that the custard is slightly red coloured, and occasionally interpersed with seeds.
7. Chandra bále, (Red Plantain.)
   The fruit when well grown is 6 inches long. It is considered by the natives to be the finest dessert kind. It is the *Tamil Shevaly.*
8. Sakalati bále, (Red Plantain.)
   This is a cottony kind, which is inferior to the last.
9. Pachcha bále, (Triangular Plantain.)
   The plant is large and ornamental. Fruit triangular, curved and coarse, 7 inches, green when ripe.
10. Dávu bále, (Snake Plantain.)
    So called from the appearance of the fruit which is long, 8—9 inches, slender and watery. The colour is a medium between green and yellow.
11. Yelakki bále.
    A small variety with small clusters of round yellow fruit 2¼ inches.
12. Arisina bále, (Dassan Plantain.)
    Unknown.
13. Ane-bále, (Elephant Plantain.)
    Fruit large, sour, and very thick skinned.
14. Budi bále, (Seed or cooking Plantain).

A tall growing ornamental variety bearing large clusters of greyish coloured fruit.

15. Kadu bále, (Pumpkin Plantain.)

An ornamental variety with roundish fruit.

16. Kalyani bále.

Ornamental, fruit very large and course.

17. Jain bále (?), (Honey Plantain.)

A local name given to a very fine sweet plantain introduced from Madras.

All the above appear to be varieties of the *Musa paradisiaca*. *Musa superba* and *M. ensete* are grown in the Lal Bagh. *

Mr. John Shaw, Secretary to the Agri-Horticultural Society, Madras, obligingly communicated to me the subjoined list of the bananas grown in the Madras Presidency.

* While these sheets pass through the press, I received for perusal (through the courtesy of Mr. Shaw, the Secretary of the Agri-Horticultural Society, Madras, an illustrated paper by Dr. Shortt on the plantains of the Madras Presidency, containing considerable additions to Mr. Cameron's accounts. As Dr. Shortt's paper is intended for publication in the Journal of the Agricultural Society of Madras, I prefer abstaining from extracting from his paper until published.

List of Plantains in the Madras Presidency.

	Native Names.	English.	Size	Color.	Thickness of skin.	Remarks.
1	Payenualay	Devil plantain	Small	Ash	Thick	
2	Munay comboo valay	Elephant tusk plantain	Long	Yellow	Thin	
3	Cottay valay	Stone or seed „	Small	„	„	No use, only pretty.
4	Bungalay valay	Guindy „	„	„	„	
5	Rustalee valay	...	„	„	„	
6	Sarvalay	Red plantain	Very large	Red	Thick	
7	Bonthen valay	...	„	Yellow	„	Used in curry.
8	Mooreesoo valay	Mauritius „	Small	Green	„	
9	Curpoora valay	Camphor „	„	Ash	Thin	The fruits are dropped from the bunch when ripe.
10	Oderay valay	Dropping „	„	Yellow	„	
11	Putchay valay	Green „	„	Green	„	
12	Malay valay	Hill „	„	„	...	
13	Manillay valay	Manillay „	Large	„	...	No use, being with seed.
14	Vuttay valay	Variegated „	Small	„	...	Very pretty and rare.
15	Poovalay	Flower „	„	„	Thin	Curious and rare plantain.

Mr. J. S. Pint writes me that the following 10 kinds of banana are sold in the bazars of Bombay :—

Lall Kella.	Puzaely kella,
Mootty kella,	Hirwa kella,
Gownty kella,	Bun kella,
Bosrai kella,	Loungie kella, and
Benghalee kella,	Chovoi or jungly kella.

Mr. Woodrow, Superintendent of the Botanical Gardens, Poona, has kindly furnished me with the following account of the varieties of banana cultivated in Western India :—

1. Bajapooree. Stem of medium height, stout. Fruit long-pointed, three-cornered, with a thick skin, yellow. Largely used in a dried state, very sweet and fine flavoured.
2. Sonekále. Stem very tall, weak. Leaves thin narrow, with red midrib. Fruit small, cylindrical, yellow, thin-skinned, of very superior flavour, considered the best.
3. Raikále or Rajkále. Stem very stout, red. Fruit very large, with thick red skin, of delicious flavour.
4. Kalee. Stem medium. Leaves short, narrow, with red midrib. Fruit large, cylindrical, yellow, of excellent flavour.
5. Goosavee. Stem medium height. Fruit medium size, yellow, thin-skinned, rather insipid, except when dead ripe.
6. Botattee. Stem tall, stout. Fruit three-cornered, thick-skinned, yellow, sweet-flavoured.
7. Googee. Stem very short, stout. Fruit cylindrical, yellow, very insipid, except when dead ripe; cultivated more for its leaves, which are used as plates for food.

8. Lakundee. Stem 10 feet, reddish, stout. Leaves of thick texture, large. Fruit long, cylindrical, large, skin medium thickness, yellow, superior flavour.

Moon, in his catalogue of the Ceylon plants, gives only the names and their English equivalents, and his list comprises as many as 47 kinds, thus rendering Ceylon richest in banana-varieties, the Indian Archipelago only excepted.

They are the following :—

I.—*Musa paradisiaca* of Moon. (Anawálu-kesel of the Singhalese.)

a. Wild ones (growing on the mountains) :

1. Anawálu-kesel aetamburu (seed).
2. „ „ gal (rock).

b. Cultivated ones :

3. „ „ aembul (sour).
4. „ „ andun (sooty).
5. „ „ gira (parrot).
6. „ „ kalu (black).
7. „ „ meegon (buffalo).
8. „ „ sapu (champac).
9. „ „ singha (lion).
10. „ „ wanduru (monkey).

II.—*Musa sapientum* of Moon (kesel of the Singhalese).

a. Wild ones, growing on the mountains :

11. Kesel ael (hill).
12. „ aeta (seed).
13. „ titta-kadali (bitter).
14. Kesel wal-suwanda (wild, fragrant).
15. „ wal-wandaru (wild, monkeys).

b. Cultivated ones :

16. „ aembul (sour).
17. „ aembul-honara-wàlu (sour, long, clustered).
18. „ alu (powdered).

19. Kesel dija (water).
20. kalu (black).
21. kalu-kanoru (black, Cannanore).
22. kan (eared).
23. kat (pingo.)
24. kitala.
25. koli-kuttu, M.
26. kota-suwanda (short, fragrant).
27. „ maha-dàra (great, cornered).
28. „ martta-man, M.
28. „ martta-walu, M.
29. „ mondan, M.
30. „ pissi (fools).
31. „ puspa-kadali (scented, medicinal).
32. „ poo-wálu (flowers clustered).
33. „ ranel (golden).
34. „ rata-hunara-wálu (foreign, long, clustered).
35. „ ratingya (cracker.)
36. „ sinhala-hanara-wálu (Singhalese, long, clustered).
37. „ sudu-kannórn (white, Cannanore).
38. „ suwandael (fragrant. hill).
39. „ watu-pálu (garden).

III.—*Musa rosacea* of Moon.

40. Kesel-kotchchi (Cochin).
41. „ ratu (red).
42. „ ratambala (red flowered).
43. „ ratna-wálu (red, clustered).

IV.—*Musa troglodytarum* of Moon. (Nawari-kesel of the Singhalese).

a. Wild ones, on the mountains.

44. Nawari-kesel-aeta (seed).

b. Cultivated ones:

45. Nawari-kesel-sudu (white).
46. „ „ kalu (black).
47. „ „ tis (thirty).

Thwaites, in his Ceylon plants, gives us but little information and only writes that wal-kuihel-gas (*Musa sapientum* of Thwaites) grows wild on the island, and he adds, that this is the species from which have originated the numerous varieties of sweet plantains cultivated in Ceylon. This is rather a laconic way of disposing of a difficult question, and I cannot help thinking that there seems to be something wrong in this statement, considering that Moon has eight wild kinds of which one (his *M. troglotydarum*) I guess to have an erect spadix.

F. Bananas of the Mascarhen Islands and Africa.

Bojer, (in his Hortus Maurit., 1837,) has recorded the bananas grown on the Mascarhen islands, and we learn from him that *Musa sapientum* is largely cultivated there and grows also half-wild around habitations. *Musa paradisiaca* (of Bojer) is grown on Madagascar, Mozambique and the Comoro islands, and is called akundru lika-lika or tsimiruhi by the natives of Mauritius, while the French call them bananes malgaches. Bojer enumerates the following kinds:

1. Akundru bara-baha of the Malgachees (bananes Malgaches vertes), fruits resembling those of akundru lika-lika, but they are shorter and more curved. Skin green, the pulp white, soft, and sweet.

2. Akundru minetine, fruit straight, cylindrical, green turning brown; pulp whitish, very sweet. A variety of this has the fruits very like those of the preceding, but they are only slightly curved, angular, the pulp whitish, of an exquisite taste and odour.

3. Akundru-makaï-fahaï (bananes jaunes or bananes à regime court), fruit medium size, straight, cylindrical, the skin and the pulp yellow, the latter firm and sweet.

4. Akundru-bara-hassok (bananes malartic or bananes rouges), fruit straight, cylindrical, sometimes slightly cornered, the skin thin and of a red colour when ripe, the pulp yellow-reddish, of a very sweet taste and odour.

5. Bananes malartic vertes of the French. Fruits exactly like those of the preceding, but they remain green also when fully ripe.

6. Bananes gigantesques de Chine. Fruit very large, oblong, slightly curved and angular, the skin yellow and very thick, the pulp yellow-reddish, somewhat firm, of a little acid taste.

7. Akundru-lambu of the malgachees (bananes de Chine or bananier nain), stem very short and very stout, the leaves oval, larger and firmer than those of the other kinds. The raceme often attains such an enormous size that one man cannot carry it. Fruits yellow or green, slightly curved and cornered; pulp yellowish, of an exquisite taste and odour.

8. Akundru-zaza, child's banana of the malgachees (bananes gingeli of the French), fruit very small, straight, cylindrical, the skin thin, yellow; pulp yellow, very sweet and of an agreeable odour. This kind is most esteemed.

9. Bananas d' Otahiti, fruit somewhat larger than that of the preceding, somewhat curved and angular, the skin yellow or green and very thick; pulp yellowish and of an agreeable taste.

10. Akundru-foutsi of the malgachees (bananes blanches), fruits middling sized, straight, cylindrical, the skin and pulp white, the latter of a mediocre taste.

We know very little about the bananas grown on the continent of Africa. *Musa sapientum* seems, however, to be pretty generally cultivated there, and Hooker figures a handsome variegate-leaved variety of it on plate 5102 of the *Botanical Magazine*. There are two wild kinds of banana (both nonsoboliferous) indigenous in the intratropical region of Africa, the enset (*Musa Ensete*), and the koba (which may be Kirk's *Musa Livingstoni*). They grow not in the hot low lands, but in the temperate regions at 5—7000 feet elevation but are much cultivated at lower elevation. How far these two kinds spread

over tropical Africa, or whether those growing on the western side of Africa are different species, must remain for the present a matter for conjecture only. Welwitsch found a species of non-soboliferous banana at 3,300 feet elevation of the Pungo Adongo (Angola.) Northwards we find the banana still on the Canaries and in the south of Arabia. In Egypt, the Berbery and the South of Europe the plant can no more be grown for the fruit-sake, but only as an ornamental plant.

G. Bananas of America.

Tropical America is rich in varieties of bananas, but I am very ignorant about them all. There, too, people possess no end of names, and they have bananas of only 5-6 in. and others up to a foot long, one of which is said to be especially delicious and remarkable for its large size and green colour. The dominica of the Spaniards is a small fruit, white and very delicate, the others are much stronger and thicker, and of a red colour. Sprenger and Loudon give twelve kinds of banana as growing in South America. A note of Sir R. Schomburgk in the Linnean Proceedings (II. 130) does not bring anything remarkable or new.

A. v. Humboldt distinguishes in America three varieties, the true platana arton (*Musa paradisiaca*); *2nd*, the cambur (*Musa sapientum*); and *3rd*, the dominico (*M. regia*, Rumph.) and he states also, that in Mexico it is believed that the arton and dominico were cultivated long before the arrival of the Spaniards. The former is called zapolote by the Mexicans, and other native names are given. A *4th* variety which Humboldt learnt know in Peru, bears the name of meija of Oceania, and is called in the markets Lima platano de Taiti, being supposed to be introduced from Tahiti.

All the bananas have been introduced into America, according to Oviedo Histor. Natur. 1556, p. 112-114, who attests that the Spanish Father Thomas de Berlangas brought them over

from the great Canaries in 1516. According to Piso (Hist. Nat. 76, ed. of 1648) the Portuguese introduced it from Guinea into Brazil. The introduced and wild bananas of America, may therefore be all referable to *Musa sapientum*, and herbarium-material from America does not contradict this presumption. However, Garcilasso de la Vega (Commentarios reales de los Incas, vol. I. 282) states that at the time of the Incas mays, quinoa, potato, and (in the hot and temperate regions) the banana furnished the principal food of the inhabitants. Father Jos. de Acosta (Historia Natural de las Indias, 1608, p. 250) affirms this although less positively, and Humboldt inclined to the same view.

There is nothing impossible in this, and there may exist truly indigenous bananas in tropical America, just as we have *Heliconia buccinata* ranging from the Moluccos to Sumatra. But we possess not facts for such an assertion. *

I have no material whatever in this direction, and for this reason must entirely pass over the American bananas and leave them to the care of one whose conscience may once be roused to the fact that man is not born a mere machine for eating bananas.

It would be of highest interest to have the American bananas as soon as possible introduced into India, with a view:

1*st*, to ascertain the species cultivated there.

2*nd*, to learn know, and compare the varieties that have developed from the introduced bananas in a new sphere of struggles and conditions during a period of several centuries.

Such is the present state of our knowledge of the bananas considered from a pomological point of view.

V. Species of Bananx as distinguished by Botanists.

Botanists have been not less unfortunate in their attempts

* See also de Candolle Geographie botanique raisonné. Vol. II. 921 *sq.*, and C. Ritter, Erdkunde, Vol. IV. part 1 (1835) pp. 875—888.

of separating or combining the numerous forms of banana into so-called species.

The earliest record of the banana is found in Pliny (Hist. Natur. Lib. XII. cap. 6.) His description, however vague, relates no doubt to the banana, and this inference is also supported by the native name pala still in use, although the name for the fruit (ariene—aretti in Telinga ?) must remain an enigma.

Rumph's (1741—1755) and Rheede's (1678—1703) Works we must pass over here, for I have already drawn from them largely in the preceding pages. They form the basis for all work in *Musa*.

The generic name of *Musa* is said by some, like Avicenna Libr. II. Cap. 484, Serapio, &c., to be derived from mauz, meuz (taste), a name which the Arabs give to the banana and which has also passed into the Pali language (mauza); others derive the name from Musa, a muse. Again others state with more reason, that it is named after Antonios Musa, the brother of Euphorbus, a Greek slave in Rome, who when liberated became the celebrated physician to Augustus. As he has written a botanical treatise on Betonica, his name may justly be commemorated in the banana. Linné took the name in the last sense, and he distinguished in his Systema naturalis (1735) three kinds of *Musa* only, *viz.*, *Musa paradisiaca*, based not only upon Rumph's plant (Herb Amb. V. 125, t. 60), but also upon Rheede's one (Hort. Malabaricus I. 17 t. 12—14), and hence is a mixture of two different species. *2nd, M. sapientum;* and *3rd, M. troglodytarum*, based upon Rumph's *M. uranoscopos*. His *Musa Bihai* belongs to *Heliconia*. A year later, in his *Musa Cliffortiana*, he published a full account of his *M. sapientum* which he, however, now re-christened *M. Cliffortiana*, giving not only a full description of it, but also two large plates which, however rude, clearly shew us *M. sapientum* as understood by modern botanists. Here also, we find a full account

of the literature on *Musa* up to that date at pp. 3—4. The seed-bearing of the banana has occupied Linné's mind and has afterwards become a source of many erroneous deductions by several subsequent authors, although already Gaertner pointed out that the distinction between seed-less and seed-bearing bananas was valueless.

Loureiro, in 1790, established *Musa seminifera, M. odorata, M. nana, M. corniculata,* and *M. uranoscopos.* (Flor. Cochinch).

Gmelin, in his 13th edition of Linné's Systema natur. (Vol. II) in 1791 adopted *Musa Ensete,* based upon the *Ensete* of Bruce's Travels in Abyssinia.

Andrews, in his Botanist's Repository, Vol. I. of 1797, published *Musa coccinea,* based upon Loureiro's *M. uranoscopos.*

Roxburgh, in his Coromandel Plants, published *Musa superba* in the 2nd Volume of 1798, and later on (in the 3rd Volume of 1819) added *Musa glauca.*

At this stage of the literature on *Musa,* Desvaux (Journ. de botanique of 1814, not accessible to me) tried to cut the Gordion knot by simply reducing all the species then known to one only, *viz., Musa paradisiaca.* He divides them into two sections, his chincapalones with fruits 7—15 inches long, and his bananiers figues with fruits 6—1 inch long. His work can in these days only be looked upon as a curiosity and as a warning to those who are always so ready to establish theories, based upon pre-Linnean or doubtful materials.

Jacquin, in the 4th Volume of his Plantarum rariorum hort caesar. Schoenbrunnensis Descript. et Icones (1864), describes, and figures *Musa rosacea* and *M. maculata,* both from Mauritius.

Don Luis Nee gives an account of his *Musa textilis* in the Anales de Ciencias Naturales (Vol. IV. 123.)

Colla, in his Memoria sul gen. Musa (1820) adds *M. Balbisiana, M. Berterii,* and *M. acuminata* from the Moluccos, based upon Rumph's works.

Dr. Roxburgh, in his posthumous Flora Indica, edited in 1824 by Carey and Wallich, augments our knowledge by his *Musa ornata*, while Dr. Wallich adds *Musa nepalensis*.

Sprengel, in his 1st Volume of the Systema vegetabilium (1825), introduces *Musa sylvestris*, Rumph. into post-Linnean literature.

Tenore, Memoria supra diverse specie del genere Musa (letta all' accademia Pontaniana nella tornato de 28 Marzo 1830) describes *Musa speciosa* of unknown origin.

V. Siebold mentions *Musa basjoo* from Japan, but gives no description whatever—Verhandelingen der Bataav. Genootschaap van konsten en wetenschapen, Vol. XII. 18 (1827 ?)

Paxton, in his Magazine of Botany (1837) figures and describes *Musa Cavendishii*.

Voigt, in his Catal. Hort. Suburbanus Calcuttensis (1844) introduces Wallich's *Musa rubra* by name only.

Zollinger, in his Verzeichniss der auf Java gesammelten Pflanzen (1845—1846) publishes *Musa Salaccensis* by name only.

V. Houttes' Flore de serres contains two species of *Musa, viz., M. vittata*, W. Ackermann (1862), and *M. zebrina*, v. Houtte (1854 or 1855).

Miquel, in the 3rd volume of his Flora of Netherlandsch Indië (1855) raises two Rumphian forms to species, *viz., M Mindanensis*, and *M. Amboinensis*.

Ripley, in the Proceedings of the Agri-Horticultural Society of India for 1859 (X. 51), calls a species *M. Arakanensis*.

Horaninow, in his Prodromus monographiæ Scitamineærum (1862), adds, *Musa discolor*, Hort. Berol. and *Musa Dacca*, Hort Berol., two species apparently much cultivated in European hothouses, but little known out of them.

F. v. Mueller, in his Fragmenta phytographica for 1864, describes *Musa Banksii*.

I gave a brief resummé of the Indian bananas in this journal, Vol. XIV. (1867), where I briefly characterised *M. dasycarpa* then known only in fruit.

Kirk, in the Proceedings of the Linnean Society for 1867, has published some notes on a supposed new banana, which he calls *Musa Livingstoniana*.

Hooker, in Botanical Magazine for 1872, describes and figures *Musa sanguinea* from Assam.

Hill, in his catalogue of the plants of the Brisbane garden for 1874, adds two Australian bananas, *viz.*, *Musa Jackeyi* and *M. Charlioi*.

F. v. Mueller, in his Fragmenta phytographiæ Australiæ for 1875, has *Musa Hillii*, *M. Fitzalani*, and *M. Seemanni*.

Wendland and Drude published in Regel's Gartenzeitung for 1875, a supposed new species which they call *M. velutina*.

I cannot embark here upon a sifting of the literature and synomy, for such would be of too technical a character, and will be published in my revision of the Musaceæ under preparation. But I will give here a synoptic review (an improvement upon that given by me in this journal, in 1867) which will exhibit the characters of those species which come within the scope of this paper.

* *Flowering spadix erect. Spathes imbricate.*

Habit of *M. textilis*; spathes quite green and smooth; seeds brown and flat; plant soboliferous ... ... *M. troglodytarum.*

Plant without stolones ... ... *M. Jackeyi.*

* * *Flowering spadix nodding. Plant soboliferous.*

× Spathes convolute, more or less channelled, more or less pruinose outside.

\+ Only the lower spathes and flower-whorls developed, the upper ones entirely abortive or rudimentary, hence forming no djantong (sterile flower-cone.)

Spathes only 2—3, rarely 4; flowers all fertile; habit of *M. Rumphiana*, ... *M. corniculata.*

+ + All spathes and flower-whorls developed, the sterile ones forming a cone.

o Seeds smooth.

Fruits cylindrical, long, and long peduncled *M. Banksiana.*

Fruits angular, short and thick beaked; spathes yellow inside ... ... *M. Karang.*

o o Seeds variously tubercled.

† Spathes all deciduous.

Fruits abruptly beaked; seeds angular ... *M Rumphiana.*

Fruits angular, shortly and truncate-beaked; seeds depressed .. .. *M. zebrina.*

† † Spathes all marcescent-persistent.

Short-stemmed and exactly like *M. nana*, but the leaf-sheaths all enveloping each other; flowers all fertile ... ... *M. rhinozerotis.*

× × Spathes imbricate.

+ Plant soboliferous.

o Spathes channelled, more or less pruinose outside.

† Leaf-stalks short or very short, with broad leafy margins.

Short-stemmed, the outer leaf-sheaths narrow and imbricate; spathes dirty purple, long-persistent; flowers all fertile and persistent ... ... *M. nana.*

Long-stemmed, the leaf-sheaths all enveloping one another; spathes yellow, deciduous; only the lower fertile flowers persistent ... *M. basjoo.*

† † Leaf-stalks elongate. Stems elongate-columnar.

Leaves usually cordate; spathes often crimson inside; seeds turbinate-globular to polyedrous, tubercled, not above 2 lines thick, *M. sapientum.*

As preceding, spathes dull-purple; seeds depressed and irregularly angular, tubercled, 4-5 lin. in diameter ... ... *M. Sikkimensis.*

o o Spathes perfectly smooth and polished.

Habit of *M. troglodytarum ;* perianth almost 2-saccate at the base ; seeds oblong, smooth, black ... ... *M. textilis.*

++ Plant without stolones, flowering once and then dying off. Spathes smooth. Seeds very large and usually smooth.

Here belong *Musa Ensete, M. Livingstoniana, M. glauca, M. Nepalensis,* and *M. superba.*

I have kept distinct in the present paper several forms which I formerly united, on the ground that it is advantageous in such practical papers like the present one, to separate forms and thus facilitate the reduction of minor varieties to their species instead of to varieties of higher order.

I have experienced no little difficulty owing to the fact that every one seemed to have taken it in his mind to change the names of the older authors. Thus Linné most unfortunately changed Rumph's excellent name of *M. uranoscopos* into the very absurd one of *M. troglodytarum* and Colla, therefore, not without reason, restituted Rumph's name. Indeed Colla himself has substituted new names for Rumph's ones, and this desire for re-christening we see still in the year 1875! I have felt much tempted to adopt Rumph's names, and who knows how much Rumph's nomenclature has influenced Linné when he introduced his binominal nomenclature into science. But the present orthodox rule according to which the binominal nomenclature only dates from Linné, has compelled me to adopt Linné's names, at the same time forcing me to call with Loureiro the present *Musa coccinea M. uranoscopos.*

In the present paper I have chiefly to deal with the cultivated kinds, and these are in India, *M. troglodytarum, M. corniculata, M. Rumphiana, M. zebrina, M. rhinozerotis, M. nana, M. basjoo, M. sapientum,* and *M. textilis.*

The non-soboliferous kinds and the small kinds with erect spadices are here entirely omitted, for they are never cultivated for their fruit sake.

At the outset I have to caution that it is in the greater number of cases absolutely impossible to recognise a banana-fruit until its proper species has been ascertained beforehand. Almost identical fruits are found on plants specifically entirely different. Hence a fruit or a fruiting bunch is usually insufficient for being identified in a great number of cases.

VI.—Enumeration of the cultivated varieties.

1. Musa Troglodytarum, L.

This species is as yet but imperfectly known, although it is one of the most cultivated forms of Australasia, extending as far west as the Moluccos and the P[illegible]lt very distinct species in habit, much resembling *M. textilis* and as large. The erect spadix, and much imbricated green bracts alone distinguish this from the rest of the cultivated species. The only figure of this is the one given by Rumph in his Herb. Amb. V. t. 61 f. 2.

1. Pisang tongkat langít.

Fruits three inches long and 1½ inches thick, tapering to the 3-cornerd base, of the colour of a dark-coloured carrot or rather brown-red; the pulp is golden yellow, like gamboge, soapy, of a tolerably sweetish taste, but rather mawkish There are usually 7—8 fruit-whorls to the spadix. (Binnendyk MS).

2.—Musa corniculata, Rumph., not of Loureiro.

This is hardly more than a monstrous variety of *Musa acuminata*, and has the largest flowers of all bananas. It is known only in a cultivated state, and ranges from the Moluccos to Java. Loureiro's *M. corniculata* cannot be the same as Rumph's.

1. Pisang tanduk besár mal. (see Plate 2—3.)

Stem 10—12 feet high, as thick as the human thigh, purplish

or reddish green, smooth; leaves 5—6 feet long, oblong, but little decurrent at the cordate or rounded base, fatty; petiole 1—1½ feet long, green, reddish on the slightly membranous margins, pruinose and glabrescent. Fruiting spadix incurved, bearing only 1, or at the outest 2, fruit-whorls, while the other 3—4 are not at all or only very indistinctly indicated. Fruits 12—15 inch long, 1½—2½ inch thick, 2—3-corned, pretty sharply beaked, curved, almost roughish and opaque, golden-yellow, afterwards becoming rusty-brown-spotted; skin thin, rupturing when taken off. Pulp reddish white, firm, dry, sweet. A bad sort for eating raw, but excellent for cooking. Two fruits of this weight as much as 1½ pound Dutch.

2. Pisang gelek, mal. (Also pisang bakdja and pis. gebiar).

This differs from the preceding in bearing more (3—5) fruit-whorls.

3. Pisang buráyut, mal.

Stem 10—12 feet high, as thick as the human thigh, green, purple-spotted, smooth, or covered with the remnants of the dried-up leaves. Leaves oblong 5—6 feet long, hardly decurrent at the rounded or cordate base, fatty beneath, the rib often reddish; the petiole 1—1½ feet long, green, pruinose and turning smooth, reddish along the little-membranous margins. Fruit like those of pisang galek, but smoother. This variety differs from the p. galek simply in this, that the fruits break off under the peduncle and so fall down on the ground.

4. Pisang lubang, mal. (Lubang=an eel burying in holes).

I have not seen this sort but it most probably belongs to pisang tanduk. The stem is said to produce only a single fruit, which ripens within the stem, which in consequence bursts. It is said to be so large that three men can satiate themselves with it.

5. Pisang gándul, mal. (Also pisang tanduk gandul, mal; (p. tanduk etjil or p. rájunan, mal). (see Plate 4).

I have not seen the plant itself, but the fruiting spadix is nodding, and bears 3—5 half-whorls of 8—10 fruits each.

These are 7—8 inch long, 1½—1¾ inch thick, curved, 3—5 cornered, long-beaked, somewhat rough, golden yellow, afterwards turning rusty-brown-spotted; the peduncle is pretty long. Skin thin, rending in moving it. Pulp reddish, pretty dry, mawkish, sweet.

(To be continued.)

Indian Famines—an enquiry into the causes, with suggestions,—by MAJOR-GENERAL C. L. SHOWERS.

The present famine in India, following so closely, and with such aggravated intensity, upon the fast recurring famines of late years, has riveted the attention of all thoughtful Englishmen, irresistably obtruding the reflection—where it is all to end. Most of our leading statesmen and publicists have as a matter of public duty expressed their views regarding the present alarming condition of the country. Mr. Bright attributes it to the want of sufficient canals, and in advocating an extension of the Indian Canal system, deprecates the expenditure of late years on railroads as disbursed, in his view, rather on military considerations than for the improvement of the country. Local opinion, on the other hand, as expressed through the public journals, is generally in favour rather of an extension of the railway system. Lord Salisbury and Sir Julius Vogel prescribe emigration to relieve the redundent population as the only means of preventing famines in India. On the other hand, immigration is advocated by a correspondent of the Calcutta *Statesman* of the 12th instant, (October) signing himself "a West India Planter," who recommends the importation of West India labourers by the return cooly ships to India to open up the waste lands of this country. Lord Mark Kerr would have the water stored and utilized wherever found or however come by, by rainfall, from rivers, in the hills, under the ground, &c. The *Spectator* advocates the

construction of tanks and reservoirs as in the old native method. The *Economist*, in making a similar suggestion, considers that a grant from the British Exchequer might expediently be made for public works of this character, and cites the precedent of the Irish famine of 1847-48, on which occasion an expenditure of about eight millions was incurred, and would have the cost of preservation of life in times of sweeping distress made a charge on the funds administered by local authorities, as the charge for the poor law is in England. Mr. Grant Duff is wholly opposed on principle to any such grant. Mr. Fawcett, in advertence to the position accepted by the Government of India, through its mouthpiece Sir John Strachey, that "famines cannot under present circumstances be looked upon as occurrences of an extraordinary character," points to national bankruptcy as the inevitable result of these constantly recurring burdens on the Indian finances if some means cannot be devised to obviate them. In regard to a specific remedy, however, no suggestion is offered—only hints for relieving the finances in other points, by reduction of army expenditure, and generally by greater economy in the administration of the same. Mr. Pedder,* while remarking incidentally on husbandry in India being defective on the presumption afforded by our absolute want of control over even local and partial dearths, addresses himself chiefly to the question, 'why the people so easily succumb to famines.' Without entering in this place into a consideration of the causes alleged in explanation of this fact, I will only advert in passing to the conclusion at which Mr. Pedder arrives, that "unless means can be devised to check the economical revolution now going on, he fears those are right who hold that its result will sooner or later be a social convulsion which will shake the Indian Empire to its foundations." The Government of Madras, acting on a correct forecast of the

* *Famine and debt in India*, September No. of *the Nineteenth Century*.

approaching famine, took the precaution of purchasing grain to enable it at all events to control prices against possible combination to raise them excessively, and if necessary, for distribution. This policy was also adopted by Lord Northbrook's Government on the occasion of the famine of 1874. Another writer would empower Government to raise export duty on grain on emergencies. The present Finance Minister on the other hand deprecates all interference with the doctrines of Political Economy in regard to demand and supply, and would allow them full scope unreservedly. Lord Derby in his address at Liverpool on opening the Art Gallery, takes a comprehensive view of the responsibilities which England has incurred in regard to India, in reference at once to our having no security that the calamity which is pending now will be an isolated occurrence; and again, to the prospect of the vastly increased population which, in every succeeding generation, we shall have relying upon us for help in their periods of distress on account of our protective measures for the preservation of life against ravages of war, pestilence, and destitution which, in the former ordinary condition of India, maintained the balance between population and means of subsistence. Lord George Hamilton would increase facilities of communication, extend the system of financial decentralization, increase the responsibility of local authorities, afford facilities to them of constructing tanks, reservoirs, and other local public works, improve our system of land tenure, and rescue as far as we can our peasantry from the clutches of the money-lenders. The *Times* hits an agricultural blot in reference to the 'dependance of India on two or three successive crops of the poorest food,' and suggests 'a sad misgiving that the former rulers of India had more of that simple craft and homely benevolence,' adapted to the condition of the country and its peoples, and confessing that 'we find ourselves beaten and have to retrieve a great defeat.'

In the diversity and, in some instances, conflicting character of the opinions above cited in regard to the best means of meeting the difficulty with which we are confronted, we have an illustration of Lord Derby's remark, that although it is a difficulty in respect to which 'all parties and all classes will be of the same mind as to what they wish to do, yet notwithstanding our unanimity we shall not find it easy to be done.' One dominant sentiment however pervades the whole series of opinions on the situation,—that it is a difficulty of Imperial magnitude, THE PROBLEM OF THE DAY, on the solution of which is involved the future of our Indian Empire.

Believing myself that the key, so far as its physical cause is concerned, will be found through an enquiry into the agriculture of the country, I desire to offer the following contribution to the subject through the medium of the Society's Journal, as the result of my experience, both in the management of the domains of Native States as Regent during periods of minority, and in the working of my own farm of two thousand acres, examples from which will be adduced in illustration of my views. The remarks which I may have to offer on the opinions of the above cited eminent authorities will be reserved for submission to the public through another channel, a discussion of the various fiscal, economic and political questions raised in the same lying beyond the scope of an exclusively professional journal.

The increasing frequency and intensity of famines of late years in India on the occurrence of drought, partial or more pronounced, would seem to betoken that the soil throughout the country is becoming exhausted. Famines have occurred from time to time within the historic period, but at long intervals. The one in the year 1661 is the earliest, I think, of which we have authentic records through Dow's history, in the pages of which we are told how the Emperor Aurungzebe exerted himself to relieve the distress of his subjects. Taxes were remitted, grain was purchased at any

price with the public money, and resold at a moderate rate to the comparatively well-to-do; while the mass of the poor classes were sustained absolutely by the Emperor's bounty. Through these measures, we are told, "whole provinces were delivered from impending destruction, and many millions of lives were saved." A century later, in 1771, India was again overtaken by drought, when the mortality was frightful. The Government of India of that day reported to the Home Government that it was computed that one-third of the population of Bengal had perished. The next famine recorded was in 1798, followed at forty years interval by that of 1838 which I can remember. The details of that calamity, as described in the reports of the late lamented Colonel Baird Smith, appointed on a Special Commission of Enquiry, gave inception, I believe, to the idea of the Ganges Canal as a contemplated safeguard against future famines in the Doab of Upper India. The year 1867 brings us to the present disastrous decade, within the period of which four famines have swept over the land, each succeeding one increasing in intensity and scope till culminating in the present awful calamity. Many millions of our British Indian subjects are involved within its desolating ravages, of which it is computed that above half a million have already perished by that most terrible of all deaths, the slow consuming gnawing at the vitals, the actual physical pain of which to individuals, must be counted insignificant in comparison with the mental anguish of witnessing the agonies of those nearest and dearest to them—helpless children crying to their equally helpless parents for bread, and slowly sinking to death before their eyes. One solace the surviving sufferers may find in the active spmpathy and personal exertions on their behalf of the head of the State, as evinced by Lord Lytton's visit to the famine districts in the height of the calamity at the most trying season of the year.

If at the threshhold of this enquiry into the increasing

frequency of famines, it should be objected, in answer to my theory of exhaustion, that if sound, the results would have appeared earlier, I cite the following authorities in support of my position that long-suffering Mother Earth will bear much and long, but if persistently impoverished by injudicious tillage, will inevitably become utterly exhausted at last. First Liebig:* "There are fields," he teaches us, "that will yield without manuring for six, twelve, fifty, or a hundred years successively, crops of cereals, potatoes, vetches, clover, or any other plants, and the whole produce can be carried away from the land; but the inevitable result is at last the same,—the soil loses its fertility.....the fields will ultimately be brought to a state of exhaustion; the corn will only yield an amount equal to the original seed, the potatoes will no longer produce tubers, and the vetches or the clover will die away after barely appearing above the ground." Next I would cite Columella, that high agricultural authority among the ancients, in writing of whom in reference to the vaunted "progress" of empirical modern teachers, Liebig observes, that the latter "inculcate nothing that was not known to the world equally well, and often even much better two thousand years ago." In his letter to Publius Silvinus Columella says: "The Magnates of the State are in the habit of complaining of the sterility of the land, or of the unsettled state of the weather, which has now for a long time exerted an unfavorable influence on the growth of agricultural produce; others are of opinion that the soil has been exhausted by the over-productiveness of former years. "But," he continues, "no one gu ed with common sense will ever permit himself to be persuaded that our earth has grown old as man grows old. The sterility of our fields is to be imputed to our own doings, because we

* Letters on Modern Agriculture, pp. 176-77.

hand over the cultivation of them to the unreasoning management of ignorant and unskilful slaves."

Next I would cite Mr. H. C. Carey of Philadelphia.* Speaking of the elements of plant-food, potash and phosphoric acid, annually taken away from the fields without any compensation worth mentioning being made to them, Mr. Carey observes : " the consequences of this may be seen in the fact that the soil is almost everywhere exhausted, and that the prosperity of the country is declining instead of increasing.....Labour spent in the spoliation of the soil is worse than labour thrown away. In the latter case the loss falls upon the present generation : in the former, poverty is the inheritance of posterity.....In New York where the average yield of wheat was from 25 to 30 bushels eighty years ago, it is now only twelve bushels.....In Virginia and Kentucky tobacco was grown until the soil was completely exhausted, and had to be abandoned ; and in the cotton districts we meet with a state of exhaustion unexampled in the world for the shortness of the time in which it has been brought about."

This is abundantly confirmed by Mr. Joseph Lyman, late of Lousiana, in his admirable treatise on Cotton Culture. " Though cotton," he observes, " is the great American staple of export, and has been proclaimed a king in the commercial world, no leading crop of the country has been so little studied by scientific men, and none has been cultivated with so little reference to fundamental principles of agricultural chemistry." And Mr. Lyman accounts for this by the facility with which fresh virgin land could be obtained, rendering it unnecessary to pursue a system of culture that should keep the land in undiminished productiveness. " Why should the cotton-grower," he asks, " on the old red lands of the Carolinas and Georgia labour to redeem his acres from the

* Letters to the President on the foreign and domestic policy of the Union, and the effects as exhibited in the condition of the people and the State.

effects of past errors when a few hundred miles to the South-west lay those wide Savannas and broad alluvial bottoms, teeming with tropical luxuriance, to which the Government would give him a fee simple for a dollar and a quarter an acre."....." The really admirable manager," Mr. Lyman adds, " is one who takes average land, keeps it in as good condition as he found it, or even better, raises his own meats, vegetables, and wool, and one year with another takes as much cotton from an acre as his neighbours, working in the old way, take from three;" and contrasting the results of good and bad culture, he observes, that " under one system the cotton-grower may confidently expect to see his plants standing six and eight feet high, the branches interlocking on both sides, each plant loaded with bolls, and the field yielding considerably over two bales an acre, while within rifle-shot he may see the lands of his neighbour covered with little stunted plants twenty inches high.....so that the average one year with another, will not be much over half a bale to the acre." Concluding his remarks on the exhaustive effect on the soil of bad culture so prevalent in the States, as necessitating constant moving, Mr. Lyman observes in derision, " The emigrants' wagon is always on the road."

The possible eventual exhaustion, then, of the soil of a country by bad husbandry will doubtless be conceded to have been established on the testimony of the above cited authorities. But in contending for this concession, let it not be supposed that I have been insisting on a truism, fighting with a shadow. On the contrary, believers in the inexhaustible fertility of Mother Earth are many: and it was against the advocates of that doctrine among the empirical teachers of modern agriculture that Liebig has had to wage his life-long battle, the history of which is well told by Professor Pettenkofer in his account of *Liebig's Scientific Discoveries*, extracted in the last July No. of that admirable Journal, the

Indian Agriculturist. And what was the formula in which that doctrine was enunciated? "*Fertile fields*"—so these teachers tell us—"*are inexhaustible in the conditions of fertility; they only require the whip to stimulate them into action.*"* We all know what the effect of the whip is upon a thoroughly jaded and told-out horse—a spasmodic spurt, resulting perhaps in the bursting of a blood vessel, or shutting up in some other way. Let my readers bear this formula in mind, for we shall presently see its application to India, and have occasion to mark similar effects resulting from the same in the vegetable, as notoriously obtains in the animal kingdom.

Recurring now to my original position, that the increasing frequency and entireness of failure of food crops of late years on the occurrence of drought, partial or more pronounced, betokens that the soil throughout the country is becoming exhausted, let us proceed to consider the cause of that exhaustion. This I apprehend to be two-fold: 1*st*, the immemorial course of cropping pursued by the native cultivator, in deference to ancestral prejudice, (*bâp dâda ka châl*) and which may aptly be described, in the words of Liebig, as the "Spoliation system of agriculture;" that is to say, incessant cropping without returning anything to the soil,—and 2*nd*, to the character of our land revenue operations.

I will only here refer, under the latter head as relating more particularly to the subject-matter of this paper, to the fixity of the field boundary ridges (*dhôls*) by which the holdings of the several cultivators are marked off. Once laid down and entered on the village map, these ridges may on no account be broken up. Thus the land is cut up into minute plots, often less than one quarter of an acre in size. The disadvantages of this arrangement are manifold. In the first place, it wholly prevents the land being properly ploughed.

* Liebig's Letters, p. 231.

No sooner have the oxen got settled to the yoke than the opposite boundary is reached, when the plough has to be turned, leaving a broad belt of the field unploughed; and though turned up in the transverse ploughing, it need hardly be pointed out that it cannot at all events have the advantage of a cross-ploughing given to the rest of the field. And since the belt of half-ploughed land runs round the four sides of each field, the aggregate loss to thorough tillage over large areas may be imagined. Again, the constant turning of the plough, effected with awkward difficulty and constant prodding of the oxen by the single man who acts as driver as well as ploughman, besides preventing furrows of any depth or straightness being turned, both worries and unnecessarily exhausts the cattle. It need hardly be added that the contracted limits of such small fields wholly precludes the use of any better description of plough than one of a single pair of oxen draught-power.

Contrast this method of tillage with that pursued in the Native States, and the superiority of the latter will be at once apparent. Eight to ten ploughs will range up in line, ready yoked, at the edge of a field of one to two hundred acres. The first starts in, turning the outer flank furrow. After it has gained about a plough's distance to its front the second starts in, turning the next inner furrow, and so on, with each plough in succession, to the last, when we have a brigade of ploughs in line in Echellon, at plough interval, marching straight to their front to the attack of the common enemy—the iron-bound soil. As it advances, breaking up between its extreme flanks a broad belt of fresh and fresh furrows, a wild strain comes trilling on the ear. Is it a war song, or an invocative chaunt to the Cornucopia of Ceres? Whatever it be, most melodious it floats down the breeze in dying cadences—telling of light hearts full of hope, looking forward to the bumper harvest that shall reward their toil, and to the merry harvest-home, with wine and wassail in good old feudal fashion under a paternal Prince, to crown their joy.

The grounds on which the present system of field division by ridges, adopted originally, it is to be presumed for fiscal convenience, may now perhaps be still defended, has reference 1*st*, to the circumstance that the ridges being low and bare, they are not open to the standing objection against field hedgerows in England—that they shade a strip of cultivated land on either side and harbour vermin; and 2*nd*, on account of the facility afforded for flooding the land through irrigation channels.

With respect to the first point of defence I would observe, that it suggests the analogy of the low stone walls dividing the Cottiers' fields in the west of Ireland, the cause notoriously of the bad husbandry of the land in that part of the country, as may be held proved by the converse. For wherever the original proprietors of these small holdings have been removed, either by voluntary emigration or by eviction, the land has presented a wholly changed and improved aspect on being thrown into large fields. The most noteworthy example of this that I saw when visiting county Mayo some years ago was Lord Lucan's property at Castlebar. You know at once when you are entering his domain from passing out of the squalor of the Irish Cottiers' nest of hovels, with encircling potatoe patches, into the region of large fields of one hundred acres and over. The enhanced value of the land under this new distribution justified the judgment and scientific knowledge that devised it, as may be gathered from the fact of one pound (£ 1), an acre rent all round, being at once given for it by some Scotch farmers who came and took it up. I was told a characteristic anecdote on the spot, illustrative of Lord Lucan's sound sense and practical wit, which has placed him in the foremost rank among the agricultural improvers of the age. A visitor on being shown over a new farm house which he had built on a part of his estate recently reclaimed from pig-and-potatoe-patch unthrift, observed that there was no view from the parlour window. "View! Pooh! stuff o' nonsense," replied

his Lordship, "the sort of tenant I like to get on my land is a man who thinks the dungheap before his window the sweetest view in the world."

In regard to the second point of defence—'facility for flooding irrigation'—we have an illustration of the *whip* which, under the fatal delusion that water contains the essential elements of plant-food instead of being chiefly a stimulant to call such elements, where existing in the soil, into activity, has been persistently applied to goad the starved soil of India to expiring efforts of production. Before citing high agricultural authorities to show that the results before us are only what might have been expected, I may adduce a striking example in illustration from my own farm operations in Dehra Dhoon of the year 1873-74, as communicated to the Bengal Chamber of Commerce, and printed in the Chamber's Report of that year. Being the first season of my experimental cotton cultivation in the Dhoon, and before I had been put in possession of my present grant, the land I took up on my own resources happened to have been for years previously under rice cultivation. After the field had attained a certain growth a marked difference was observable between the plants, and by referring to the Chamber's Report, p. 168, it will be seen that I described this difference in the following terms:—"It was curious and instructive to observe the distinct indication of the rice cultivation by the low stunted plants growing on the lately saturated beds, divided by fine rows of plants marking the lines of the division ridge-rows," *(dhols)*. We have here a practical illustration of the deteriorating, exhausting effect upon the soil, of irrigation carried to the extent of flooding, in fields dammed in by ridges. The above example placed on record between three or four years ago, long before the present discussion was raised by the successive famines that have since occurred, may be held to tell with peculiar force.

Mr. Robertson, Superintendent of the Sydupet Government

farm near Madras, gives the following examples to the point. In describing his operations in sub-soil drainage, he observes: "satisfactory as are the results, they do not fully exhibit the benefits in this instance gained by sub-soil drainage, for it must be remembered that before drainage, the land was almost *hopelessly unproductive*, having been rendered so by swamp cultivation."

In support of my remark, submitted in a previous place, that water does not in itself possess in any appreciable degree the essential elements of plant-food, I may cite Liebig again, pp. 39, 40, and 41, wherein he gives a number of excellent analyses of common river, well and drainage water from land, as published by Graham, Miller, and Hofmann (Chem. Soc. Qu. T. IV. 375), from which it appears that 100,000 gallons, or 500 tons of Thames water, taken from five different places, contain on the average six pounds of potash, well water about two and a half pounds, and drainage water, that is, rain water which had naturally percolated through the soil, taken from seven different fields, mineral constituents and organic matter combined in the proportion of a little over three parts on the average in ten thousand. In commenting on the inappreciable proportion of the constituents of plant-food in water hereby exhibited, Liebig remarks, that "an idea may hence be formed of the quantity which a plant during the period of its growth can possibly obtain from such a solution."

But while I deprecate the flooding system of irrigation at present pursued throughout India on the notion, erroneous as I think will be held proved by the foregoing premises, that water contains the essential elements of plant-food, and in ignorance probably of the deteriorating effect on the soil of such a process, I am not insensible to the important part that water plays in the nourishment of plants in respect of its serving to render the mineral constituents of the soil fit for absorption by the roots. But how little water will suffice for this purpose, may be inferred from the consideration that by

far the greater bulk of plants consists solely of the organic elements of carbon, hydrogen, and oxigen, united in the proportions in which they form *water*, and that the whole of this is derived from the air. The following remark of Pettenkofer supports this view: "fast as the roots are able to extract the insoluble mineral matters from the soil, they also extract from it moisture hygroscopically combined with it, which is then, to a certain extent, restored by the atmosphere, even without rain."

But not only on account of its impoverishing effect on the soil do I deprecate swamp cultivation. Its reactionary lowering effect on the plants so raised, both in respect of washiness of grain and want of resisting power in the plant generally, is only in one degree less to be deplored. The fact of such effect being produced, I am in a position to prove, by the converse, by examples drawn from my own farm. The appended despatch* from the Secretary to Government of India in the Department of Revenue, Agriculture and Commerce, enclosing reports from the Chambers of Commerce, on the produce of my cotton fields, raised on unirrigated land, from indigenous seed in the third years' cultivation, on the principle of selection, bears satisfactory testimony to the progress that can be made in improving the indigenous products of the country by scientific culture. The estimated value of from Rs. 26 to 27 a maund in Calcutta and from 9½*d.* to 10*d.* a lb in Liverpool, brings the quality up to a high average American produce. Again, my rice crop of last year (1876), raised on *unirrigated* land, was, so palpably superior, that I thought it worth while to forward samples to the departments of Agriculture of the Government of India and of the N.-W.-Provinces, with a report, copy of which will be found in Appendix (No. 2). Mr. Buck, Director of Agriculture, N.-W.-P., in recognition of the superiority of the samples, and with that zeal for promoting the inter-

* App. I.

ests of his department which distinguishes him, applied to me for a supply of seed from my fields for distribution in his districts. This requisition was duly responded to. It is readily intelligible that grain raised on properly prepared soil with all its nutritive constituents, mineral and other, to feed the plant, must produce a firmer and more nourishing grain than that raised in swamps. The difference might be illustrated by analogy drawn from the animal kingdom—the difference for instance between a boy raised on pap and another on meat and bread, or between a colt stall-fed on hard meat, and another grazed on the swampy rank pastures on which it was dropped. A handful of my dry-grown rice feels like a handful of pebbles in comparison, and indeed the natives call it "*putturee dana*" (stone grain) in reference to its weight. Besides the greater hardiness which the plant gradually acquires by the dry method of cultivation.—and it is well-known that plants of the same species can be habituated to widely different conditions of existence,—the nutritive and staying properties of the grain are enhanced to an incalculable degree. To this fact I have lately received important corroborative testimony in a report by Mr. Gammie, Superintendent of the Government Darjeeling Plantations, "on dry rice cultivation as practised by the Lepchas," received through the kind courtesy of Mr. Buck. "The Lepchas," Mr. Gammie writes, "say that their own rice is so much superior in nourishing qualities to that of the plains, that if they take a meal of the latter they are hungry again in an hour or two, while they can go for a day on a meal of the dry rice without inconvenience." Now, the elevation at which the Lepchas grow this dry rice, ranges according to Mr. Gammie's report, from 600 feet to 4000. The lowest limit brings it quite within the level of the plains generally, and therefore warrants a reasonable expectation of our being able to introduce it, to supplement at least, if not largely to supersede, the swamp rice cultivation of the plains. By this

a three-fold advantage would be gained: 1*st*, the production of a more nourishing article of food; 2*nd*, a greater hardiness and resisting power in the plant against drought or other climatic vicissitude; and 3*rd*, saving the land from the fatal impoverishment entailed on soils by swamp cultivation.

Water, the antagonist element of fire, resembles it in this quality that, like fire, it is "a good servant, but a bad master." Canal irrigation in moderation, if supplemented by a collateral drainage system, may be beneficial in seasons of scant rainfall. But as at present applied throughout India, unaccompanied by a drainage system going hand in hand, its effect, as may be understood on the principles illustrated by examples above enunciated, is to impoverish the soil, and moreover to render naturally healthy tracts pestilential by exposing a swamped surface soil to the malaria-generating action of a tropical sun. The general unwillingness of the ryots cultivating land under the canal areas to take the water, from their experience of its impoverishing effect in covering the land with the saline efflorescence called *Reh*, and in other ways, the *modus operandi* of which they don't understand but which I have above endeavoured to explain, affords a strong presumption in support of my first position in this connection. The notorious unhealthiness of the canal bordering tracts serves to establish my second; the most memorable example in support of which within my experience was the enforced abandonment of Karnal, a large military station which had been formed on our then N. W. Frontier for the occupation of a garrison of from 8 to 10,000 troops. Owing to the deadly malaria caused by the Jumna canal which was carried along the water-shed in the vicinity of Kurnal, the station after a few years had to be entirely abandoned, leaving thousands of graves, and the ruins of barracks and other public buildings, representing millions of cost, as the only monuments of that disastrous occupation. A system of powerful main drains carried down at right angles to the line of

the canal with sub-soil drains opening into the same, might possibly have saved that station. Again, river-fed irrigation canals are apt to fail precisely when most needed through the lowering of the surface level of the feeder rivers in seasons of drought. The advocates then of more canals, pure and simple, as the *sine qua non* for the situation, would appear from the foregoing premises to be taking, from imperfect information, a contracted view of a large and many-sided question.

But not only as an indispensable adjunct to the irrigation canal system would a supplementary drainage system seem to be peremptorily indicated. On well, though but comparatively recently, established agricultural principles, I would venture to advocate the bringing of all the culturable land of the country under a system of sub-soil drainage, more especially the vast area of retentive black cotton soil in Malwa, and in Central and Southern India. This soil formed by the disintegration of basalt and trap rock obtaining in those regions, and found generally alternating with laterite, has an extraordinary tenacity, in its present condition, of retaining water in the monsoon, so that the whole country becomes one vast morass, and all local traffic is suspended. As applicable to land in England no discussion would be necessary, the advantage of sub-soil drainage being there fully recognized. But since the applicability of the system to land under a tropical climate like that of India may at first view seem doubtful, it may be useful to consider briefly the principles upon which it is based, and its *modus operandi*. Leibig writes: (pp. 48-9) "When in a hot summer the surface of the ground is dried, the powerful attraction of the soil for the vapours of water in the air provides the means of supporting vegetation . . . . . A second source from which the dry soil derives by absorption its moisture, is presented by the deeper lying moist strata. From these a constant distillation of water is taking place towards the surface . . . . . By drainage the water, which rises by capillary attraction being placed at a greater depth,

the dry soil now receives from the lower strata, a quantity of moisture in the form of vapour which supplies the wants of plants." In an article in the July No. of *The Indian Agriculturist*, by S. D., the subject of sub-soil drainage is ably discussed, and in his remarks on some experiments conducted by Mr. Robertson of the Madras Government Farm, cited in a previous part of this paper, the above principles of Leibig are well illustrated. In continuation of the remarks which I had occasion to cite in support of my view of the impoverishing effect of swamp cultivation, Mr. Robertson adds : "Throughout the long drought which was experienced during the year under review, the cotton plant on the pipe-drained land was always green and fresh, while that growing on undrained land was withered and blighted. I feel no doubt whatever regarding the benefits that will be secured by sub-soil drainage in retentive soils in this part of India." On this S. D. aptly observes that "When a land is not drained heat and cold does not affect the soil deeper than about a foot. But if there be drains underneath, the soil becomes comparatively more porous and permits a greater movement of air; heat and cold then affects more or less the soil between the surface and the drains—a depth of three or four feet. Thus what the heat 'gains in space it loses in intensity.' The surface soil being therefore less heated and baked loses less moisture by evaporation. This is the reason why a drained land is comparatively warmer in the cold season, while it is cooler in the dry season." This view is corroborated by the general testimony of the farmers in Great Britain, that in dry weather land when drained does not burn so easily, or bake or fissure so injuriously as undrained land does.

The following remarks on this point, in a letter I received from the late lamented Lord Tweeddale, in June 1874, bear important testimony to the efficacy of sub-soil drainage as the result of his experience in India, and contain valuable suggestions for extending the system for the improvement of the cotton

plant. "I think an experiment should be made," writes his Lordship, "for growing cotton on the black soil of the Southern parts of India. I am not aware of having touched on this subject in former letters to you. You are aware of the tenacity of the black soil for retaining water during the monsoon. The consequence is that a cotton plant, if planted during that season, will live in a wet bed until the sun dries the land by evaporation. In this weak state its bed is changed into a dry, and then into a scorching heat under a glaring sun. Twenty acres of land should be roughly drained—the drains eighteen feet apart and four feet deep: the soil dug in dry weather and pulverised at least fourteen inches. The seed should be sown about the commencement of the monsoon. The plants would live in a comparatively dry bed, and the wood and leaves grow during the monsoon, and during the fine weather that follows the monsoon, the bolls would form and ripen. The expense of this operation would be recouped by the increased production of fibre. My reason for believing in the success of this system is derived from the experiments I made at Madras by the same means in growing wheat and potatoes in which I was successful, and I then established the principle which I think might be applied to cotton. The economical mode of trying the principle would be to use two planks of thin sawed wood, and put in the form of a V inverted in the drain. It would try the experiment before the white ants could destroy the wood. Then by cutting off a few of the twigs from the branches the sap would go into the fibre of the bolls. This is an experiment that I never tried when I was in India, and which I have since regretted."

But not only in view of its probable effect on the production of cereals, cotton, and other plough crops in greater abundance and perfection, is the system of sub-soil drainage throughout the culturable land of India generally to be advocated. Its beneficial effect in improving pasture lands is well-known throughout Great Britain. A coarse rushy stubble growing on fields

will be changed as by magic into a fine short nourishing sweet grass, which will fatten sheep and cattle like the South-downs. This is well known by all farmers there. Here in India, the inferior quality of the cattle may largely be attributed to the bad pasturage, and it is not chimerical to expect that the size and strength of cattle throughout the country would in time be improved greatly by better pasturage created by drainage; admitting, among other advantages, of the introduction of a more powerful plough than that now in use as the only one adapted to the weak puny cattle of the country. The reaction of this change in improving the general productive power of the land through deep ploughing, need hardly be insisted on.

The important point of manure remains to be considered, and which I propose to consider in connection with the system of rotation of crops. Many, while recognizing empirically its efficacy as a fertiliser, give it up as hopeless in a country like India, where the natural manure of the cattle droppings is diverted from its original purpose to be used as fuel by the inhabitants, who are at the same time too poor to import expensive artificial manures, such as guano, &c. Such writers would appear not to be aware that fodder and other green crops need not necessarily be consumed by cattle and form manure, to be applicable as a fertiliser to fields. Liebig observes: "The keeping of cattle is necessary for the production of manure; but the production of manure is by no means necessary for the fertilisation of corn-fields. In the system of rotation of crops, *all that is required* is, that green crops should be grown, and that their constituent parts be incorporated with the arable surface-soil of the field; and it is quite immaterial for the cereals whether the green crops be previously eaten by the cattle and converted into manure, or not. If lupines, vetches, clover, turnips, &c., are cut up and ploughed in in the green state, their action is far more powerful."

The fundamental principle upon which manuring operates in retaining land in its original fertility and reproductive power, is to restore to the soil the constituents carried off by the crop grown. Any other system of farming has been well designated by Liebig as a *system of spoliation*, and must inevitably tend to the ultimate exhaustion of the soil.

The reader who may have followed me in the foregoing review of the causes to which, in my apprehension, the present situation is to be referred, will be at no loss to indicate the appropriate remedial measures to be adopted. It may be convenient perhaps if I endeavour to formulate the same as follows :—

1*st*. Throw the village lands into large fields by levelling down and plouging up the intervening ridges (*dhols*), through which under the present system each individual proprietor's (*putteedar's*) portion of the village land is permanently divided off into minute patches, stereotyping sterility. This measure alone would serve to bring a large area in the aggregate of strong land under cultivation which, not broken up for ages, would represent, in comparison with the exhausted surface of the mid-lying fieldlets, virgin soil. The laying down of field landmarks on a different plan, or at all events the collection and payment of each proprietor's share of the total assessment on the village might safely be left and the responsibility thrown upon the village heads, *(lumbardars)* who receive a small percentage on the collections. The throwing of the land into large areas would admit of its being properly ploughed and prepared for the seed.

2*nd*. Arrange for a rotation of crops and systematic manuring as follows :—Divide the ploughed land into three parts or tracts, not by fences, but on some plan generally recognized by the village community. Then proceed with a systematic course of rotation with the crops found suitable to climate and soil of different localities respectively, but with this

invariable provision in every case—that on the fourth year one of the parts shall be left fallow in succession, after being heavily manured by a green crop grown upon it in the preceding season, cut and ploughed in. This method of manuring, it has been demonstrated in the preceding pages, in correction of the popular notion and corroborated by high authority, is far more effective that the same substance passed through cattle and applied to the soil as dung; and its adoption will meet the objections of those who despair of Indian agriculture because the chief natural manure of the country, the dung of cattle, is diverted by the necessities of the peasantry from its natural purpose to domestic uses as fuel, and they are too poor on the other hand to supply its place with imported artificial manures. The efficacy of such green crop manuring would be greatly increased if done through deep-rooted plants, such as lucerne, turnips, carrots, &c., which derive their food from the mineral matter of the sub-soil. Though popularly called *roots*, as observed by Dr. Masterman, in his Masterly Paper on Manures, read at a meeting of the Exworth Farmer's Club, "they are really succulent under-ground stems." If ploughed in then at, or a little before, maturity the mineral matters extracted by these plants for their growth from the sub-soil, would be given to the arable surface soil as extra fertilising ingredients in excess of the manuring given to it by the plants in their constituents of ash, potash, phosphoric acid, &c. By systematically pursuing this course we should arrive at a means of utilizing the plant food elements in the sub-soil, unpenetrated hitherto by the weak and shallow native plough, to the periodical renovating of the arable surface-soil which only at present is reached, and tu :ed up again and again to exhaustion. This would be no small gain to Indian agriculture in the interim till we can introduce the use of the sub-soil plough which, if two or more pairs of cattle can be yoked to it under the large field arrangement as advocated, need not be despaired of. That the natives are fully alive to

the advantages of sub-soil ploughing, was clearly established by Mr. Phillips' operations on the Government farm at Allahabad. When he was good enough to show me over it a year or two ago, I saw Howard's plough worked by three pairs of cattle, and most easily and effectively the sub-soil furrows were turned. So decided an advantage did the natives recognize in the produce of the land thus prepared that they readily gave 60 Rupees per acre rent for it, while other land in the vicinity was fetching only 9 or 10 Rupees. On this question of the comparative advantages of Native and English ploughs, I may add the testimony of Mr. R. W. Lloyd, Superintendent Experimental Farm, Amritsir. In his letter to the *Indian Agriculturist* in last August issue, he writes :—"The English plough does the work in an immeasurably superior manner and at far less cost." Then after a memorandum of comparative cost which fully bears out his latter proposition, Mr. Lloyd adds :—"The outturn from the land worked with the English plough is certainly not less than 15 or 20 per cent. more than that worked entirely on the native system."

Before passing on from the subject of manuring, while advocating the application of green crops on the method above sketched, I would not lose sight of the importance of having a dung-pit constructed in every village on the scientific plan of retaining all the liquid element which contains, in its nitrogen and alkalies, the chief fertilising principles of manure. Thus the pit, while being covered in above, to be protected from the washing in of the rain, should be equally water-tight below. Then a valuable compost might be formed by throwing in all the weeds and refuse vegetable matter of the fields and of the cattle yard, with as much dung as may be scraped up after the cow-dung fuel (*opla*) is made. Add ashes of all sorts; muck or peat, which is decayed vegetable matter in mass, and abounds in phosphates and alkalies; lime where procurable; and above all bones, yielding the phosphate and carbonate of lime. The outskirts of every

village are strewed with bones. These should be collected and burned, as suggested by Mr. C. W. Carnegy, in his letter to the *Pioneer* of August last, when telling us of the caste prejudice he found existing among the people against breaking them up. Another most valuable form in which bones might be added to the manure store is that of superphosphate, produced by the application of sulphuric acid to them.

3rd. Sub-soil drainage, on the principles enunciated and illustrated in a preceding place. On land under canal irrigation, it has been demonstrated to be absolutely indispensable, both in regard to cultivation and sanitation. Irrigation, unaccompanied by sub-soiling, makes the land, as Mr. Mechi well puts it, "like the bottom of a pond and ruins the crop." On the other hand, the necessity for the two operations going hand in hand, on sanitary grounds, has been amply illustrated by the example of Kurnal and other parts of the country, once healthy, rendered deadly by canal irrigation without drainage. In regard to the applicability of the system to the vast area of black cotton soil obtaining throughout Central and parts of Southern India, strong arguments have been adduced in favour of the same, supported by the recorded experiments of Mr. Robertson, of Sydapet, and the opinion with reasons of so eminent an agricultural authority as the late Lord Tweeddale. Besides the advantages indicated of obviating the guttering of the soil into holes during the rains and of its fissuring and hardening into an iron-bound surface in the dry season, sub-soil drainage here would admit of the cotton seed being planted at the beginning of the rains instead of, as now, delayed into some time after the close when the surface ground being dry, the seed can be planted without the risk of being rotted by excessive moisture. Thus a period of four months, and these the best of the year, would be gained in the cultivation of the most valuable staple crop of India. With regard to applying the system to the other land through-

out India generally, I would recommend that the measure should be adopted tentatively. Let two 20 acre plots of every village land be so drained, arable and pasture, and watch results. If found beneficial, as I apprehend it would, equally in improving the quality and increasing the quantity per acre of the plough crops, in obviating the iron-bound surface baking now obtaining in the hot season, and in improving the herbage of the pasture plot, then let the system be generally applied. Since the aggregate cost of the operation throughout India might seem at first view to place this proposal beyond the scope of the practical, I would explain. Take the village as the unit of our calculation. Now, the cost of thorough sub-soil drainage in the United Kingdom is £ 4 (four pounds) per statute acre. By far the largest proportion of this cost is on account of labour, that of piping being comparatively small, even where pipes are used, boulders or rubble being often used as a substitute. Well, if the experimental operation on our village land prove successful, and the cultivators are satisfied of the economic advantages of the new *gim*, there would be no fear, wedded to immemorial custom as they are notwithstanding, about their giving their labour free towards bringing all the village lands under the same favorable conditions, it being every man's personal interest to do so, provided fixity of the Goverment assessment were guaranteed. Thus, as the village unit is of universal application throughout India, the system of sub-soil drainage might be generally introduced throughout the country at comparatively slight public cost at the moment, and none eventually. For the small advances that might be required for the cost of piping wherever pipes were employed, might be made on the same principle as advances are made by the Land Improvement Department in the United Kingdom: that is, by a 6 per cent. charge per annum, whereby both interest and principal are liquidated in 22 years. Where boulders or rubble were used for the drains, no advances whatever would

be required, but the employment of such material for the construction of the drains is open to the objection that they are liable to fill in and so clog the drainage.

4th. Reservoirs for the storage of rainfall, on the plan of construction of those found at the present day in the territories of the Native States—noble monuments at once of the beneficence and munificence of the former rulers of the land. The reservoirs and tanks, on a smaller scale, constructed by my lamented friend, the late Col. Charles Dixon, in the Mairwarra tract, are much on the same plan. Many of them, from the original planning out of the ground to their completion, fell under my observation while Political Assistant in Rajpootana. They are well worthy the attention of every District Officer, and may be studied in Col. Dixon's *Sketch of Mairwarra*, which contains drawings, with details of construction and cost, of most of those works.

5th. Extension of the Indian Railway system, through supplementary feeder lines, to open up remote districts—a suggestion which I submitted in 1854 as a rider to Lord Dalhousie's admirable Railway Minute, which sketched out the main lines as obtaining at the present day. The supplementary lines, however, were not then added to the system. If introduced now, among the measures adopted in the present emergency, they might be constructed on the cheap method I had observed in the United States when travelling on rough timber railways through the primeval forest which rose for hundreds of miles continuously like a wall on both sides. The stations on this far West line were of the most primitive description; a platform for alighting on, covered by a rude shed with a 'liquoring-up' bar, comprising the whole equipment—inexpensive, but answering all needful purpose; our sensible, practical, and go-ahead cousins being far too sagacious to waste money in eyewash—in erecting palatial stations to gild railway Director's prospectuses, or stalling their iron-horse after the fashion of the foolish

Roman Emperor Caligula. Those rough and ready American lines, slow but sure and cheap, suggested the idea to me.

The agricultural principles enunciated in the foregoing pages are the same as those advocated in my published Cotton Treatise of 1865, only extended and illustrated by subsequent study of the high scientific authorities and practical experimentalists, whose words and works are cited above in support of my own views. But no maxims however sound, no examples however confessedly opposite in illustration, can avail to change the inferior empirical character of Indian husbandry unless the same were presented to the native cultivator, and rendered intelligible to his understanding, by a competent authority in direct communication with him. Through one directing and controlling head alone could the several processes above demonstrated as essential to good husbandry, be possibly carried out: the interchange of seed between districts lying far apart,—varying the rotation course at one place with new crops from remote districts under analogous conditions of soil and climate,—green crop manuring with deep-rooted plants to tap the sub-soil,—watching the effects of the experimental sub-soil drainage on the land under the three conditions indicated; *1st*, that under canal irrigation; *2nd*, in the large area of the black cotton soil, and *3rd*, in the alluvial tracts; in order that a decision might be arrived at in regard to the advisability of introducing the system generally throughout India at large, or partially only in particular tracts,—finally and especially would it be the duty of a Director General of Agriculture to collate the reports of agricultural operations from all parts of India, whether from public officers in charge of experimental farms, or of subordinate departments, —Amritsir in Northern India here, Sydapet in Southern India there,—or in communications to the Agricultural and public journals from private planters and others; and to embody and systematise the multifarious facts so acquired in periodical reports for general information. Every other department of

the Government service has an Executive Head, directing its working and responsible for results. For instance, Commissariat, the Commissary General; Public Works, a Member of Council having direct control; Finance the same;, the several branches of the Government Survey—Geodetical, Trigonometrical, and Revenue,—separate Executive Heads with distinctive corresponding appellations; Forests again, the Director-General, &c., &c., the last four, ranged under the Department of *Revenue, Agriculture and Commerce,* as the channel of communication with Government, the office of record, of disbursement, of official notifications, and of all other departmental requirements; Agriculture alone, the most vital of all to the public revenue and to the prosperity of the people from whom it is drawn, having no representative under that overtasked bureau!

In the face of the serious loss of revenue occasioned by the present famine, as testified in Mr. Secretary Bernard's despatch, dated the 20th September last, and other official documents, added to the enormous famine expenditure in recent years, that at present being incurred, and the burthen prospectively saddled on to the country in the shape of a permanent Insurance Fund duly provided for in the annual Budget allotments, it would be sheer trifling to object on the score of economy to any measure calculated to retrieve the agricultural condition of the country to which that burthen is owing. The fatuity of such objection could only be paralleled by that of a general who counted the cost of shot and shell in the presence of a powerful and well-equipped enemy. Let us then face our difficulty, and frankly confess (what the reader has the data before him in the foregoing pages to judge for himself) that the arable surface soil of the country is mostly exhausted. But there is 'balm in Gilead.' For throughout the length and breadth of the land there exists, in the underlying sub-soil, a region of mineral wealth as plant-food, untouched, unturned as yet by the shallow plough of the native cultivator, an unworked mine of inexhaustible resource,

the exploitation of which on an intelligent scientific system alone is required to retrieve the situation. Recurring then to Canning's memorable metaphor—'Let us call a new (subsoil) world into existence to redress the balance of the old!'

Note to page. 175.

The last example I would cite is from the Right Honorable Mr. Longfield's Paper, in the Cobden Club Series on the Tenure of land in Ireland. "The small farmer in Ireland," he writes, "has never sufficiently considered the necessity of keeping up the fertility of the land. Ireland has been mercilessly overcropped. Notwithstanding the increase of pasture since 1848, the land has not yet recovered from the exhaustion caused by the over-tillage of a century." Here we have the clue to the potatoe famine of 1847. The exhausted soil could no longer produce tubers.

Appendix No. 1.

From the Under Secretary to Government of India, Department of Revenue, Agriculture and Commerce, to Colonel E. L. Showers. Dehra Doon, dated, Simla. 26th July. 1875.

FIBRES AND SILKS.

I am directed to acknowledge the receipt of your letter of the 5th ultimo, forwarding a sample of cotton grown in Dehra Doon from selected indigenous seed during the seasons 1874-75, and to forward herewith copies of the reports received from the Bengal and Bombay Chambers of Commerce on the quality of the cotton and its estimated value in Calcutta, Bombay and Liverpool, which appear to the Government of India to be very satisfactory.

From the Secretary, Bengal Chamber of Commerce, Calcutta, 30th June, 1875. *to Assistant Secretary to Government of India, Department of Revenue, Agriculture and Commerce.*

I beg to acknowledge the receipt of your letter No. 198 of the 26th instant, together with a sample of cotton grown in Dehra Doon from selected indigenous seed, and in reply to subjoin for the information of Government the report upon it from Mr. Eisenlohr of Messrs. Ernsthausen and Oesterley.

"Such cotton would just be the thing for our local mills to make them "spin finer yarn and independent of fields of sale like Burmah for their coar- "ser numbers. I describe the cotton as extremely clean and of splendid "color, staple even and strong, of twice the length of usual Bengal sorts. Value "about 9½*d.* to 10*d.* per pound in London, or say from Rs. 26 to 27 per maund here in Calcutta, and Local Mills would buy any quantity at that price.

From the Secretary, Chamber of Commerce, Bombay, 5th July 1875, *to the Secretary to the Government of India, Department of Revenue, Agriculture and Commerce.*

I am directed to acknowledge the receipt of your letter No. $\frac{C}{199}$ dated 26th ultimo of the sample of cotton grown in Dehra Doon from selected indigenous seed, and have now the pleasure to send you the opinion of the Committee of the Chamber upon it.

Staple, strong and even, texture a little rough, color good and clear but slightly yellow. A parcel of any quantity of cotton would probably, if equal to sample, obtain a price fully up to that of the finest description of machine ginned Broach or Hengenghat, but so small a sample is seldom to be depended upon; valuation in Bombay about Rs. 205 per candy of 784 lbs.

Appendix No. II.

From Colonel C. L. Showers, to A. O. Hume, Esquire, C. B., Secretary to Government of India, Department of Revenue, Agriculture and Commerce, dated Dehra Doon, 22nd December, 1875.

Referring to past correspondence on the subject of the produce of my grant in Dehra Doon and especially to your office despatch No. 73 of 26th July, 1875, forwarding me copies of reports received from the Bengal and Bombay Chambers of Commerce on the samples of indigenous cotton submitted with my letter of the 5th June preceding, with the expression of the satisfaction of the Government at the result of my operations, I have now the honor to forward samples of four different sorts of rice grown on my land and noted in the margin.

1. Rutwa (similar to the Nukkee and Sattee of Bengal) market price at Dehra from 35 seers to 1 maund per Rupee.
2. Aujna, same price as above.
3. Aujnee, from 30 to 35 seers.
4. Ramajwain (similar to the Hurser of Bengal) market price from 30 to 35 seers.

2. All four are of the common cheap sorts consumed by the peasantry—have been produced by the ryots on my estate under my general directions as regards method of cultivation, rotations of crops, and the principal of selection, but with their own implements of husbandry, on *unirrigated* land. The specimens gathered at random from the last season's crop, will, I think, be recognised as superior, both in respect of size of ear and fulness and weight of grain, although somewhat reduced from having been lying about some weeks, and the dry grains falling out. The yield per acre on the average 20 maunds, or 1,600 pounds.

3. In view of such results as the produce of careful method of cultivation, it may perhaps occur to Government, confronted from time to time, as at the present moment, with the wide-spread failure of this cheap staple of the people's food, that some means might be devised through your department to introduce practically throughout the rural districts a better system of agriculture, and thus save at once the people from the calamity of these frequently recurring famines, and the Government from the responsibility and loss occasioned by a diminished revenue, and the cost of maintaining a starving population.

Monthly Proceedings of the Society.

Thursday, the 27th January, 1876.

DR. GEORGE KING, *President, in the Chair.*

THE Proceedings of the last Meeting were read and confirmed.

The following Report from the Council was submitted and adopted:—

The Council have now to submit their usual Annual Report for the past year.

The progress of the Society as regards the election of new Members during the year 1875, is greatly in advance of previous years; an accession much needed for the attainment, if practicable, of a number, in excess of the average of previous years, but which it has unfortunately failed to do. Although the number elected and rejoined are 160 (exceeding that of any previous 12 months) against 112, 89, 87, and 133 in four previous years, and although the deductions by declared resignations (52) deaths, (23) are in the aggregate six less than that in 1874; yet the number of names (65) removed from the list at the end of 1875, on account of non-payment of subscriptions for two years and upwards; as also the removal of the names of certain parties (7) who were elected in 1874 and 1875, but have failed to respond to the notices of election (in all 72), coupled with the names of 25 Members who, owing to long absence from India, or not rejoining on return, have also been removed, reduce the paying number to 663 or 12 less than in the year 1874. Of these 663, it may be mentioned, that 59 Members included in the list as resident in the country, have not yet responded to calls for subscription,—thus further reducing the actual paying number of Members to 604. In addition to the above 663 nominal paying Members, the Society comprises 31 life Members, 17 Honorary, Associate and Corresponding, with 116 absent in England, bringing up the total to 827 Members, as specified in the subjoined classified statement:—

[It is not deemed necessary to introduce this statement.]

Among the Members lost by death, the names of the Right Hon'ble Sir Edward Ryan, an Honorary, and Mr. James Cowell, a Corresponding Member, cannot be passed over in silence. Sir Edward Ryan was for several years, and until his retirement from India in 1840, the President of the Society, and in that capacity, and previously as a Vice-President, h. endered valuable service. The Society under his management commenced the career of prosperity, which it has, till recently, maintained. Mr. James Cowell, was a zealous and active working-member during his long residence in this country; he more especially took much interest in those important staples, cotton and fibres, and

was always ready to afford the Society the benefit of his experience in these and other articles. On his return to England he was elected a Corresponding Member, and in that capacity continued his interest in the affairs of the Society, till declining health obliged him to cease his communications.

The Council regret inability to report so satisfactory an improvement in the financial position or prospects of the Society as could be desired, and must hopefully rely on permanent aid, as formerly, from the Government Imperial funds, to secure the stability and proper and effective working of the various objects of the Society.

Included in the amount of ordinary receipts, are three distinct items, *viz.*, interest on vested funds Rs. 180, proceeds of sale of *Araucarias* Rs. 2,042, and proceeds of sale of ornamental shrubs Rs. 1,093-7-6, aggregating Rs. 3,915-7-6, which, being deducted from the legitimate ordinary sources of income, would reduce the amount of receipts to Rs. 31,832, which is below the average ordinary income of the Society for five previous years.

The entire amount of the vested funds of the Society has been sold, and proceeds absorbed in meeting past liabilities. The Society's garden, which had been laid out at some considerable expense, has now been denuded of all its stock of valuable *Araucarias*, (some of them six and seven years old) as also of the greater portion of its stock of well grown and well advanced in size, handsome and attractive ornamental shrubs, the majority of which were reared before the garden was commenced on, while others, introduced and planted in the garden on its first formation, have nearly all been disposed of. The Society cannot therefore expect for some time any further income from these three sources. These extraordinary sales, while they have tended so materially to swell the receipts for the year under review, have been effected at the cost and partial spoliation of the garden, in order to meet pressing demands on the Society.

The amount under the head of subscription is shown to be slightly in advance of previous years. This increase is mainly attributable to the amount realized from new Members on account of admission fees; and, but for this fact, the actual amount of subscription would not have exceeded the ordinary average.

The cost of maintenance of the garden, although greatly reduced, continues a heavy drain on the resources of the Society, absorbing not less than one-third of the annual subscription with, unfortunately, not so proportionate a return as to render the operations of the garden as yet so satisfactory to Members as could be desired.

The Society have to record with thanks the temporary aid kindly afforded by the Government of Bengal by a donation for the year of Rs. 2,400, which amount, together with the sale proceeds of imported *Araucarias* and other ornamental shrubs, as above adverted to, has enabled the Society to defray its old liabilities.

The arrears from Members who have availed of their privileges, is Rs. 1,680-1-7 for balances of subscription and other charges, or say Rs. 290, more than last year. The balances of arrears for four previous years, may be set out as follows :—

	1871,	Rupees	271	5	0	
	1872,	„	89	5	0	
	1873,	„	195	10	9	
	1874,	„	174	4	1	
					730	8 10.
Arrears for	1875	„ ...	...		1,680	1 7
		Total, Rs. ...			2,410	10 5

A large portion of the Rs. 730-8-10 may be looked upon as hopelessly bad, representing, as it does, claims on deceased Members and Members who have left the country, &c.; and will, at the close of another year, be reduced by carrying all such irrecoverable amounts to the debit of profit and loss account.

The Council are of opinion that such results of the working of the Society reflect credit on the executive. Were the entire arrear (Rs. 730) irrecoverable, the loss on each year would not exceed Rs. 180 per annum, and considering the nature of the connection of Members with the Society, and the absence of all coercive measure to enforce payment of subscription, &c., the loss may be considered trifling, arising, as it does, for the most part on account of deaths, leaving the country, and other risks inseparable from all monetary transactions.

In respect to the distribution of plants from the garden, it may be mentioned, by way of record, that 240 applications have been partially met, but not from that number of Members, seeing that several were obliged to apply repeatedly in consequence of the inability of the Gardener to meet their requisitions fully at one time.

From the Gardener's return it would appear that out of 240 applications, 77 were for fruit grafts and 19 for cuttings of ornamental shrubs and rose plants; further that 7,149 ornamental rooted plants have been delivered, including 686 roses, 520 cuttings of ornamental shrubs and 120 of roses, besides 1,858 grafts and seedlings of fruit trees.

To non-members, 1,800 ornamental plants have been sold, and 5,629 to the new Zoological Garden.

The Council desire to record their obligations to several Members for contributions of plants and seeds, including, among others, Mr. H. A. Firth for a valuable collection of *Araucarias*. Messrs. C. K. Hudson and L. Johnson for Orchids; Dr. T. Beaumont for bulbs and tubers of rare plants; Dr. Geo. King for seeds; and to the Superintendents of the Hong-Kong and Mauritius

Government Gardens for plants, and to the Queensland Acclimatisation Society for seeds.

Several subjects of interest and usefulness have come before the Society during the past 12 months, including communications on the disease of the cultivated (mulberry) silk-worm in Bengal; on the tussar silk-worm; tobacco culture with reports on specimens; the culture of mahogany and coffee, including the Liberian variety; reports on trial of the Cuzco maize in various parts of the country; introduction of certain varieties of potatos, &c. Notices on all these having appeared in the monthly proceedings need not be further dwelt on in this Report.

Another number of the Journal has been published, Part I. of Vol. V. Part II. is now in the Press.

It will be observed from the foregoing remarks how needful it is for the future stability of the Society, and to enable the Council to carry out its operations on a more extended scale, than recently, that a larger annual amount should be placed at their disposal. The Council, therefore, at the commencement of another year, seek the active co-operation of the Members to aid them in extending the usefulness of the Society. An Indian community has always been a fluctuating one, and never more so than, for obvious reasons, at the present time; and, consequently, a considerable addition is annually needed to fill up vacancies. With such object in view, the Council, in conclusion, conceive they are not preferring an unreasonable request in asking each Member during the year to place at least one of his friends on the list of subscribers.

The election of Officers and Council was next entered on with the following result:—

President.—The Hon'ble Louis L. Jackson.

Vice-Presidents.—The Hon'ble Sir Richard Garth, Baboo Protapa Chundra Ghose, Dr. George King, and Mr. S. H. Robinson.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. R. Blechynden, Mr. W. Swinhoe, Baboo Peary Chand Mittra, Mr. E. Broughton, Baboo Gonendro Nath Tagore, Mr. J. Martin, Mr. J. W. O'Keefe, Mr. W. H. Cogswell, Rajah Suttyanund Ghosal Bahadoor, Dr. S. Lynch, Mr. H. J. Leitch, and Mr. G. L. Kemp.

The following names were added to the Standing Committees which required strengthening:—

Grain.—Mr. W. H. Cogswell. *Garden.*—Dr. Lynch and Rajah Suttyanund Ghosal. *House.*—Mr. R. Blechynden. *Finance.*—Mr. S. H. Robinson.

Chowdry Zalim Singh and Mr. W. A. Pryce were elected Members.

The following candidates were proposed for election:—

Henry James Sparks, Esq., C. S., Lucknow,—proposed by Captain A. E. Wilkinson, seconded by Lt.-Col. E. G. Clarke.

Head Gardener of the Ram Nawas, Jeypore,—proposed by the Secretary, seconded by Dr. King.

Manager of Boroomcherra Tea Garden, Cachar,—proposed by Mr. T. M. Gibbon, seconded by the Secretary.

His Highness the Maharajah of Puttiala,—proposed by Mr. F. Jennings, seconded by Dr. King.

John Laruleta, Esq., Rampoora Factory, *vid* Jeagunge,—proposed by the Secretary, seconded by Dr. King.

G. Hayes, Esq., Zemindar, Purneah,—proposed by Mr. Edward Dubois de Saran, seconded by the Secretary.

Rejoined.—C. W. Wilmot, Esq., Assistant Commissioner, Santhal Pergunnahs.

CONTRIBUTIONS.

1. The Annual Report of the Smithsonian Institution for 1873. From the Institution.

2. Monthly Reports of the Department of Agriculture of the United States for 1874. From the Department.

3. Annual Report for 1873 of the Ohio State Board of Agriculture. From the Board.

4. Memoirs of the Boston Society of Natural History, Vol. 2, Part 3, Nos. 3, 4 and 5, and Vol. 2, Part 4, No. 1. Proceedings of the Society from January to October 1874. From the Society.

5. Report of the Committee of the Bengal Chamber of Commerce, from May to October 1875. From the Chamber.

6. Journal of the Asiatic Society of Bengal, Part 2, No. 3 for 1875. From the Society.

7. Memoirs of the Imperial Botanic Garden of St. Petersburgh, Vol. 3. From the Director.

8. A pamphlet and other papers on the Tussur silk-worm, by Captain Consemaker. From the Author.

9. On the cultivation of Vanilla in India: by J. E. O'Connor, (revised edition) two copies from the Department of Agriculture, and one from the Government of Bengal.

10. A small collection of Orchids from the Khassea Hills. From H. L. Johnson, Esq.

11. Two baskets of Orchids from Assam. From Captain W. J. Williamson.

12. A quantity of Coffee seed from Chota Nagpore. From the Rev. A Herzoy.

13. A quantity of Coffee seed from Mysore. From A. Mockett, Esq.

14. Some acclimatized Cuzco maize. From Colonel T. H. Chamberlain and Lieutenant J. F. Pogson.

Some seed recently gathered from the fine capsicums, presented at the last Meeting by Mr. Whitty, was placed on the table.

GARDEN.

The Gardener's monthly Report was submitted. Mr. Head notifies that the garden has been now quite cleaned up; and a large quantity of manure collected; (for which he is principally indebted to the Hon'ble E. G. Birch and Mr. Sterndale) all the mango trees have been well manured; all blanks in the orchard filled, and some new kinds of mango planted out. A good number of mango grafts have been made last year, as also peaches. The Gardener gives the report on three cases of rare plants recently received from Messrs. Veitch, which is, altogether, not so satisfactory as could be desired. He also furnishes a list of roses now available, as also those that will be ready for distribution in the rainy season, and sends specimens of vegetables for exhibition treated with guano and other manures, and some unmanured. Mr. Head sends a plant of *Aphelandra Roezlii* in flower which was received from Messrs. Veitch in May 1874, and was for a long time almost dead. He hopes to be able to propagate it this year.

CUZCO MAIZE.

Submitted the following letters in continuation of those from the same gentlemen, read at the last meeting :—

Colonel T. H. Chamberlain, Cantonment Magistrate, Ranikhet, 10th January, 1876.—"A few days ago I posted to your address a parcel 'prepaid' containing four 'average' specimens of the Cuzco maize grown here by me.

"Unfortunately they were *not* the best, for the rats had clambered up the stems of the plants and selected the largest heads for their depredations. I shall repeat the experiment this year on better soil; and with more carefully prepared beds, so as, if possible, to produce better in every way. I send you in a bag some loose seeds taken off much smaller cones, which seem to have attained finer growth in smaller heads than they do with those like I sent you.

"I shall be glad to know what your committee of arbitrators say to these; and whether there is much, and if so what, difference as to quality compared with what Lieutenant Pogson was to send from Simla.

"I shall this year distribute seeds of both kinds to some of the cultivators in the neighbouring vallies and table lands, round me, to see what they can do with them. I think they should do well, for the Kumaon farmers are generous in manuring their lands, and I will give those who try these full instructions, as I am anxious to see them get into the market, assured they will answer.

"If you care to have more of the seed pray let me know, I will reserve some for you, as perhaps you would like to experimentalize with this partly acclimatised seed. It strikes me that Mount Aboo, Puchmurree, Ootacamund, and the Kangra Valley would be good places to try them at.

"I will send Mr. Halsey some of these to try. I noticed the same thing he

remarked about the flower and the roots of these plants. I rectified both, cutting the cane to help it, and earthing up round the rooty portion of the stem to prevent the monsoon and winds throwing them down."

Lieutenant J. F. Pogson, Simla, 18th December, 1875.—On the 16th instant, I despatched to your address, a small dâk bangy parcel, containing—

"1*st*.—An entire cob of Cuzco maize.

"2*nd*.—Seven small envelopes, each containing twelve Cuzco maize seeds, of which twelve weigh ten grains; 12 eleven grains; 12 thirteen grains; 12 fourteen grains, and 12 fifteen grains. These six are the produce of two small sized cobs matured on one plant. The seventh envelope contains 12 seeds taken from two cobs borne on one plant. They are striped and heart shaped. The eighth envelope contains local maize seed sent for comparison.

"In reference to the maize seed the increase in weight of the seed is very remarkable.

"You sent me 100 seeds; of these—one weighed six grains; one under six grains but over five and four weighed five grains each. The remainder 94 weighed under five grains, and over four; none were less than four grains in weight.

"I have now some very fine cobs not yet ripe, and as they promise to yield monster seed the heaviest seeds sent may be thrown into the shade.

"We have had one fall of snow on the 4th and several sharp frosty nights. But the Cuzco maize seems to defy frost and snow. I have yet to find out how to shorten the period of arrival at maturity, for unless the maize can be trained to ripen by the end of October, it will obstruct the sowing of the wheat and winter crops; such as *grain*, which is not affected by snow or the severest frost. In due time a full report of the acclimatization and present experimental cultivation of the Cuzco maize will be submitted for consideration."

In a subsequent letter of 22nd January, Lieutenant Pogson adds as follows:—

"On the 19th instant I had the pleasure to receive your letter and also the parcel of seeds from Sylhet, and for which I am very much obliged, and hope in due time to astonish Simla, with the 24 inch sword beans. The new kind sent will have my best attention. I hope my letter descriptive of the various parcels of Cuzco maize duly reached you. On the 6th January I gathered all the cobs; but until they are thoroughly dry my further investigations will have to be postponed; judging from size of seed I think they must be heavier than those already sent you: what surprises me is, the small size of the cone on which the grains are developed. I can let you have 100 more seed if you want them. The Revd. Mr. Rebst, of Kotegurh, intends trying the maize as soon as he returns.

"It will no doubt interest the Society to know that the stalk of the Cuzco maize is exceedingly rich in sweet juice, which in the plants which have not borne cobs, is as sweet, and as abundant as in the best sugar-cane; and the odd part of the affair is the aroma of the juice, and cut stalk, is just the same as the

aroma of the sugar-cane. In fact it was this aroma which led to this discovery, and if I am not very much mistaken will lead to further discoveries. I think it is quite possible that if the second or third set of "*adventitious roots*"* were bled, or tupped at or after sunset, and an earthen pot placed under (toddy pot fashion) that, by next morning, a good supply of sweet juice would be the result. I have kept all the stalks, and as the saccharine matter must still be present in the dry cellular tissues, it might be feasible for your chemist, Dr. Waldie, to determine the quantity of sugar present. If this can be done I will cut up the stalks into suitable lengths, sew them up in gunny and send them to you for chemical analysis. I have allowed 16 plants to remain where grown, under the impression that fresh stalks may be thrown up from the true roots which are not dead, otherwise the standing stalks would not be green for several feet of their height.

"I may here mention, that I peeled, cut up into morsels and ate, or chewed some three feet of Cuzco maize stalks, and being a good judge of sugar-cane the comparison made by me may be fully relied upon.

"If it can be managed, I would wish some member of the A. & H. Society, who is a sugar planter, to grow the Cuzco maize, (I will supply seed and instructions) for the express purpose of making sugar. In this experiment the male flowers should be removed, so that all the carbon taken up by the cob and seed may remain in the sweet juice."

In connection with the above, the following letter, dated 24th December, from the Superintendent Central Prison, Lucknow, was likewise submitted:—

"A small packet of seed was given to me by the Inspector General of Prisons. It was sown early in the rains on rich soil—soil which had been trenched for latrine refuse. All the seed germinated, the plants grew to a height of 7′ or 8′., cobs formed in nearly all of them, but the rains injured the plants, they rotted a few inches above the ground though the latter was well drained. The plants which survived the rains did not thrive; the whole produce proved abortive as if the seeds had not been fertilized. I have preserved only one good cob There are two or three yet on the plants, but it is doubtful if they will come to perfection. The stalks of the plants are very succulent and would prove excellent food for cattle. The seeds preserved shall be tried next year."

Note.—The seeds furnished by Colonel Chamberlain and Lieutenant Pogson are about equal in size, though the former appear to be in rather better condition. They are considerably larger than American maize. The cobs in both cases are small as compared to the North American kinds of maize; but whether they are naturally small or whether they have deteriorated from those raised in their own country, we have no means of judging, as the seed from which this produce has been raised, was sent to the Society in a shelled state. It would be interesting to learn whether each stalk of this maize yields in cuzco more than two cobs. The varieties raised in the United States give only two as

* I have plants with five such sets, 3 and 4 are common.

a rule, whereas our country maize yields three and sometimes four cobs. Col. Chamberlains' best cobs, as he states, were devoured by rats, so that those sent by him are not the largest.

Treatment of the Tea plant with Guano.

Messrs. Ede and Hobson, Agents for Messrs. Ohlendorff, submitted for the information of the Society, in continuation of a previous communication the following report from the Manager of the Ramgurh Tea Estate, at Hazareebaugh on the result of an experiment made with dissolved Peruvian Government guano:—

"With reference to the three barrels of Peruvian, Guano we received from Messrs. Ede and Hobson for trial as a manure on the tea-plant, I beg to say that the result of applying it has been very satisfactory. I think I may safely, from the observation of the actual yield of the plant thus treated, state the increase to be at least 200 lbs. of green leaf, or 50lbs. of tea per acre; as compared to other manure or fairly treated cultivation; but its use and continuance will depend a good deal on the price of the article. Six such barrels as you sent me would suffice for one full acre (2,500 plants.) * * * * *

"The cost of appliance is very small, and if carried out just a little before the actual rains set in, the result tells at once."

Tea drying by Patent Process.

Submitted the following letter, dated 13th December, from Surgeon Major J. B. Brown, Medical Store-keeper, Allahabad, on the above subject:—

"With reference to a leading article in the issue of the *Englishman* of Saturday the 11th current, respecting the want of Tea planters in Assam and Cachar of means for drying their tea, I shall feel obliged, by your informing me how I can obtain particulars of their requirements. I have patented a plan by which water is heated with great economy of fuel, the heat being retained for a very long time; the proportion is about 1 seer of wood for 40 seers of water, which will keep the water up to 120° Farenheit for 5 hours consecutively. If a little more wood is used the heat is not only greater, but can be retained for longer periods. It would be easy to heat large slabs of metal and retain it to any given temperature for a great many hours. The larger the operation the more perfect the contrivance would be. I would propose to have slabs of metal at the upper part of the boiler so that they might be in free contact with it.

"By drying any material on a surface thus heated by water there is no danger of burning or scorching. This is not on the American stove principle, burns wood principally, but can consume other fuel too. After the first expense of putting up, the cost for fuel would be nominal, and made of moderately thick sheet iron, 3-18th of an inch would last as long as any other boiler. I shall be happy to afford every explanation. I have a water heater now working at my house, and shall be happy to show it to any one who wishes to see it."

Letters were read:—

From the Secretary to the Government of India, Department of Agriculture, in reply to reference on the subject of Tussur silk, in connection with Mr. Lotteri's application for Government aid. Mr. Hume observes, "that the whole question of the development of the tussur silk trade has been fully considered by the Government of India, and dealt with in a resolution recorded in this Department on the 23rd November, 1875, a copy of which is herewith forwarded for the information of the Society."

"From this Resolution it will be seen that the efforts of Government are at present confined to experiments, the object of which is to ascertain whether a large and constant supply of cocoons can be easily obtained for the market at rates which will render subsequent operations remunerative to persons who may be disposed to enter on the business. It is not probable that the State will itself enter on manufacturing operations which can generally be most advantageously left to private capital and enterprise. In any case there is no present intention of establishing a Filature, and no opening for the employment of Mr. Lotteri."

From Messrs. W. Moran & Co., forwarding the skin of a rat said to be very destructive to young tea plants, with extract of a letter regarding it from the Manager of their Khoreel garden in Cachar.

"I send the skin of an animal called by the natives 'Jungly Chooa,' they are very destructive in gnawing off young tea plants, level to the ground and eating the roots, they burrow in the ground after the character of the mole. The coolies have a very ingenious mode of catching them; when finding their runs, ignite some material in a gurrah that will cause great smoke, place and hermetically seal round the mouth of the gurrah next the run, then from the bulge part of the gurrah make a small hole, insert a bamboo and blow the smoke into their runs at several places; this will drive them out of their nests stifled and readily caught."

Dr. Lynch exhibited several exceedingly well grown turnips and lettuce raised in his garden in poor sandy soil. He mentioned that the earth had been turned over, a trench made, into which was deposited some leaf mould and urine, the earth then replaced and ridged up, on which the seeds were sown; and that beyond watering the plants they had had no other care.

Dr. Lynch unfortunately cannot give the names of the varieties, as his gardener either destroyed or misplaced the labels, indicating the varieties and names of seeds-men. These turnips vary in weight from 2¼ lbs. up to 5¼ lbs., and are of delicate flavour.

Mr. Cogswell exhibited a fine three years old plant, in full flower, of *Euphorbia jacquiniflora* raised from a cutting.

Thursday, the 24th February, 1876.

THE HON'BLE LOUIS S. JACKSON, *President, in the Chair.*

The proceedings of the Annual General Meeting were read and confirmed.

The following gentlemen were elected members :—

Messrs. H. J. Sparks, C. S., John Laruleta, and G. Hayes; Head Gardener of the Ram Nawas, Jeypore; Manager of the Boroomcherra Tea Garden, Cachar, and His Highness the Maharajah of Puttiala, K. C. S. I.

The Hon'ble Sir A. J. Arbuthnot, K. C. S. I., was proposed as a member by Lieut.-Coll. W. M. Lees, seconded by Coll. C. H. Dickens, C. S. I.

CONTRIBUTIONS.

1. Memoirs of the Geological Survey of India; *Palæontologia Indica.* Vol. 1, 4 and Vol. XI. Part 2. From the Superintendent.

2. Report on the Administration of Bengal, 1874-75. From the Government of Bengal.

3. Reports (3 vols.) of the Secretary of the Department of Agriculture, Victoria, for 1873-74 and 75. From the Secretary.

4. The "Indian Forester," Vol. I., Nos. 1 and 3. From the Editor.

5. Journal of the Asiatic Society of Bengal, Part 1, No. 4 for 1875, and proceedings for December 1875. From the Society.

6. Journal of the Bombay Branch of the Royal Asiatic Society, No. 31, Vol. XI. From the Society.

7. Transactions of the Asiatic Society of Japan, Vol. III., Part 2. From the Society.

8. A further quantity of acclimatized Cuzco maize raised at *Rannikhet.* From Coll. T. H. Chamberlain.

This seed is fully equal in size to original stock, and is available for general distribution.

9. Three kinds of melon seeds, the Cabul sweet, the Cabul Surdah, and the Peshawur sweet melon. From Mr. R. Nicholson. Mr. Nicholson has received these from Captain Birch, 27th P. N. I., at Nowshera. The Surdah is described as "something between a sweet and water-melon, juicy and well flavoured."

10. Two plants of the cannon ball tree, *Couroupita Guianensis*, and 2 Chusan palms. From Mr. H. A. Firth.

11. 75 Palms of several kinds, 120 other plants of sorts, and a collection of seeds of Himalayan *Coniferæ.* From Dr. George King.

12. 19 Plantain shoots of the Martaban kind, from the Andamans. From Mr. O. H. Brookes.

13. A small collection of Orchids from Upper Assam. From Mr. C. J. Simons.

Mr. John Martin exhibited 3 hyacinths in excellent flower, named Leonidas, Bouquet tendre and Queen Victoria Alexandra.

Mr. S. Collins shewed some cut specimens, very prettily marked, of Verbenas; and a healthy plant, in flower, of *Clianthus Dampieri.*

Mr. Thomas Hindmarsh submitted some fine heads of celery, each weighing from 3½ to 4 lbs., raised in his garden at Kancharapara, E. B. Railway.

Dr. Lynch exhibited some unusually large specimens of nole-kole, and beet, raised under the same treatment, as were the turnips and lettuces submitted at the last meeting.

Captain Protheroe, Deputy Superintendent, Port Blair, submitted a few pods of a Vanilla, collected in the jungles there, where a variety of the plant grows wild, and requested an opinion, if any, on its value. Captain Protheroe observes—"this variety is not the *Vanilla aromatica*, but the pods may be of value for dye, and as the plant grows luxuriantly in these jungles, there would be no difficulty in extending its cultivation."

The Secretary reported that the Manager of the Great Eastern Hotel Company had obligingly tested these pods as an ice-flavorer, but had found it destitute of any aroma. He had requested Captain Protheroe to send plants to ascertain the variety, and whether it could be improved by careful cultivation.

Tea Blight.

The Secretary read extract of a letter recently received from Mr. Grote in reference to the specimens of diseased tea leaves, submitted by Mr. James Dallas, of the Blanerne Tea Factory, Cachar, and alluded to in the Proceedings of September last:—

"The specimens of diseased jungle leaf forwarded in your letter of 1st October, came to hand in a very bruised condition. I laid them, however, before our Scientific Committee last week, and Dr. Berkeley has taken them home with him. The blotches on the leaves are apparently fungoid; but one leaf has been ruined as he thinks by a beetle. Try and get your planter friend to send you a few further leaves, (whether of tea or jungle plants) showing similar marks of injury. We should prefer having them in spirits, but if the leaves are dried under pressure before despatch they will not rot in the letter as these have done."

Wax-yielding Insect from Chota Nagpore.

Read the following letter from Mr. F. Moore of the Indian Museum, regarding specimens of the wax-insect which were submitted by Mr. T. F. Peppè and alluded to in the Proceedings of March 1875:—

"The wax-insect referred to in your recent Reports as having been forwarded from Chota Nagpore by Mr. F. Peppè, and of which you kindly transmitted specimens for examination, is doubtless the same as that observed in Madras by the late Dr. J. Anderson. In the 'Philosophical Transactions of the Royal Society for 1794, pp. 383 to 401, Dr. Pearson has given an elaborate account of an analysis he made of the wax produced by this insect. Its occurrence in the Chota Nagpore District is an interesting discovery, and if collected in large quantities in the same manner as is done with stick lac, the wax obtained from it would prove a useful and profitable article of commerce. The insect, of which the wax-covered female only is known at present, is named *Ceroplastes cerijerus*,

and is allied to the *Pela* of the Chinese, who have long made use of it for commercial purposes, and propagate it in much the same manner as is done in certain parts of India and Burmah with the lac insect. The wax of the *Pela* is there a considerable article of trade; in 1869 its re-export from Hankow to Shanghai and lower ports which pass through the Custom House, was estimated to be 4,000 piculs per annum. The price in Chungking was quoted in that year at 110 taels per 100 catties, and in the year before it was as high as 170 taels. The Chinese make use of the wax for the manufacture of the large candles which are burnt in the Buddhistic shrines. Of the sample of Mr. Peppé's insect wax which you recently forwarded to Dr. Forbes Watson, the accompanying analysis has been made.

Analysis of Insect-wax from Ranchee, Chota Nagpore.—"Of a dull opaque pale brown colour. The outer shell, darker and somewhat translucent. Moderately hard and brittle. Of somewhat pleasant smell.

"On crushing in a mortar, minute drops of water made their appearance. On heating, it spluttered much owing to the disengagement of steam. At 55°C (131°F) it melted to a clear liquid with a slight flaky deposit.

"O. 5868 grm. burnt left an unweighable trace of ash.

"Absolute alcohol dissolves 34 per cent. Boiling absolute alcohol leaves 1·02 per cent. of the wax undissolved.

"Therefore we conclude that all is soluble in boiling alcohol, except 1·02 per cent. As regards alcohol, therefore, the wax behaves as follows:—

Soluble in cold alcohol	34·00
Soluble in boiling alcohol	64·98
Insoluble in alcohol	1·02
	100·00

"In Bengal, the wax is very easily soluble, with the exception of a little brownish matter.

"In either, it dissolves freely, but not entirely. In essence of turpentine it is very sparingly soluble. Carbonic sulphide also dissolves it only partially.

"It was impossible to obtain two specimens of the wax, such as would yield quantities of moisture that agree analytically. In one specimen I found 13·16 per cent., and in another 11·02 per cent. of water. We have only to look at the sample carefully to see how much more water there is in some parts than in others.

Sp. gr. of the wax 1·04

"Organic analysis gave the following results:—

	I	II
Carbon	78·57	78·79
Hydrogen	13·46	13·08
Oxygen	7·97	8·13
	100·00	100·00

"A compound having the composition C. H. O. would consist of

13 26.

Carbon	...	78·79
Hydrogen	...	13·13
Oxygen	...	8·08
		100·00

"Comparing this analysis with my analysis No. II. the correspondence I considered sufficiently close to justify the conclusion that this wax is a compound of 13 atoms of carbon, 26 atoms of hydrogen, and 1 atom of oxygen."

Thursday, the 23rd March, 1876.

THE HONB'LE LOUIS S. JACKSON, *President, in the Chair.*

The proceedings of the last Monthly Meeting were read and confirmed.

The Hon'ble Sir A. J. Arbuthnot, K. C. S. I., was elected a Member.

The names of the following gentlemen were submitted as candidates for election :—

Baboo Surba Nundo Roy, Inspector of Police,—proposed by Mr. John Lynam, seconded by the Secretary.

Mr. R. A. Manuel, Rangoon,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Mr. W. H. Newson, Calcutta,—proposed by Mr. W. H. Jones, seconded by the Secretary.

Manager Margaret Hope Tea Plantation, Darjeeling,—proposed by the Hon'ble H. H. Sutherland, seconded by Mr. W. H. Cogswell.

Manager Terimarmah Tea Plantation, Darjeeling,—proposed by Mr. Sutherland, seconded by Mr. Cogswell.

Secretary of the Wheler Club, Meerut,—proposed by Colonel C. Reay, seconded by the Secretary.

Mr. W. M. Benwell, Calcutta,—proposed by Dr. G. King, seconded by Mr. R. Blechynden.

Baboo Runglall Sing, Baugulpore,—proposed by Mr. J. DaCosta, seconded by the Secretary.

Mr. John Hay, Merchant, Calcutta,—proposed by Mr. H. J. Leitch, seconded by Mr. G. L. Kemp.

Mr. W. G. Allen, Asst. Conservator of Forests, Mudhopore, Punjab,—proposed by Mr. F. Halsey, seconded by the Secretary.

Dr. R. A. K. Holmes, Supdt. Central Prison, Meerut,—proposed by Mr. R. H. Smith, seconded by Mr. G. Billings.

CONTRIBUTIONS.

1. Journal of the Royal Asiatic Society, Vol. 8, Part 1. From the Society.

2. Transactions of the Royal Society of Arts and Sciences of Mauritius, Vol. 8, N. S. From the Society.

3. Preliminary Forest Report of Pegu; by S. Kurz. From the Government of India, Department of Agriculture, &c.

4. Economic Products of the N. W. P., Part 1, Gums and Gum-resins. From E. T. Atkinson, Esq.

5. Du Breuils Cours elementaire, theoretique et pratique, d'arboriculture; and Le Bon Jardiniere for 1869, Parts 1 and 2. From Dr. Tonnerre.

6. A collection of seeds from Queensland. From L. A. Bernays, Esq., V. P., Acclimatisation Society of Queensland.

7. A varied collection of Palms and other plants for the garden. From Dr. King.

GARDEN.

The Gardener's report was submitted, of which the following are extracts :—

"Propagating of all the most desirable and new plants is being proceeded with in the propagating house. With the aid of the bottom heat arrangement, I have been able to heat the propagating bed 15° to 20° above the bed on the cool side of the house, and to gain from 10 to 12 days on cuttings of some kinds put in as an experiment at the same time on each side of the house. Some of the new plants have already given several cuttings which have been rooted; and others again have given a cutting. Only a few have, however, done this. I hope to get some of them ready for partial distribution next rains or perhaps September.

"I have propagated a few roses by the aid of bottom heat from wood of last year's growth. I am contemplating an experiment with current year's growth.

"The grafts made late last year on Edouard have done tolerably well; there are a few trees of nearly all the kinds, that were sufficiently strong for grafting, in stock; now there is not, however, a large stock, except of a very few strong growing kinds."

The coffee seeds presented by the Revd. Mr. Herzoy of Ranchee and Mr. Mockett of Mysore, have germinated readily.

In connection with the above, two reports from the Garden Committee were also submitted, entering into various details and suggesting that with reference to the limited number of ornamental plants now in stock, the sale to the public of these be temporarily suspended. The sale of fruit grafts, however, to be continued as heretofore. The reports were adopted.

PROVISION FOR IMPORTED SEEDS FOR 1876.

A report from a Special Committee of the Council on the above subject was submitted. The Committee recommend that the supply of vegetable seeds from America be divided between Messrs. Landreth and Son and Mr. Buist of Philadelphia, whose trial assortment of last year has proved so satisfactory; that a

consignment of flower seeds be ordered from Messrs. Landreth; and the full supply of vegetable and flower seeds from Messrs. Vilmorin, Andrieux & Co., of Paris. The supply last year of seeds (vegetable and flower) from Messrs. Haage and Schmidt of Erfurt, have unfortunately not proved so satisfactory as was anticipated judging from their trial assortment of 1874, which was unexceptionally good. The report was adopted.

CUZCO MAIZE.

Read letters of 1st and 17th March from Lieut. J. F. Pogson, giving further particulars regarding his plantation of Cuzco maize, of which the following are extracts:—

"In reply to your last letter I have been examining the cut Cuzco maize stalks stored by me in winter, and find the pith has in drying contracted very considerably leaving the centre hollow, and adhering to the sides, resembling, when cut, a joint of one inch in diameter bamboo, with a softish inside; the adherent pith smells strongly of sugar-cane, and has a decided saccharine taste. Under these conditions, it would be incurring needless expense, subjecting the dried stalks to analysis for sugar, inasmuch as there is no doubt whatever on that point; and the richness in sugar can only be determined by operating on the fresh juice. My idea is that all experiments on the Cuzco maize should be devoted to its capabilities as a sugar-yielding plant as contradistinguished from a food grain producer. Therefore to throw all the sweet juices into the stalk, the cobs, as soon as formed, should be cut off, or wrenched off. The quantity of carbon contained in the numerous envelopes which cover the grain spike, is very considerable, and if by removal, at an early stage of growth, the carbon is economised, increase of sweet juice should be the result.

"This morning I pulled up one of four Cuzco maize plants which were left *in situ*, to enable me to ascertain whether new shoots would be thrown out by the old roots. On examination I found that whilst the old roots springing from the first joint, were partly alive and partly decayed, the second joint was alive and sound, and of the thirteen adventitious roots thrown out by this joint three were alive, as well as the rootlets connected with them; the other ten were decayed. Hence our use of these first set of adventitious roots has been traced, and if sprouts appear as the season advances, the Cuzco will very much resemble the sugar-cane. I have sent Carter & Co. of London one hundred seeds, each weighing ten grains, with instructions as to culture, and to determine its value as a British sugar-yielding plant. I think it will answer as such, and be found far more remunerative than the sugar beet.

"I have had several applications for Cuzco maize seed to grow on trial as a sugar producer, so this idea is now fairly taken up.

"By yesterday's post I sent you 107 seeds of Cuzco maize, 50 seeds of nine grains each in one parcel, and two smaller parcels containing seeds taken off the third and fourth row of a single cob of Cuzco maize, which bore eight rows of

grain. This particular plant was manured with mineral manure applied in smaller quantity, and when the plant was five feet in height, an opening was made at the roots, and some fresh fowl's dung, a lump of the size of an unskinned walnut was placed therein and earthed up. This cob was very imposing to look at, on the plant, and I expected that a good many seed (from outward appearance) would have exceeded 15 grains in weight. However, on weighing seed by seed, belonging to each row, only one seed of fourteen grains was found, being the fourth seed on the fourth row counting from the base to the apex.

"The cob produced 212 seeds, of which two seeds only weighed seven grains each. On the sixth row the third seed got compressed between a 12 grain seed and a 10½ grain seed, and it weighed 5½ grains. The third seed, on each of the rows from one to eight weighed as follows:—

No. of Row	3.					6.	7.	8.
Weight of 1st seed / Seed in grains	11½·	11·	12·	11½·	11½·	12·	10·	10·
The 3rd seed	12·	12·	12½·	12½·	11½·	5½·	11½·	13·
The 6th seed	9.	13·	13½·	12·	10½·	11·	9·	11·
The 9th seed	10½·	12½·	11½·	11½·	11·	10·	11·	10·
The 12th seed	11·	11½·	12·	12·	10·	10½·	10½.	9½
The 15th seed	10·	10½·	11·	10·	10½·	10·	10½·	10·
The 18th seed	9½·	11·	11·	9½·	8½·	9½·	9½·	7·
The 21st seed	10·	9·	10·	10½·	9·	8½·	9½·	9½·
The 23rd seed	9·	10·	10·	8·	8·	8·	9½·	9½·
The 24th seed	9·	9½·	9½·	9·	7·	Nil·	9½·	9.
The 27th seed	8·	8·	8·	7·	0·	0·	0·	9·
The 30th seed	0·	0·	7½·	0·	0·	0·	0·	0·

"This table is very curious, as the change in grain developement commences with the 24th seed, one to twenty-three being perfect. You will see that the compressed seed being excepted, 7 grains is the weight of the lightest seed, and as original stock weighed only *four* grains, the increase is considerable, whilst, with all the others, it is very remarkable, showing that the Cuzco maize under proper culture will thrive in the Himalayas, and as a sequiter in England. I have kept a dozen 15 grain seeds for experimental sowing; also 14 & 13, and it will be interesting to see if the 15 grain limit will be passed. The plant whose seeds are sent bore three other cobs, of which two were blind, and the third though of good size, bore only 12 seed, developed here and there on the spike. The 4th cob and highest on the plant was perfect.

"I enclose a letter from Mr. Macgregor, and you will find a parcel of 75 seeds addressed to him. If you would give Mr. Macgregor some of Col. T. H. Chamberlain's seed, his experiment would be made on a large scale; only ask him to

sow Chamberlain's seed separately from mine so that degeneration or otherwise of both may be noted."

The following is Mr. Macgregor's letter referred to by Mr. Pogson:—

"I read with much interest your letters of the 18th December and 22nd January to the Agricultural and Horticultural Society of India, on the subject of Cuzco maize, relative to its sugar producing qualities.

"Having a large experience in sugar growing in several of the best sugar-producing countries, namely, Java and the Spanish Phillipine Islands, and as I am about trying it on a large scale here, as the soil and the climate seem to be particularly adapted for it, therefore from the foregoing you may note the interest I would take in the success of the Cuzco maize being profitably sugar-producing, and would feel obliged if you would forward me a few seeds per baughy post "bearing" to experiment upon, and in return I will give you a full report of the success or non-success thereof."

The Secretary mentioned that he had sent Mr. Macgregor some of Colonel Chamberlain's seed, and requested him to favor the Society with the result of his experiments.

A letter was read from Captain Coussmaker, enclosing copies of further circulars in connection with his experiments on the rearing of the Tussur silk-worm.

Mr. C. E. Price submitted a well-grown plant in flower of *Cyclamen Persicum*. The bulb was planted towards the end of January, and the first flower opened on the 16th March.

Thursday, the 20th April, 1876.

THE HON'BLE LOUIS S. JACKSON, *President, in the Chair.*

The proceedings of the last Monthly Meeting were read and confirmed.

The following gentlemen were elected Members:—

Baboo Surja Nundo Roy; Managers, Margaret Hope Tea Plantation, Darjeeling, and Terramarmah Tea Plantation, Darjeeling; Secretary of the Wheler Club, Meerut; Messrs. R. A. Manuel, W. H. Newson, John Hay, W. G. Allen, W. H. Benwell, Baboo Runglall Sing, and Dr. R. A. K. Holmes.

The names of the following gentlemen were submitted as candidates for election:—

Col. F. C. Anderson, Deputy Superintendent Revenue Survey, Banda,—proposed by Mr. G. E. W. Knox, C. S., seconded by Mr. S. H. Robinson.

Stanley Llewhellin, Esq., Chitwarra Factory, Mozufferpore,—proposed by Mr. H. T. Creswell, seconded by Mr. W. H. Cogswell.

Cantonment Magistrate, Lucknow,—proposed by Major A. E. Wilkinson, seconded by Mr. H. J. Sparks, C. S.

Johari Mull, Zemindar, Mahomedpore, Bijuore,—proposed by Mr. A. Boulderson, C. S., seconded by the Secretary.

H. B. Beckett, Esq., Deputy Commissioner, Edwardsabad, *vid* Bunnoo,—proposed by Dr. Geo. King, seconded by Mr. W. H. Cogswell.

C. P. White, Esq., Bullisjooree Tea Garden, Assam,—proposed by Mr. H. H. Sutherland, seconded by Mr. S. H. Robinson.

The Political Agent for Superintendent Rajkumar College, Bundelkund,—proposed by Dr. J. P. Stratton, seconded by Mr. Cogswell.

The Hon'ble Sir Andrew Clarke, K. C., M. G., C. B, Member of the Governor-General's Council,—proposed by the President, seconded by Mr. Cogswell.

The Manager, Burrumsal Garden, Sylhet,—proposed by Mr. John Mackinnon, seconded by the Secretary.

CONTRIBUTIONS.

1. Report on food grain supply and famine relief in Bengal and Behar. From Government of Bengal.

2. Report on the administration of British Burma during 1874-75. From the Chief Commissioner.

3. Journal of the Bombay Branch of the Royal Asiatic Society, No. 32, Vol. XI. From the Society.

4. Journal Asiatic Society of Bengal, August 1875, extra number, Part 2, and Part 2 No. 3, 1875, and Proceedings for February, 1875. From the Society.

5. Seed of *Amaranthus salicifolius* and *Henderi*, and Aehimines tubers. From C. Nickels, Esq.

6. Seed of *Areca macrostachya*. From L. A. Bernays, Esq., V. P., Acclimatisation Society of Queensland.

7. Six hybrid Begonia tubers. From Dr. T. Beathnout.

GARDEN.

The Gardener's monthly report was submitted, of which the following are extracts:—

"Since last report Thuja Orientalis seed 8 oz. has been received from Saharunpore. Sown on same day. It has germinated tolerably well, and the most forward have been pricked off into pots.

"A tin containing Areca macrostachya seeds has been received from the Acclimatisation Society Queensland, packed in moist earth. On examination the germs of the seeds appear perfectly fresh, not shrivelled as formerly. Sown on the same day as received one pot containing a number for trial to ascertain the result.

"The seeds received from Queensland on March 12th and sown on the 14th. Out of 500 Araucaria Cunninghamii four have germinated and been potted off. I don't think there will be any more now, for on examination of some of the remaining they appear to be lean seeds. The Terminalia Melanicarpa is germinating, and the Eurycles Cunninghamii bulbs are growing; all the remaining are

dormant at present; there is however no time lost as yet. From a previous consignment of Ptychosperma Alexandra and Kentia Wendtlandiana I have one seed only of each growing. I don't think there will be more; the remaining seeds appears to have perished; all are being saved for a little time longer.

"Out of 9 cuttings' of Liberian Coffee put into soil in a flower pot at the latter end of the last rains and left outside unprotected and only supplied with water till January, when they were transferred to a new pot and soil and plunged in bottom heat in the propagating house; the result is 3 cuttings rooted and potted off, one still living, and the remainder dead. On the 15th ultimo there being some nice young side shoots on the trees planted out I removed as many as were sufficiently advanced and put them into sand under a bell-glass with bottom heat in the propagating house. In a day or two a few had rooted, these were the most succulent, but the remainder continued healthy and were found to be forming a callus after eight or nine days. As soon as more shoots were ready, which was about the 1st instant, I removed all that were ready, about fifty in all, and put them in the same way; none of these have died. I took about 30 more on the 15th instant, making in all nearly 100 cuttings. At the present time looking healthy. I have filled all the bell-glasses, putting in one of the Arabian Coffee for comparison. I hope to get a tolerable percentage of these to root, and I purpose as there is a lot more side shoots removing them from time to time as they become ready. The trees planted out are growing very well now, but will not flower this year."

The Council proposed, there being a vacancy in their body, that Mr. J. A. Crawford be requested to fill it. Letters were read:—

1. From W. C. Taylor, Esq., Khoordah, Orissa, forwarding some gum of the Báhará tree *(Terminalia bilirica.)* Mr. Taylor remarks that this gum is produced in large quantities in the Khoordah jungles, and is eaten by the people. He wishes to learn if it is known and if it possesses any market value.

The Secretary placed on the table a specimen of this gum from the Society's Museum, which was presented in 1840 by Lieut. Kittoe, with the following remarks thereon:—"The Bahará tree yields an immense quantity of gum, which appears in quality to resemble the ordinary gum Senegal of commerce, and is largely partaken by the Chooars and Coles as food. It could be collected in large quantities in the Midnapore forests." This gum is introduced in Dr. Cooke's report on the gums, &c., in the India Museum, or produced in India; but no opinion is offered as to quality or market value, but a reference is made to Mr. Kittoe's remarks as above quoted.

2. From Major R. C. Money, Deputy Commissioner, Julpigoree, submitting a sample of *dhan* grown in the Dooars, possessing the curious property of containing two, three, and even four grains in each husk. Major Money states that "he has never before met with dhan of this description. The man who grew it, I am told says, that some three years ago a Fakir gave him a

handful of dhan; the sample I send is some of the second year's crop; each crop has had the same peculiarity as to more grains than one being in the husk. Dhan like this has not been seen here prior to this."

The Secretary remarked that this description of dhan had been more than once brought to the notice of the Society. Rajah Suttyanund Ghosal observed that he has had this description for three consecutive years, and that it has preserved its peculiarity. The grains are much smaller than ordinary descriptions, and probably would not yield a larger crop per beegah.

3. From the Secretary Prome Municipality, apply for a collection of trees useful and ornamental, for avenue and other purposes. Attention promised.

Thursday, the 18th May, 1876.

THE HON'BLE LOUIS S. JACKSON, *President, in the Chair.*

The proceedings of the last Monthly Meeting were read and confirmed.

The following gentlemen were elected Members: —

Col. F. C. Anderson, Messrs. Stanley Llewhellin, H. B. Beckett, C. P. White, the Hon'ble Sir Andrew Clarke; Cantonment Magistrate, Lucknow; Johari Mull; the Political Agent for Superintendent Rajkumar College, and Manager Burrumsal Garden, Sylhet.

The names of the following gentlemen were submitted as candidates for election :—

Col. Henry S. Rammell, 29th M. I., M. S. C., Secunderabad,—proposed by Conductor T. Coles, seconded by the Secretary.

Major P. W. Bannerman, Political Agent of Bhugelkund,—proposed by Mr. H. T. White, seconded by the Secretary.

C. J. Middleton, Esq., P. W. D., Gya,—proposed by Mr. C. M. Jerdon, seconded by the Secretary.

Rejoined.—W. C. Plowden, Esq., C. S., Meerut; Joseph Sladen, Esq., C. S., Mozuffernuggur, N. W. P.

Read a letter from F. L. Beaufort, Esq., C. S, resigning his membership, consequent on his approaching departure from India, after an uninterrupted connection of 38 years. Mr. Beaufort, observes,—"I have taken, and always shall take, a lively interest in the labors of the Society, than which there is no more useful Institution in India." On the recommendation of the Council, Mr. Beaufort was proposed to be elected an Honorary Member, on account of his unusually long term of Membership.

Mr. J. A. Crawford was elected a Member of the Council.

CONTRIBUTIONS.

1. Annual Reports for 1874 and 1875 connected with opium cultivation, and a book of plates to accompany the reports. From John Scott, Esq., on special duty, Opium Department.

2. Annual Report of the Board of Regents of the Smithsonian Institution, Washington, for 1874. From the Institution.

3. The Indian Forester, Vol. I, No. 4. From the Editor.

4. Proceedings of the Asiatic Society for March. From the Society.

5. Several back numbers of the Society's Journal. From J. A. Crawford, Esq.

6. A case of plants from the Government Gardens, Hong-kong. From the Superintendent.

7. A few suckers of the Martaban Plantain. From C. Ady, Esq.

8. A small collection of Orchids from the Andamans. From S. U. Phipps, Esq.

9. A collection of seeds of Millets of sorts. From Dr. S. Lynch.

10. Seeds of the Chinese Cucumber, "*Solly Qua.*" From Dr. King. (These seeds have been widely distributed.)

The Secretary drew attention to the proceedings for June 1872, at which Dr. King exhibited a specimen of this cucumber, measuring 3 feet 9 inches, they are said to attain a length of 7 feet. The following note on the mode of growing was read at the same meeting, and is now re-introduced for general information:—

"This cucumber is easily grown, but requires plenty of manure. The plants must be trained upon wall or trellis work, and the fruits must be allowed to hang down vertically from the time they set. If this latter point be not attended to, instead of acquiring their natural length the fruits grow short and thick."

11. A large quantity (upwards of a maund) of acclimatized seed of the Chinese sugar cane or African Imphee (*Holcus saccharatus.*) From H. Deverell, Esq.

Mr. Deverell reports this sweet grass as famous for fattening cattle. He also grows the "Jaucera," (*Sorghum vulgare.*) of which cattle likewise eat greedily.

GARDEN.

The Gardener's monthly report was read. Mr. Head acknowledges receipt of the various plants and seeds referred to above, of which several have reached in good condition, especially the plants from Hong-kong; and he adds:—"Out of the cuttings of Liberian coffee, put in on the 15th March under a bell-glass, three have rooted, and were potted a few days ago; most of the others are looking well. I am continuing to put in cuttings, as procurable, making a substitute for bell-glasses."

MAHOGANY SEEDS.

A report was submitted by the Gardener on the result of his sowings of the contents of 24 pods of mahogany seeds presented by Mr. W. H. Cogswell, in April 1875. The result, as contrasted with the sowings of others, to whom seed was also given by Mr. Cogswell, is by no means satisfactory, namely, only 50 per cent. having germinated against 75 per cent. in the other instances.

Successful introduction of English forest trees into Dalhousie.

Read the following interesting extract of a letter from Francis Halsey, Esq., of Madhopore, Punjab, dated 20th March:—

"It may interest some of our members to hear the success which attended the importation of a large number of English forest trees which I made last year

on account of the Dalhousie Municipality. It consisted of over 1500 plants of English and Spanish Oaks, English Elms, Limes (Tilia), Beeches, Spanish Chesnuts, Copper Beeches, Mountain Ash and Larch; also some crimson flowering Horse Chesnuts. They were packed in two deal cases and took only 41 days in transit from London to Dalhousie, where they arrived in February last year, and cost altogether Rs. 120. By the end of last rains, they were all (with the exception of the crimson flowering Horse Chesnuts) well grown young trees. Before packing, the young trees were cut down to two eyes each, that is, almost to the level of the ground, and the roots carefully wrapped in dry moss. They were sent to me by Messrs. Veitch of Chelsea, and that firm deserve great credit for the manner in which they carried out my instructions."

Letters were read :—

1. From the Military Secretary to His Excellency the Viceroy, intimating Lord Lytton's readiness to become Patron of the Society in succession to Lord Northbrook.

2. From Col. A. R. Hutchinson, Gwalior, applying for certain seeds :—"I see" observes Col. H. ——"that the English papers notice very favorably the Caucasian prickly Comfrey (*Symphytum asperrimum*) as a forage plant admirably suited for the plains of India. If you have any plants I should like to try to introduce it; as also a gigantic cucumber, or gourd; I remember reading about it in 1872-73 growing most successfully in the Central Provinces, Nagpore I think, if you could spare a few seeds."

The Secretary mentioned that through the kind assistance of Dr. King, he had been able to send Col. Hutchinson some seed of the "Solly Qua," which is probably the cucumber referred to. He had informed Col. H., that no seeds or plants of the prickly Comfrey were available, and that, to quote the words of Dr. King,—"as a native of the Caucasus, where it grows by *the sides of streams*, it is not likely that it has any chance as a crop in the dry plains of India." The Secretary added that he had received several other applications for seeds of this plant from Members who had, apparently, been attracted by the glowing description of it recently inserted in the newspapers.

3. From Col. W. Kincaid, Sirdaspore, *viâ* Indore,—announcing his success in raising *Eucalyptus globulus*, and requesting information as to the best mode of treatment, as he is desirous of acclimatising these trees at Dhar which is a very feverish place. (Necessary information given.)

4. From Lieut. J. F. Pogson, Simla, a few more details regarding Cuzco maize,—how distributed, and the result under manure.

5. From the Secretary, Smithsonian Institution, Washington, returning thanks for publications of the Society.

Thursday, the 22nd June, 1876.

S. H. ROBINSON, ESQ., *V. P., in the Chair.*

THE Proceedings of the last Monthly Meeting were read and confirmed.

The following gentlemen were elected ordinary Members:—

Col. Henry S. Rammell, Major P. W. Bannerman, and Mr. C. J. Middleton.

Mr. F. L. Beaufort was elected an Honorary Member.

The names of the following gentlemen were submitted as candidates for election:—

Maharajah Mahender Pertab Sing Bahadoor of Orcha, Tehri,—proposed by Dr. J P. Stratton, seconded by Mr. J. A. Crawford.

B. Alone, Esq., District Superintendent of Police, Jaunpore,—proposed by Mr. C. Nickels, seconded by the Secretary.

F. E. T. dela Courneuve, Esq., Manager, Raneegunge Coal Association,—proposed by Mr. G. L. Kemp, seconded by Mr. W. H. Cogswell.

Rao Chatter Patti, Jogudar of Alipore,—proposed by Dr. Stratton, seconded by Mr. Crawford.

A. L. Harman, Esq., Jatapore Factory, Sarun,—proposed by Mr. John Stalkartt, seconded by Mr. Cogswell.

W. Morey, Esq., Ghatal,—proposed by the Secretary, seconded by Mr. Crawford.

W. Grierson Jackson, Esq., C. S., Azimghur,—proposed by Mr. J. R. Reid, C. S., seconded by Dr. R. C. Sanders.

Lieut.-Col. Guy A. Prendergast, Commandant 15th Bengal Cavalry, Cawnpore,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

John Hutchison, Esq., (Messrs. W. L. Toulmin & Co.,)—proposed by Mr. Robinson, seconded by the Secretary.

A. L. Keith Murray, Esq., Higli Mari Garden, Nowgong,—proposed by the Secretary, seconded by Mr. Cogswell.

Mr. Peter Donaldson, Superintendent of Jail manufactures, Alipore,—proposed by Dr. Lynch, seconded by the Secretary.

CONTRIBUTIONS.

1. Third Annual Report for 1875 of the Secretary Department of Agriculture for Victoria. From the Secretary.

2. Report of the Bengal Chamber of Commerce from November 1875 to April 1876. From the Chamber.

3. Records of the Geological Survey of India, Vol. IX., Part 1. From the Superintendent.

4. Report of the Royal Botanical Gardens of Mauritius for 1875. From the Director.

5. Journal Asiatic Society of Bengal, Part 1, No. 1, 1875; and Proceedings for April and May. From the Society.

6. Protection of property and life from lightning during thunderstorms, by W. McGregor. From the Author.

7. Reports on the Forest Administration in the several Provinces under the Government of India, 1873-74. From Department of Agriculture.

8. A small collection of Orchids from Burma. From Mr. R. A. Manuel.

9. An Assortment of acclimatised flower seeds, raised in the Barrackpore Park Garden. From Mr. R. Errington.

10. A further quantity of seed of the "Solly Qua." From Dr. G. King.

11. Tubers of Tydeas, Gesneras, &c. From Dr. T. Beaumont.

12. Several back Numbers of the Society's Journal. From F. L. Beaufort, Esq.

The Secretary placed on the table a copy of the Journal, just issued from the press, Vol. V., Part 2, which will shortly be distributed to Members. Also a manuscript copy of the supplementary catalogue (now in the press) of plants introduced into the garden since the publication of the catalogue in 1874; together with a list stitched in the Journal of the varieties of Mango grafts in the garden. The Secretary further announced the receipt of the consignments of French vegetable and flower seeds from Messrs. Vilmorin, Andrieux & Co., and of assortments of maize and tobacco seeds from America. The full consignments of seeds from America are expected next month, when the general distribution will commence.

GARDEN.

The Gardener's monthly report was read. Allusion is primarily made to the receipt of certain plants, seeds, and tubers from Dr. Beaumont, Mr. Manuel, and others. The Gardener reports a large collection of Coffee seedlings raised from Messrs. Mocketts' (Madras) and Herzoys' (Chota Nagpore) contributions and from garden stock, about 3,000 in all; also of seedlings of *Casuarina muricata* and *Thuja orientalis*. Several more Liberian Coffee cuttings have rooted. Operations in grafting have commenced.

Treatment of the Peach tree.

Submitted the following account from Mr. C. Nickels of Jaunpore, of the result of his treatment of the Peach tree:—

"I have been very successful with peaches this year, both as regards size and quality, a tree upon which I had been experimenting, having yielded fruit 8½ inches in circumference and 4½ ounces each in weight and of very fine flavour. The following is my system of treatment:—At the close of the rains or about the 15th of last October, I laid the roots of the tree in question bare, for about four feet all round from the stem. By the 1st December the tree had ripened its wood and the leaves had nearly all fallen. I immediately pruned it and pulled off the few remaining leaves. The roots were then covered with dry well-decayed cow-house manure, and over this a thin layer of earth. About three

weeks afterwards the tree was in full bloom, and when the fruit had set I began irrigating it. My plan is always to give plenty of water. After a little while I thinned out the fruit, allowing only one to remain upon each shoot. All the time that the fruit was swelling I gave it *liquid manure* prepared as follows:— Two parts fresh goat's dung, two parts *oil-cake*, half part *soot*, and half part *lime*. This mixture I put into earthen jars buried in the ground, about half the jar being filled with the mixture, and then filled up with boiling water and kept closely covered. The liquid manure was prepared two months before it was required, and the tree got about three gallons of this mixture diluted with a large quantity of water once a week.

"Next year I hope to produce finer peaches, if that is possible. I think rotten fish might be added with advantage to the liquid manure, and *bone*-dust to the roots. I'll try the experiment at all events.

"Would you like to have a few grafts from my tree for the Society's Garden? If so, I shall be happy to prepare them for you, or I could send you cuttings during the rains for budding, *i. e*, if this operation can be successfully performed in Calcutta. The fruit is of considerable beauty and fine flavour, and the color of the flesh is pale with a slight tinge of red next the stone. I need not say there is not the least taste of bitter in it, as is so common."

Letters were read:—

From Dr. R. C. Sanders, Azimgurh, applying for seeds of Solly Qua, Sorgho, and *Eucalyptus globulus*. Dr. S. writes, that he wishes to grow the two former in the Jail Gardens as an experiment. Of the *Eucalyptus*, there are three young trees doing well. Application fully complied with.

From J. H. Bridgman, Esq., Goruckpore, reporting that he has five Mahogany trees doing well from the seed supplied him last year. "The *Panicum spectabile* grass," adds Mr. Bridgman "has not hitherto been a success. It made no progress in the rains or the cold weather, but when the weather began to get warm, at the beginning of April, it shewed more signs of vigour, since which time I have not seen it. I have not had enough of it to try how it is liked by the cattle, but its stalks are so hard and woody, and the leaves so tough, that I am by no means confident that they will take to it." (This seed was received from Dr. Schomburgh, Director of the Royal Botanic garden, Adelaide, who writes most highly of this fodder grass in a paper published in the proceedings of July, 1874.)

From Bradford Leslie, Esq., Engineer to the Justices, applying for information regarding the best kinds of trees for public roads and squares. Complied with.

Thursday, the 20th July, 1876.

S. H. ROBINSON, ESQ., *V. P., in the Chair.*

The proceedings of the last Monthly Meeting were read and confirmed.

The following gentlemen were elected Members:—

Maharajah Mahender Pertab Sing Bahadoor, Messrs. B. Alone, F. E. T. Dela Courneuve, A. L. Harman, W. Morey, W. G. Jackson, John Hutchison, A. L. Keith Murray, Peter Donaldson, Baboo Chatter Patti, and Coll. G. A. Prendergast.

The names of the following gentlemen were submitted as candidates for election:

G. Foster, Esq., Assistant Conservator of Forests, Saugor,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

D. Keith Murray, Esq., Nowgong, Assam,—proposed by Mr. Cogswell, seconded by Mr. D. Mackinnon.

Mr. W. G. Amos, Calcutta,—proposed by the Secretary, seconded by Mr. J. A. Crawford.

H. M. Kisch, Esq., C. S., Manbhoom,—proposed by Mr. F. Wilcox, seconded by Captain C. H. Garbett.

Rajah Kali Narain Rai Chowdry, Bahadoor, of Bhowal, Dacca,—proposed by Mr. R. D. Lyall, seconded by Mr. Crawford.

Mr. R. Barton West, Calcutta,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

J. K. Hunter, Esq., Kopili Tea Estate, Assam,—proposed by Mr. H. H. Sutherland, seconded by Mr. Robinson.

Baboo Bihari Lala Pain, Calcutta,—proposed by Baboo P. C. Ghosa, seconded by Baboo Nobinchunder Burral.

Percy W. Langdon, Esq., C. S., Nowada, Gya,—proposed by Mr. Robinson, seconded by Mr. Crawford.

Manager of the Naga Dhoolie Tea Garden, Assam,—proposed by the Secretary seconded by Mr. Robinson.

Municipal Committee, Prome,—proposed by the Secretary, seconded by Mr. Cogswell.

C. H. Maseyk, Esq., Jungypore,—proposed by the Secretary, seconded by Mr Robinson.

Rejoined.—Captain S. Mactier, Delhi; Mr. E. Durup de Dombal, Mymensingh; Dr. Geo. Henderson, Rawul Pindee; and Syed Wilayat Ali Khan, Patna.

CONTRIBUTIONS.

1. Report on Meteorology and Horticultural Gardens in the Province of Oude for 1875-76. From the Chief Commissioner.

2. Notes on the Tree Ferns of British Sikkim. By John Scott, Curator of the Royal Botanical Gardens, Calcutta. From the Author.

3. District Arboriculture in Northern India. By W. Coldstream, C. S. From the Author.

4. The Indian Forester, Vol. 2, No. 1. From the Editor.

5. Journal Asiatic Society of Bengal, Part 2, No. 1, 1876. From the Society.

6. Journal of the Royal Asiatic Society of Great Britain and Ireland. Vol. 8, Part 2. From the Society.

7. Plants of *Anæctochilus*. From G. L. Kemp, Esq.
8. A glazed case of plants. From Mr. W. Bull of Chelsea.
9. Shoots of the Martaban Plantain. From C. Ady, Esq.
10. Two glazed cases of fruit trees and ornamental plants. From C. Ford, Esq., Superintendent Hongkong Government Gardens.

GARDEN.

The Gardener's monthly report was submitted. He first refers to receipt of certain plants and seeds from Messrs. Kemp and Ady, the Government Gardens of Hongkong, and Queensland, as already alluded to. The contents of two cases of plants from Mr. Bull of Chelsea, one ordered and the other a present, have arrived in excellent condition, four only having died *en route*. Mr. Lynam has presented a healthy plant, 2½ feet high of *Eucalyptus globulus* and one of *Sophora secundiflora*. Mr. Head adds as follows: "the main operations in the Garden have been the increase of stock on all favourable occasions, shifting plants in larger pots, potting off seedlings, &c., when unfavourable for outside work. The whole of one set of roses, varying from 5 to 30 layers of each kind, has been made, and the second set commenced, which will yield nearly as many. Layers of fruit and ornamental plants and *gooties*, when applicable, have been made and continuing; as well as a little grafting, dividing the available hands for the purpose, so as to carry all on simultaneously."

The Secretary placed on the table a new catalogue of the books in the Library. He stated that the loss of books had been trifling since the last catalogue was prepared in 1866. There was, however, a valuable work, Balfour's Cyclopædia of India, which was missing and could not be traced. It was probably lent in 1872 or '73: the Member who borrowed it, would oblige by returning it.

WHEAT CULTIVATION IN INDIA.

The following remarks by Lieutenant J. F. Pogson, on the above subject, were submitted:—

"Our present export wheat trade, which has already reached £ 827,606 in value, (the quantity being 1,755,954 cwt.) might be immensely increased if it was generally made known, that in the N. W. Provinces, Oude, and parts of Behar, water carriage is largely available, and as the rains commence a month or six weeks after the wheat crop has been harvested, the canals and rivers are fully available for navigation. We have the magnificent Ganges Canal, with its terminus at Cawnpore, and its branch terminus at Kalpee, on the River Jumna. The lands irrigated by this Canal, and its works, is capable of producing any quantity of wheat, and as that indigenous to the "valley of the Nerbudda" is in high favor in the London market, it is quite feasible for European firms to purchase such seed wheat at Saugor and Jubbulpore, and then to get it sown and cultivated by the zemindars occupying land in the Northern Doab. In Oude, the

same plan could be carried out, and eventually from Benares to Hooghly no other description of wheat would be grown.

"I observed with regret that an influential newspaper has informed its readers in general, and the British public in particular, that the superior wheat of India, 'is all but shut out of the English market,' by the want of cheap communications in the country between the producing districts and the coast.' A London millionaire, unacquainted with the vast dimensions of Gangetic India would, after a perusal of the extract, arrive at the conclusion, that although there was first-class wheat available in some parts of Hindustan, it was not to be obtained from want of roads and railways. The real state of the question is however different. From Roorkee to Calcutta water carriage is open from June to October, and the railway is open from Loodiana to Howrah all the year round. The wheat produced over this vast tract of land is of ordinary quality, and *the seed has only to be changed* to produce the superior cereal. Hence in place of expending millions sterling in connecting the *choice wheat* producing district with the coast, common sense dictates the adoption of the economical and practical place of introducing the seed and raising the crop on the valley of the Ganges instead of the Nerbudda.

"If the Government carried on an export wheat trade, its officers would no doubt have introduced the best variety of seed wheat. But in the present case it is the London merchant who wants the wheat, and in place of sending out a proper representative supplied with capital, to arrange matters and secure results, an agitation is got up on the subject of cheap modes of transit for the conveyance of a particular description of wheat at present procurable only within a circumscribed circle, and in a limited quantity.

"A reference to the Proceedings of the A. and H. Society will show that I have *ab initio* advocated the export of Indian wheat to England. The removal of the duty of three annas per maund of 82 lbs. has had the effect of actually creating an export trade destined to reach millions sterling, and not even America can successfully compete against India in the production of cheap first-class wheat. It becomes more than desirable that the utmost publicity should be given to the capabilities of India, as a great wheat-producing country. The wheats of England and Europe after being acclimatised in the Himalayas and Neilgherries, would grow in all the wheat-producing districts of Hindustan including the Punjab. But as it would appear that the '*English millers have discovered remarkably fine milling qualities in Indian wheat,*' there is no necessity for importing even a bushel, though it is urgently and imperatively necessary that the wheat so highly prized should be extensively cultivated in all districts situated within 20 miles of a river or navigable canal.

"I am opposed to official interference with zemindars and ryots, and although official aid is exceedingly valuable, in the present instance, it should be confined to the distribution of seed wheat free of cost; the *Donors*, being European

Capitalists, under engagement to purchase the crop of superior wheat at fair market value. The Calcutta or London firm which gives away a thousand rupees worth of Nerbudda wheat per district *selected at its discretion*, will ultimately gain very considerably by its judicious liberality. It is in fact laying out a *six pence* to make sure of a *sovereign*, or to put it agriculturally, to secure in perpetuity, the cultivation of a first-class highly marketable cereal, to the exclusion from culture of inferior kinds having so low a value as to be quite unfit for conversion into Christian bread and biscuits."

In a subsequent letter of 12th July, Mr. Pogson offers some further observations on the same subject:—

"I notice that at page 186 and 187, the Editor of the *Indian Agriculturist* advances the proposition that Government should enter the market, purchase wheat, and send it to England for sale, and with the proceeds pay the Home charges. I do not think this would answer, for the moment the Government entered the market, the Bunnias and Seths, who are the real grainholders, would send up the prices. The cheap price of wheat is indicative of dear money or scarcity of Rupees. If the Bunnias sell wheat at 24 seers per Rupee, they have purchased it from the ryots and zemindars at 48 seers.

There is plenty of money (Rupees) in the country, but they are in the wrong man's pockets, and until British Capital is brought forward, the Bunnia will make advances, at not less than 37½ per cent, and when cash is needed to pay the Revenue instalment, or kist, it will be forthcoming on the usual terms. One rupee principal and one rupee interest, the latter taken in grain, when the British Capitalist comes on the scene. He will be satisfied with six or eight per cent, and the ryots and zemindars will hail him as a preserver.

"That book of Mr. Reade's 'Never too late to mend,' has done India incalculable harm, for the system being adopted in our jails and grand prisons, the criminal classes are far better off than the honest and industrial classes. We have now, I am afraid to say, how many thousands of able-bodied rascals and criminals comfortably housed and fed in Indian jails. Now if gangs of 500 or 1000 under suitable supervision, were made to clear forest land, scrub and jungle, and the relief gang of another 1000 to plough and sow it with wheat, the produce of their labor would be something very considerable, and the land being rendered fit for culture, natives from the over-populated parts of India would become settlers. This method of employing convict labor would make the criminal classes feel that nothing was to be gained by committing crime on purpose to be cared for in prison. As a beginning such gangs might break up uncultivated land in the vicinity of Railways, and sow with Nerbudda wheat, for distribution next year, in various parts of India. This would be quite legitimate work, and would not interfere with the honest agriculturists operations. I believe over 2000 convicts are employed on the Sutlej canal, and work well. Hence, as canals are called for, a great number of convicts available might be so turned to account,

and the way would be paved for extension of cultivation in all directions where uncultivated exists.

"This war of Christian independence, will most likely last for years, and put a stop to agricultural operations in entire provinces. The export of food grains from India will follow, as a matter of course, and I submit that every agricultural convict should be sent to the *State Plough*, and other able-bodied criminals to clearance work. The wood unfit for timber or building purposes being made into charcoal, and buried in pits for future use and sale.

"These men could build *Pise* huts on a standard place, and when settlers arrived, the convicts would have to vacate, and the late convict station would become the village of the future.

"There is nothing utopian in this scheme, the criminal population is greatly on the increase, and extra accommodation and police will follow. To stop the evil is quite feasible. But if Mr. Reade's plan be continued, the Government may at no distant date count its convicts by the hundred thousand instead of by hundreds.

"A convict village sounds odd, but I think it would succeed for agricultural purposes. Mind you the time-expired convict returns to his village as a member of its society, and is not looked down upon. Hence, if 50 or 100 convicts, whose time had not expired, were settled on lands, and their women kind were allowed to join them, the station would become a village, and after the time of servitude was over, I think very few would return to their original villages. This is not exactly an agricultural letter; but as the State cannot afford to feed idlers and non-producers, my views, if adopted in whole or part, might be productive of much good."

Fodder Plants of India.

Read the following letter from Dr. S. Lynch, on the above subject:—

"Having seen accounts of the enormous yield of valuable fodder obtained from a plant called the Caucasian Comfrey which is recommended as suitable for cultivation in Bengal as well in other parts of India, I am desirous of asking a few questions in the hope of getting information on certain points connected with the cultivation of this and other fodder plants in India.

"When the yield of the Comfrey is stated to be from 80 to 120 tons per acre, does this mean that that number of tons is got at a single cutting, or is it the yield of the whole year, in successive cuttings? If it is the entire yield that can be got from the plant in the year, then I believe that it possesses no advantage over our common jauira (*sorghum-chblum*) which by irrigation in the dry season gives as many as four or five cuttings, and as many without irrigation in the rains, with heavy yields. The same is true of the Chinese sugar-cane, and of some of the lesser millets. In the beginning of May last I sowed patches of ground with jauira (*sorghum,*) kaon: (*Panicum Italicum,*) and shánú (*Panicum frumentaceum.*) On the 29th June I cut the kaon at the rate of 17

tons to the acre: the janira, then four feet high, gave 22 tons, and the shámá 27 tons to the acre. The janira and kaon had been sowed thin, in drills, with the object of getting seed, not fodder. The shámá was sowed broad-cast and thickly; these crops had the advantage of good rain in May (2 inches) and of the usual fall in June (9 inches.) With respect to the lesser millets there will be no second cutting, but they could be sown two or three times over in a year. The cattle here eagerly eat the green food derived from these plants, and thrive accordingly on them. The cultivation is of the simplest kind, and the seed is always cheap, and after the first crop would cost the cultivator nothing. In the hot weather, I made sound sweet hay equal to oaten hay, from the lesser millets. I would ask, in the face of such facts, what need is there for looking abroad for novelties of a doubtful utility to introduce to the attention of cultivators? The results I speak of can be obtained every where in India. As the crop remains so short a time on the ground, (in the experiment referred to, only two months) the farmer can avail himself of the opportunity of getting in a green crop, when his land would otherwise be lying bare, waiting for the season to plant out his rice.

"I would ask if the Managers of Model Farms in Bengal have ever taken a piece of rice ground, such as we see it round Calcutta, lying bare after the crop has been taken off in December, and to remain in that state till the following August, and have sown any crop of fodder, taking advantage of a fall of rain in the early part of the year. If it has occurred to them to do this, have they found that the green food so grown was adapted for bringing half-starved bullocks, such as natives work in the plough, into good condition; and have they ever tried the effect of ploughing in part of the green crop as manure, and if so, with what effect on the productive capacity of the soil for the next crop? At a time when the attention of cultivators in India is called to the advantage of the system of manuring locally by growing a green crop for the purpose, it would be interesting to be told by the Managers of Model Farms what they have done in that way. The suggestion of Colonel Corbett (of Upper India) that janira should be the crop chosen is not, I think advisable, it is a plant with long thick stalks and carrying less leaf in proportion to stalk than such crop should have.

"In this garden we have a gigantic amaranth. Growing rapidly, with much leaf, and seeding abundantly, the seed also being valueless. This plant might be tried by any one desirous of making the experiment. There is one objection to this method of manuring ground in India. The native plough cannot bury the crop, and European ploughs must be used. I am aware that Mr. Robertson of Madras has made many experiments on subjects of this nature, which always appeared to me to possess a high value, although discredit was sought to be thrown on them by Mr. Elliot of the same province before the Society of Arts last year. . . . .

"Lastly, I would ask, whether the many enquirers after the qualities of the Prickly Comfrey are aware that there is an Agricultural Society in Calcutta, where subscribers can obtain, besides other advantages, early and accurate information on such matters, and in this case, might have learnt on the highest authority that the climate is not adapted for the profitable growth of this Caucasian plant in India."

Letters were read:—

From G. Foster, Esq., Assistant Conservator of Forests, Saugor Division, applying for seeds of *Eucalyptus* of various sorts, as he is most desirous of introducing these trees in the tract under his charge. Complied with.

From Captain W. J. Williamson, Deputy Commissioner, Garo Hills, applying for seeds of the "Prickly Comfrey."

The Secretary mentioned he had imformed Captain Williamson, that the Society had not any seeds of this plant, and that it was doubtful if it would succeed in his locality.

From Captain James Murray, Mussoorce, forwarding a small quantity of silk worm eggs from acclimatised Japan worms. Captain Murray adds, that he will be prepared to give eggs to any one applying for the same. These eggs have been distributed among certain Managers of Filatures belonging to Messrs. Lyall, Rennie & Co., and Messrs. Jardine, Skinner & Co.

From H. W. Newton, Esq., forwarding a sample of Jute which grows wild in Arracan, and requesting a report thereon.

Mr. Cogswell, a member of the Fibre Committee, offers the following opinion:—

"Very short-poor bodied, badly grown, indifferent color, but of fair strength, tolerably free from runners, and towy and generally well prepared. Present value about Rs. 2-12 to 3 per bazar maund. By the term 'well grown' I conclude is meant uncultivated, the seed must have been sown from imported Bengal seed."

Thursday, the 24th August, 1876.

BABOO PROTAPA CHUNDRA GHOSA, *V. P., in the Chair.*

The proceedings of the last Monthly Meeting were read and confirmed.

The following gentlemen were elected Members:—

Messrs. G. Foster, D. Keith Murray, W. G. Amos, H. M. Kisch, R. Barton West, J. K. Hunter, P. W. Langdon, C. H. Maseyk, Rajah Kali Narrain Roy Chowdry Bahadoor, Baboo Bihari Lala Pain, Manager of the Naga Dhoolio Tea Garden, Assam, and Municipal Committee, Prome.

The names of the following gentlemen were submitted as candidates for election:—

W. F. Westfield, Esq., Kurruntee Tea Estate, Julpigoree,—proposed by Mr. G. L. Kemp, seconded by Mr. H. J. Leitch.

Mark Hartnell, Esq., I. G. S. N. Co.,—proposed by Mr. S. H. Robinson, seconded by Mr. W. H. Cogswell.

C. T. Ambler, Esq., Merchant, Monghyr,—proposed by Mr. H. Dear, seconded by the Secretary.

W. D. Blyth, Esq., C. S., Nattore,—proposed by Mr. W. H. D'Oyly, seconded by the Secretary.

G. S. Freeman, Esq., Lohoria Factory, Chumparun,—proposed by the Secretary, seconded by Mr. Robinson.

Rejoined.—Baboo Preonauth Sett.

CONTRIBUTIONS.

1. Journal of the Bombay Branch Royal Asiatic Society, No. 33, Vol. 12. From the Society.

2. Report of the Royal Botanic Garden for 1875-76. From Dr. King.

3. Report on the Jarrah timber of Western Australia. By H. E. Victor, C. E. From Mr. C. H. Compton.

4. A Manual of Cinchona cultivation, by Dr. G. King. From the Department of Agriculture.

5. Journal of the Asiatic Society of Bengal, Part 2, No. 2, 1876, and Proceedings for June and July. From the Society.

6. Annual Meeting (24th) of the British India Association. From the Association.

7. Report of the Sanitary Commissioner for Bengal for 1875. From the Government of Bengal.

8. A collection of seeds. From the Queensland Acclimatisation Society.

9. A small assortment of bulbs and acclimatized seeds. From Mr. C. Nickels.

10. A Wardian case of ornamental plants. From Messrs. James Veitch and Son.

GARDEN.

The Gardener's monthly report was submitted. Mr. Head refers to several contributions to the Garden from Dr. Beaumont, Mr. Nickels, the Queensland Acclimatisation Society, the Royal Botanic Society, Messrs. Veitch and Son, and others. Of the collection of 33 plants just received from Messrs. Veitch, 6 are quite dead, 10 in a precarious state, 4 sickly, and 13 alive and healthy. The deaths have probably been caused by the breakage of a pane of glass. The plants received about a month ago from Mr. Bull, have generally gone on well, and have been reported, and cuttings of some have been procured. About a dozen in all have died; and there are doubts if a few others will start into growth, although there is life in them at present. In respect to the seeds from Queensland, the Gardener remarks to the following effect:—

"From the various consignments of seeds from Queensland Acclimatisation Society, very little is obtained; the seeds being generally bad. Some time ago I suggested that such as palms and seeds that did not readily germinate should

be transmitted in moist earth. A trial was made, selecting *Areca macrostachya*, and 60 seeds of each was sown to test the germination ; 48 seedlings have been obtained out of the 60 from the moist earth, and the remaining seed has grown freely ; but not a seed from the others sent in pulverised earth and canvas bag grow, showing the advantage of moist earth for seeds that do not quickly germinate."

Oregon Wheat.

The Secretary called attention to two samples of wheat on the table. These formed portion of a small supply presented by Capt. C. Edmonds of the "Baron Aberdare," who had brought them from Oregon where they are much prized. The ears of both kinds ("White Winter" and "Little Club") are nine inches in length. The Secretary added he had distributed this seed, as judiciously as possible, to members resident in various parts of the country, the Punjab, Simla, Saharanpore, Shajehanpore, Cawnpore, Allahabad, Ghazeepore, Gorruckpore, Bhaugulpore, Monghyr, Purneah, Chittagong, &c., and requested them to give the result of sowings.

Mr. R. Duncan, of the Phœnix Steam Flour Mills, had kindly reported on these wheats to the following effect:—

"The samples of Oregon wheat are both good. The 'White Winter,' a very fine floury grain, full bodied, soft and white, and must make beautiful flour. The 'Little Club' is not so nice; the grain being smaller and mixed with a few hard flinty grains, and not unlike this country 'Doodea' wheat. Both are superior floury grains however and softer than this country wheat."

Coffee Cultivation in the Andamans.

The Secretary next alluded to the sample of Coffee on the table, the produce of Port Blair, and submitted the following remarks from Captain Wimberley on the subject :—

"All the information I can give you about our coffee is this. Col. Ford was the first who tried coffee here. He planted some at Mount Harriett in 1863. Where he obtained his seed from is not certain, but it is believed that it came from Ceylon.

"Anyhow there was coffee bearing here in 1866, as Col. Ford, in one of his reports to Government in that year, notices that the coffee trees had borne fruit very fairly during the last season. From that time up to last year the coffee estate at Mount Harriett had progressed so far that there were some 40 beegahs under coffee, 20 beegahs of growing trees, and 29 beegahs of old trees from Col. Ford's time. These latter never having been pruned had grown into enormous trees, growing all wood and no berry.

"As this experimental estate had been kept up for 12 years, I thought it was time to try crop on a large scale, and I therefore felled jungle and started a very large nursery, and this year I have increased the coffee plantation to about 600 beegahs, the whole of which looks very promising. Of course we

shall not be able to tell whether it will answer for some 3 years to come. But if labor is available for it and it is attended to, that is, properly weeded, manured, pruned, &c., I have every reason to suppose that it will succeed.

"This coffee was not quite ripe when gathered, and the value put on it was accordingly low. It was, however, estimated that had it been ripe, it would have brought Rs. 40 per maund in the Calcutta market.

"It was agreed to send a few plants of the Liberian Coffee from the Garden for trial, as soon as they were sufficiently advanced for transmission."

SUNN FIBRE.

Dr. Lynch submitted two samples of Sunn Fibre, prepared from plants raised in the Alipore Jail Garden, on which Mr. W. H. Cogswell, a member of the Committee, offered the following remarks :—

"I return the samples of Sunn. It is very well prepared almost perfectly so, of clean, bright, good colour, length and strength being equally good. I have marked the samples 1 and 2. No. 1 is worth to-day about Rs. 9 per bazar maund, or Rs.2 superior to bazar quality, the latter selling at about Rs. 7 a maund.

"The No. 2 sample is neither so good in colour nor so clean as No. 1. It may be valued at about 1 Rupee inferior, say Rs. 8 a maund. The above samples are very desirable hemp, and would meet with a ready sale."

SILK COCOONS FROM BURMA.

Mr. Hardinge, the Secretary of the Agricultural and Horticultural Society of British Burma, sends some cocoons of a silk-worm received from the Henzada district, which is described as now; no description of the worm or the moth accompanied the parcel. Mr. Hardinge desires to have an opinion on them for communication to the local Government.

Mr. E. G. Buskin, a member of the Silk Committee, reports on these cocoons as of "rather a dingy colour, a good size, and seems to contain a fair quantity of silk of fair quality. A few seers should be throughly dried in the sun and sent up, that we may have them reeled off and test the produce. Without this it is impossible to value them."

BLIGHT OF VARIOUS KINDS AFFECTING TEA PLANTS.

Read the following letter from Messrs. Macneill & Co., on the above subject:—

"The effects of blight and red spider having become of such a serious nature on many Tea Gardens both in Assam and Cachar, but especially in the latter province, we are anxious to procure all the information possible regarding these, in order that we may be able to assist the Managers of the Gardens in our Agency, as far as possible, in mitigating the evil. We write to ask whether you can help us with any information you possess regarding these insects and their ravages, and the various plans adopted with the view of getting rid of them. Possibly you may have some pamphlet on the subject, in which case we should be glad to receive a number for distribution.

"Any particulars you can give us will be much esteemed."

The Secretary remarked that the subject of blight and other enemies with which the Tea Plant has to contend, had, as Members would probably remember, been rather prominently before the Society for several years past. Several particulars interesting to naturalists had been published from time to time, but no practical information had as yet been elicited towards providing a decided remedy. He further observed that it were very desirable that some decided action were taken instead of mere casual notices and suggestions from amateurs, which could not be practically carried out on a large scale. The subject had occupied his attention when in London in 1873, and he had, in communication with a practical entomologist, suggested the advantage, if feasible, of engaging the services of a practical professional man, to travel over the Tea districts of Assam and Cachar, whereby, in the course of two years or so, he might, by carefully studying the character of these various pests in their several localities be able, by close observation, to arrive at some practical mode if not of entirely destroying, at least of modifying the effects of their destructive ravages. Instead of diminishing in course of time by extended cultivation, clearance of jungle, &c., the ravages of these pests, whether in the form of blight, bug, red, and now green, spider, would seem to be increasing; and it therefore became the more incumbent on owners and agents to take decided action in order, if possible, to rid the Gardens of the numerous enemies, so fatal to vegetation, which now abound. The Meeting, coinciding with these observations, the Secretary was instructed to prepare a note on the subject for the information of the Committee, preparatory to circulation to all interested in this important industry.

INDIAN CORN AND OTHER FOOD CROPS.

Submitted the following remarks by Lieut. J. F. Pogson, on the above subject :—

"I observe in the columns of the London *Economist*, that an immense quantity of maize is sent annually to London from America. The price per quarter of 480 lbs. being for American white and yellow mixed from 32 shillings to 32*s.* 6*d.*, whilst yellow Odessa maize and also that from Galatz and Ibraila, is priced at 33 shillings per quarter.

"In 1874-75 the imports of Indian Corn or maize, amounted to cwts. 15,577,064 in 1873-74 to cwts. 17,442,897, and in 1872-73 to cwts. 20,254,498. If we leave out the hundreds, the total is cwts. 53,273,000, or an annual average of cwts. 17,757,000.

"In the Upper Provinces, Rs. 2 per maund is considered a fair and remunerative price for muckee or maize, and at this rate the cwt. costs Rs. 2-11-2, and the quarter of 480 lbs. or maunds 5, seers 33, Rs. 11-10-4. The London selling price is at par Rs. 16, but as such exchange is out of the question, the cost in English money will be considerably less. In good and ordinary years I think the cwt. of maize could be purchased for Rs. 2. Then cwts.

17,757,000 × 2 = Rupees 35,514,000 the value of the grain including agriculturists' and vendors' profits. I submit that neither America nor Russia could grow and sell maize at these low rates, and as the Jowar or 'Holcus sorghum' a far superior grain, can be obtained at 1 Rupee per maund, India could actually inundate not only the United Kingdom but all Europe with these two cereals, and as the latter is as nourishing as wheat, and yields a fine white flour, it has only to be made known to come into use, as a bread stuff in England and Europe. I have already shown how easily India can compete against all comers, in the wheat trade; and if maize and Jowar be added, our exports of grain will be something immense.

"As the American maize does not suit the climate of the N. W. Provinces owing to its ripening late, all imported seed should be sent to the Punjab, where even the country maize ripens in October, November, according to change of latitude; and this acclimatised maize would exactly suit the London market; the N. W. Provinces, Oudh, and Upper Behar could supply the Jowar.

"The immence increase of poppy cultivation in China will, before long, seriously affect the Opium revenue, and unless we have something to fall back upon, heavy losses will result. The cereals named (Jowar and Maize) would sell well in China, where food seems scarce, and is getting more so. Here, again, Government convict-labor could be turned to account, the crops raised being sold for export to China.

"Even if gold was freely found in India, matters would not mend, unless grain exports were increased; and if this was started all would go well."

Oil-producing Trees of British Burma.

The following remarks from Lieut. Pogson, were accidentally omitted in last month's Proceedings:—

"I notice," writes Mr. Pogson in a letter of 20th August—'that my information on the edible oil-producing trees of Burma have not been published. Owing to want of information on this subject I see the Punjab Horticulturists are going to try olive cultivation on a large scale for the sake of the oil. Now, if the Burmese trees answer as well, and grow sooner, they are to be preferred'."

In his previous letter, Mr. Pogson encloses the following remarks:—

"The sweet or fatty oil-producing trees, sub-trees, and shrubs of British Burma are as valuable as the *olive*,* those producing naturally sweet-scented oils being still more so. But there being no official system of organisation for

* Olive.—The olive oil of *Sicily* changes hands at from £43 to 45 per tun, while the produce of *Goiza* commands from £46 10*s.* to £47 per tun. The superior qualities of olive oil are used for culinary purposes, the inferior is used in the preparation of wool for spinning, and the lowest quality of oil produces the finest soaps.

The cocoanut of India realises in London from £38-10*s.* to £42 per tun, and as it is not fit for food, it stands to reason that the pure sweet oils of British Burma will sell at a higher rate than cocoanut, while the naturally a scented oil would command very high prices, for conversion into toilet hair oils and *pomades* so extensively used by continental nations.

turning these great and permanent sources of wealth to account, they have remained in *statu quo*. As this paper is intended to draw the attention of the British capitalist to the natural resources of India, it may not be out of place to supply detailed information on the subject of these *oil-producers*, and as they would all grow in the *Andaman Islands*, and also on the *Malabar* and *Coromandel Coasts*, the Penal Settlement might be converted into a valuable wealth-producing possession, exporting convict-made bland oils to Europe, and supplying the coasts named with seedlings, whilst, if sanctioned by the Government of India, the officers of the Forest Department of Burma, could supply applicants with the seeds needed.

"Of these the most valuable are, *First*.—The *Connarus speciosa*. A large tree, very plentiful and remarkable for the quantity of its seeds, which are of large size abounding in sweet oil.

"*Second*.—The *Connarus nitida*, a sub-tree, about ten feet in height, very plentiful and affords an oil seed of smaller size, but equally rich in a similar sweet oil.

"*Third*.—The *Galedupha arborea* and *Galedupha tetrapetala*. Both of these yield an oil expressed from the seed. Both trees are very common. The seed is large, and it is alleged might be collected in any quantity. The oil is commonly used for burning, and medicinally as an embrocation.

"*Fourth* and *Fifth*.—The *Buchanania latifolia*, and *Buchanania angustifolia*. Both trees are freely met with, and both yield in abundance valuable oil seeds of the sweet or fatty class.

"*Sixth*.—The *Xanthoxylon badrunga*. This plant affords a plentiful supply of oil seeds, which, states Doctor J. McClelland, has not as yet I believe been taken advantage of as it deserves.

"*Seventh*.—The *Calophyllum longifolia* is from its size reckoned amongst timber trees, and affords an oil seed. This tree together with the *Calophyllum inophyllum*, and *Calophyllum laneeolaria* bear fragrant flowers. Their seeds are large, and contain a considerable portion of oily matter which possesses much of the aroma of the flower.

"*Eight*.—The *Spondias mangifera* is a tree which grows to a considerable size, and yields abundant seed rich in oil.

"The reader will hardly believe that this list of oil seeds 'might be extended,' and that it has purposely been confined to those which could be supplied in bulk in the Rangoon, Pegu, and Tounghoo districts of British Burma."

Grouping of Palms on Lawns.

Read a note from Mr. D. T. Gordon, of Surdah, seeking information respecting the best mode of grouping Palms on a large circular bed in the centre of a lawn.

The Secretary mentioned that Mr. John Scott, had obligingly assisted him in meeting Mr. Gordon's request. Under the impression that the plan prepared by

Mr. Scott, and the kinds of palms to be introduced, would be interesting and useful to many, now that the culture of this most beautiful family had extended so considerably, he proposed that this sketch be lithographed, for insertion, with Mr. Scott's notes, in the next issue of the Journal. Agreed to.

Mr. George Bartlett forwarded, for inspection, a fine healthy grown plant of a rare palm "Dimorphus Rumphii," which was much admired.

For the above contributions and communications, the best thanks of the Society were accorded.

Thursday, the 19th October, 1876.

W. H. COGSWELL, ESQ., *in the Chair.*

The proceedings of the last (August) Meeting were read and confirmed.

The following gentlemen were elected Members:—

Messrs. W. F. Westfield, Mark Hartnell, C. T. Ambler, W. D. Blyth, and G. S. Freeman.

The names of the following gentlemen were submitted as candidates for election:—

Lieut. John Corse-Scott, 37th N. I., Bareilly,—proposed by Capt. Wm. Barrow, seconded by the Secretary.

Manager Coliabar Tea Estate, Assam,—proposed by Mr. H. H. Sutherland, seconded by Mr. J. A. Crawford.

H. W. Bruce, Esq., Tea Planter, Tezpore,—proposed by Mr. E. H. Cowie, seconded by the Secretary.

E. J. Shuttleworth, Esq., District Superintendent of Police, 24-Pergunnahs,—proposed by the Secretray, seconded by Mr. Crawford.

Duncan MacBean, Esq, Proprietor Paror Tea Estate, Kangra Valley,—proposed by Major-General H. M. Wilson, seconded by the Secretary.

Moulavi Nassiruddin Ahmed, Zemindar, Behar,—proposed by Baboo Bimala Churn Bhattacharjya, seconded by Mr. W. H. Cogswell.

S. J. Andrews, Esq., Gadee Zillah, Moorshedabad,—proposed by Mr. J. Perrin, seconded by Mr. Cogswell.

Baboo Chunder Coomar Roy, Narail,—proposed by Mr. A. Hume Smith, seconded by the Secretary.

Baboo Gopal Chundra Basu, Kuranpal *vid* Cuttack,—proposed by the Secretary, seconded by Baboo P. C. Mittra.

Wm. Henderson, Esq., Pathicherra, Cachar,—proposed by Mr. W. Spicer, seconded by the Secretary.

S. Dignam, Esq., Solicitor, Calcutta,—Proposed by Mr. S. U. Phipps, seconded by Mr. Crawford.

Dr. E. B. Gardner, Civil Surgeon, Jaunpore,—proposed by Mr. C. Nickells, seconded by Mr. D. M. Gardner, C. S.

Rejoined.—Mr. E. C. Vancutsem, Calcutta, Dr. H. Bowser, Balasore, and Sir James Wemyss, Bart., Dacca.

CONTRIBUTIONS.

1. Annual Report of the Ohio State Board of Agriculture for 1874. From the Board.

2. Manual of Potato cultivation. By W. B. Freeman, Superintendent Model Farm, Shillong. From the Author.

3. Description of the process at present used for manufacturing Cinchona febrifuge at the Sikkim plantations. By H. C. Wood, Government Quinologist. From Government of Bengal.

4. Proceedings of the Asiatic Society of Bengal, August 1876. From the Society.

5. A collection of Peach grafts, from the Queensland Acclimatisation Society. Received from the President.

6. Seed of the Carob tree (*Ceratonia siliqua.*) From C. E. Livesay, Esq.

7. A quantity of Geranium seed. From C. Nickels, Esq.

GARDENER'S REPORT.

Acknowledges receipt in the garden of 20 Peach trees in 15 vars (one since dead); from the Queensland Acclimatisation Society.

Five Wardian cases of Araucarias, Conifers, Palms, and Crotons, and some seeds; from Messrs. Shepherd and Co.'s Nursery at Sydney, in very indifferent condition.

A Ward's case of 24 Cinnamon Liches; from Messrs. A. S. Watson and Co. of Hongkong, of which 14 have arrived in good condition.

A quantity of *Lycopodium* from the Nicobars in 2 vars; from O. H. Brookes, Esq.

A quantity of seeds from Queensland Acclimatisation Society.

Three packets Palargonium seeds; from C. Nickels, Esq.

A small collection of plants; from the Royal Botanic Garden, Calcutta.

Sends for exhibition, in obedience to orders, a large number of new plants which have from time to time been introduced into the garden since its formation at Alipore, commencing, as directed, in alphabetical order, excepting only in case of flowering varieties which the Secretary explained were to be availed of for exhibition while in bloom. Such exhibition will be continued for the next two months to complete all newly introduced plants.

Sends also for exhibition two fruits of Solly Qua, and a bunch of *Musa Cavendishii.*

Reports on garden operations generally, and fears that scarcity of water supply in the tanks will become a serious question.

The Gardener also submits a preliminary report of the result of his trial sowings of imported vegetable seeds, American and French, which is altogether favourable. A completed report will be submitted at next meeting.

The following is a list of the plants exhibited:—

Abutilon Selowianum marmoratum.
Acalypha glabrata.
„ marginata.
„ colorata bicolor.
„ tor ta.
Adiantum Farleyense.
„ amabile.
Allamanda Hendersonii.
Alocasia metalica.
„ zebrina.
„ Sedenii.
„ violacea alba?
„ intermedia.
„ Lowei.
Anthurium magnificum.
„ miquelianum.
„ pedato radiatum.
„ tetragonum.
„ Wildenovi.
„ longifolium.
„ cordifolium.
„ crystallinum.
„ regale.
„ leuconeurum.
„ grande.
Aphelandra Aurantica Rœzlii.
„ Leopoldii.
„ fascinator.
„ nitans.
Aralia Guilfoylii.
„ reticulata.
„ Orsyana.
„ Veitchii.
Begonia blanda.
„ Duchess de Brabant.
„ Manæl de Silva Brusky.
„ Marshalli.
„ Mr. Stewart Low.
„ The O'Donoghue.
„ Sp.(Darjeeling)?
„ manicata.
Begonia Sambo.
Bignonia hœzlii.
Caladium Auguste Riviere.
„ Cannærtii.
„ Dr. Lindley.
„ Duc de Nassau.
„ E. G. Henderson.
„ Jules Putzeys.
„ Lepeschkinei.
„ Louise Poirier.
„ Max Kolb.
Caladium Mrs. Dombrain.
„ Murillo.
„ Napoleon 3rd.
„ Schmidtii.
„ Alfred Bleu.
„ Brognairtii.
„ Burree.
„ Herold.
„ Imperatrice Eugenie.
„ Lucy.
„ Poecila.
„ Ricci.
„ Vesta.
„ Donezetti.
„ Laingi.
„ Princess Royal.
„ Princess of Wales.
Cissus Endresii.
„ Lindenii, same as Amazonica.
Clerodendron speciosum.
„ Balfourii.
Croton aucubæfolium.
„ elegans.
„ irregulare.
„ undulatum.
„ Vietchii.
„ maxima.
„ grande.
„ Hookerianum. { Not true Same as Vietchii sent for comparison.

Croton interruptum (Jacksons.)
„ multicolor?
„ Weismanii.
„ Youngii.
„ Sp. (Jacksons.)
„ Johanis.
„ majesticus.
„ ovalifolius.
„ spiralis.
„ volutus.
„ angustifolius giganteus.
„ cornutus.
„ fucatus.
„ Hillianus.
„ Disrealii.
„ Mooreanus.
„ Albertii.
„ Evansiana.
„ Lori Cairnes.
„ Traveller.
„ angustifolia } Obtained from the Botanical Garden under these names Appear the name
„ interruptum }

Curculigo recurvata variegata.
Cyanophyllum Bowmanii.
„ spectandum.
Dieffenbachia Bausei.
„ Bowmanii.
„ eburnea.
„ gigantea.
„ Baraquimanum.
„ grandis.
„ imperialis.
„ nobilis.
„ Pearcii.
„ illustris.
„ lanceola.
Dracæna albicans.
„ Chelsonii.
„ Guilfoyile.
„ Haageana.
Dracæna gracilis.
„ pulcherrima.
„ amabilis.
„ Dennisonii.
„ excelsa.
„ Gayeii.
„ Hendersonii.
„ imperialis.
„ metalica.
„ Mooreana.
„ nigro-rubro.
„ princeps.
„ Shepherdii.
„ striatifolia.
„ Youngii.
„ fragrans latifolia.
„ marginata.
„ Amboynensis.
„ Australis lineata.
„ „ Vietchii.
„ circulasa maculata.
„ magnifica.
Dichorisandra undata.
„ vittata discolor.
„ „ tricolor.
Eranthemum atropurpureum.
„ Cooperii.
„ sp.
Ficus eburnea.
„ Parcelli.
„ sp. Kew.
Fittonia gigantea.
Cocos Weddelianum.
Godwinia gigas.
Ixoras, Dixiana, sanguinea, and spectabilis, in flower.
Maranta virginalis, Makoyana.
„ Warscwiczii, Subispatha, picta, Parsina, bella, Seemanii, porphyrocalis.

The fruit of the Cavendish Plantain was approved of, and instructions given for propagating largely.

Tobacco cultivation and curing in Oude.

Dr. Bonavia, Superintendent, Department of Science, Lucknow, submits some tobacco leaf raised from Manilla seed and cured by Mr. S. L. Naher of Pratabgurh, Oude, by a process of his own. Dr. Bonavia asks for its examination by competent judges with a view to pronouncing on its fitness for the foreign market. Messrs. Ernsthausen and Oesterly obligingly report on this sample as follows:—

"Good thin leaves, rather indifferent cure, but of good flavor, partly suitable for segar covers; market value uncertain, probably 10 to 12 Rupees per bazar maund."

Exotic and Indigenous Wheats.

Read the following letter from Lieut. J. F. Pogson on the above subject: —

"By this day's bangy post I have sent you a small parcel containing six samples of wheat. Of these two one of the American kind ('White Winter' and 'Little Club') sent by you for experimental cultivation, and the four others are Hill wheats. One being the produce of imported English seed wheat grown by a Zemindar for seven successive years. The imported seed was given by the late General P. Innes, and was first sown in 1869, and harvested in May 1870.

"A comparison of the American with the three indigenous Hill wheats will show, that they are superior to the American, whilst the acclimatised English is superior to all.

"The small samples of the American wheat are sent for purposes of comparison.

"The sample No. 3 is grown in the Protected Hill State of 'Koonyhar,' not far from the Military Cantonment of Subathoo. This wheat is considered the finest quality of wheat grown in these Hills, and its flour is very white and greatly prized by all classes. The Rajas, Ranas, and superior classes consume this wheat in preference to all other home grown kinds, and if the Koonyhar wheat answers in Behar, its introduction and cultivation would be most beneficial. I have obtained ten seers of this wheat from Koonyhar direct, and have secured five seers of the acclimatised English wheat, and shall be glad to send for disposal under the orders of the A. and H. Society as many seers as you may require. So pray let me know without delay, as every hour is now of value. Short telegram would suffice, and I would start the seed as soon as received, either by banghy or bullock train, or part by each mode of transit.

"I will have the remainder of the American seed sown by my 'Maêt,' who is a Zemindar. I showed him the seed, and his reply is worth recording—'We can, and do grow, better wheat than this; but as you wish it, I will sow and grow both kind.'

"The Hill men would not of their own free will grow American wheat of the quality sent, for the indigenous kinds are better, and bulk for bulk weigh more.

"My own opinion is that Hill wheat grown in the plains on good wheat land, would produce superior crops, and under high cultivation very superior crops.

"These wheats stand any amount of cold, and if the samples sent by banghy

were to be sown as soon as convenient in the Hooghly Zillah, near or above Chinsurah, a good result might be safely predicted.

"I have not yet seen 'Nerbudda wheat,' but if it is superior to Koonyhar, its introduction and cultivation on the large scale would pay the producer well."

MEMORANDUM, DESCRIPTIVE OF THE 6 SAMPLES OF WHEAT.

1. American Wheat Imported "White Winter."
2. American Wheat Imported "Little Club."
3. Sample of Koonyhar Wheat, indigenous.
4. Ditto of Hill-grown Wheat, indigenous.
5. Ditto of Simla Wheat purchased in the bazar in August 1876.
6. Ditto grown at Simla. Wheat the produce of imported seed, English.

Mr. R. S. Duncan, of the Phœnix Steam Flour Mills, has kindly reported on these samples to the following effect :—

Packets 1 & 2 are samples of the American White Winter and Little Club wheat, on which I have already reported in my letter of the 19th August.

Packet No. 3, marked Indigenous Koonyhar Wheat, is a fine hard Dooden wheat full of gluten and consequently well suited for making Soojee, from which all our loaf bread in India is made. This is a very useful description of wheat in constant demand in Calcutta market for local consumption.

Packet No. 4, marked as "Hill grown indigenous wheat from Simla," is a remarkably fine full bodied floury wheat equal to the American "White Winter" Flour made from this wheat should bear comparison with Californian flour.

Packet No. 5 appears to be the same wheat as the above, but not so fair a sample.

Packet No. 6, marked as "The produce of imported English seed grown at Simla," is a very inferior hard flinty grain unfit for flour, and far too flinty for Soojee, and I should suppose unsaleable in the Calcutta market.

This to be the produce of English wheat grown in this country, is very disheartening. Better improve the cultivation of the indigenous wheat (as samples 4 and 5) as no better wheat need be desired than these two samples from Simla.

Resolved.—That the above notes and report be introduced in this day's proceedings for the information of persons interested in the wheat trade, and to enable them to communicate direct with Lieut. Pogson. Best thanks were accorded to Mr. Duncan for his report on the samples.

Utilization of the seed of the China Tallow Tree.

Read the following communication from Dr. G. Henderson, from Rawul Pindi on the above subject :—

"I have now found out a method of utilizing the seed of the tallow tree, which thrives in most parts of India, and which would no doubt have been largely cultivated had it not been for the difficulty of extracting the tallow. Some months ago I suggested to Mr. Myers, the Gas Engineer at Rawal Pindi, that a

great saving might be effected if he would use oil seed in retorts instead of oil. He acted on my suggestion, and for some time has made all the gas for the lighting of the barracks here from oil seed. A case of sheet iron which exactly fits the retort is filled with the mustard seed, and when the retort is hot, this sheet iron tube is introduced. Now if the seed of the *Stillingia sebifera* can be grown cheaply which, I believe, it can in most parts of India, the very large quantity of oil and tallow which its seeds contain might be utilized in this way. I believe a patent was taken out some years ago for making gas from oil cake, but it struck me at the time that it would probably pay better to use oil, instead of oil cake for this purpose."

Letters were read—

From the Superintendent of the Jail at Dinagepore, applying for full information connected with the culture and manufacture of Havanna Tobacco. Complied with.

From General C. Murray, referring to the Mahogany tree and the adaptability of the soil in the vicinity for its growth. "I take this opportunity of mentioning," remarks General Murray, "that the Mahogany trees I got up last year have grown up four feet already. They are planted out at the "Park" (is an estate here.) The soil there seems well adapted to them. There are Mahogany trees there; a couple of tremendous size must have been planted upwards of 70 years ago, the largest 11 feet 8 inches in girth, four feet from the ground."

From H. B. Beckett, Esq., dated Bannu, 21st October, drawing attention to an enormous plant of double Balsam: "I enclose the dimensions of a double Balsam, which is now growing in the public garden here. I have never before seen or heard of a plant of this size; I therefore send the dimensions. Height of the plant, 38 inches. Circumference of stem at the base 7 inches. Circumference of the bush at its widest parts 9 feet 6 inches. All one mass of scented blossom—double."

From W. T. Dyer, Esq., Assistant Director, Royal Gardens, Kew, applying for all the separate publications of the Society connected with Tea cultivation in India, irrespective of the Journal, to enable them to meet constant applications on the subject. Complied with.

Thursday, the 23rd November, 1876.

BABOO PROTAPA CHANDRA GHOSA, *V. P., in the Chair.*

A letter was read from the President, intimating his inability to attend the meeting consequent on indisposition.

The proceedings of the last meeting were read and confirmed.

The following gentlemen were elected Members:

Lieut. John Corse-Scott; Manager, Colebar Tea Estate, Assam; Messrs. H. W. Bruce, E. J. Shuttleworth, Duncan MacBean, S. J. Andrews, Wm. Henderson,

S. Dignam; Moulavi Nassiruddin Ahmed; Baboo Chunder Coomar Roy, Baboo Gopal Chundra Basu, and Dr. E. B. Gardner.

The names of the following were submitted as candidates for election:

Baboo Jogendro Nauth Roy, of Norail,—proposed by Mr. A. Hume Smith, seconded by the Secretary.

Dr. A. D. Cooper, Civil Medical Officer, Naga Hills,—proposed by Mr. P T. Carnegy, seconded by the Secretary

CONTRIBUTIONS.

1. Records of the Geological Survey of India, Vol. IX., Parts 2 and 3. From the Government of Bengal.

2. Report on the Royal Gardens, Kew, for 1875. From the Director.

3. Journal of the Asiatic Society of Bengal, Part 1., No. 2, and Part 2. No. 3, for 1876. From the Society.

4. Samples of two seasons' acclimatised Maize of different sorts, raised in his garden at Naini Tal, originally from American stock. From Capt. W. Barron.

Capt. Barron has promised to send a larger quantity in April next for distribution among the Members. He distributes it among the natives who are anxious to have it. These samples were highly thought of, and the cobs considered equal in size and the seeds in regularity to the imported American Maize of this season.

5. A small supply of Guinea grass seed, raised at Shahpore, Oondee, Tirhoot. From W. B. Carshore, Esq.

Mr. Carshore had intended sowing a large quantity, but a tremendous hail-storm, at the end of October, destroyed his crops.

6. Seeds of *Corypha Australis*, from the Acclimatisation Society of Queensland. From L. A. Bernays, Esq., Vice-President.

7. Four Peach grafts. From C. Nickels, Esq.

These grafts are taken from the tree referred to by Mr. Nickels in the June proceedings as yielding such fine fruit, both in quality and size.

8. A specimen of Gum Kino, of fine quality, from the "Peasal" tree (*Pterocarpus Marsupium.*) From C. E. Livesay, Esq.

GARDEN.

The Gardener's monthly report was submitted. The receipt of a further supply of 84 Lichee grafts, from Messrs. A and S. Watson of Hong-Kong, is announced. The condition of the healthy plants since arrival is improving, whilst the sickly ones are gradually dying. "The wood selected for *gooties* was very much larger than is generally used in this country, and probably several will die as the season advances." The *Corypha Australis* seed from Queensland appears fresh and good. The Peach grafts from Mr. Nickels in good order. The *Araucarias* from Australia, to which allusion was made in the last report, are now recovering. "There are no actual deaths since last report. About 20 still look sickly, and may die. It is not anticipated that any more will die." There is a large stock of coffee plants on hand raised from Arabian stock. "I have to report that of

the 12 Liberian Coffee planted out. 5 plants are shewing indication of flowering this season; one tree very abundantly, and may be in flower in January next. There are ready for distribution of this variety, 12 seedlings from Mr. Bull at from 6 to 9 inches high, and 8 from cuttings about the same size, and 20 at about 3 inches; also 50 smaller which will be ready from time to time." The Gardener adds that the Roses have been pruned, and cuttings again made of the best pruning to ascertain if at this season they can be made to root.

The following is a list of plants sent up for exhibition at this Meeting:—

Covellia rhizocarpa.
Dalechampia Roezliana alba.
Bignonia picta.
Fittonia Verschaffeltii.
Hyophorbe amaricaulis.
Hoffmania robusta.
„ Roezlii.
Laportia Schomburckii versicolor.
Paulinia thatictrifolia.
Kentia Balmoriana.
Peperoma arifolia, (to exhibit the size of plant 9 months from a leaf.)
„ Verschaffeltii, (same age.)
Pandanus Maritiana.
„ Veitchii.
Philodendron Lindenii.
Pteris serrulata cristata.
Sanchezia nobilis variegata.
Terminalia elegans.
Vanda cerulea (in flower.)
Dypsis Sp.
Hoffmania Ortgiesii.
„ refulgens.
Kentia Canterburriana.
Rhopalia elegantissima.
Retinospora pipifera.
„ obtusa.
Rhodea Japonica macrophylla marginata.
Thujopsis Dolobrata.
Stadmania amabilis.
Yucca filamentosa.
Stevensonia grandifolia.
Smilax macrophyllavariegata.
„ longifolia variegata.
Chilie from Bhotan in fruit (7 ripe.)
Cissus porphoriphyllus.

In connection with the above, a report from the Garden Committee was submitted, by the Council, suggesting expenditure of a sum not exceeding Rs. 650 for the introduction of certain works connected with the water supply, so as to economise labor on this head; for the erection of additional sheds for housing both rare and ordinary plants in pots; for purchase of another pair of bullocks, and for the supply of a large number of pots of sizes, &c. The Committee also report in respect to the planting out of a quantity of Lychee grafts recently received from China, and to the disposal of a large stock of Araucarias of sorts from Australia. The Committee also recommend that the sale of ornamental plants be re-opened to the public under certain reservations.

Resolved.—That the report, in all its details, be confirmed.

Blight of various kinds affecting Tea Plants.

A paper on the above subject, in the shape of a prospectus drawn up by the Council, and in connection with the discussion which took place at the general

meeting in August last, was next submitted. The following is a copy:—

The subject of blights affecting Tea plants has been again recently brought to the notice of the Agricultural and Horticultural Society; and it being considered desirable that some action be taken in the matter, it has been referred to the Council with that object in view.

The line of action the Council are disposed to recommend, is as follows:—

To engage the services of a practical Entomologist to travel over the Tea districts of Assam and Cachar, for two years, whereby he might be able, by carefully studying the character of the various kinds of blight in their several localities, to arrive at some practical methods of preventing the propagation of these pests, and when they are found, if not of entirely destroying, at least of modifying the effects of their ravages.

It is estimated that the services of such a practical professional man might be obtained at Rs. 300 per month which, for two years, would amount to ... ... Rs. 7,200

The cost of passage from England and back ...	...	„ 1,000
Contingencies, travelling, &c. &c. ...	...	„ 1,800
	Total	„ 10,000

The Managers of gardens would, no doubt, afford him every aid in travelling through the districts; and exercise the rights of hospitality to a certain extent, so as to lessen his expenses. If the Agents of the various gardens, especially the larger ones, would agree to subscribe a certain sum according to acreage, say Rs. 10 per hundred acres, under cultivation, the amount to each would be trifling, even if the results were not successful.

The Council would take steps to endeavour to secure the services of a competent person. They would also undertake to publish the result of his enquiries and furnish each subscriber with a copy. When publishing such reports the Council would also propose to supplement it with a *resumé* of the papers already collected by the Society over the last eight years, and published in their Journal and Proceedings, so that, taken together, with the proposed Entomologist's report, the Tea Planter may be put in possession of all the practical evidence collected on the subject. The compilation and reprinting of these papers, it is believed, would be covered by the above estimate.

Resolved, that this prospectus, in a printed form, be circulated to all interested in the subject; the further action of the Society depending on the result thereof.

Potatos.

Read the following letter from E. Buck, Esq., Director of Agriculture and Commerce, N. W. Provinces, advising despatch of two maunds of seed potatos

"I have just despatched some seed potatos from Nainee Tal to the Government Farm at Cawnpore, and have instructed the Superintendent to forward two maunds to your address, you should receive them by the 15th. It has occurred to me that the arrangement which I have found to answer in these provinces may perhaps be applied with success to Calcutta, *viz.*, to export seed yearly from the Hills for raising a spring crop in the Plains.

"Four years ago I imported several kinds of English seed, which however reached me mixed and without names attached. The produce of some of the seed potatos which I gave to cultivators at Nainee Tal is now in the market, and the potatos are much liked. I raised a good crop at Cawnpore from similar tubers two years ago, and the produce was much superior to the ordinary native grown crop.

"It is easy to export from Nainee Tal by end of September, so that the potatos arrive in Cawnpore by the first week in October, the sowing season of that district. I should be glad to learn about what date potatos are usually sown in Calcutta.

"If you could kindly arrange for the seed I now send being sown at Calcutta, you may be able to judge whether it is worth while to continue the practice of obtaining Hill seed, in which case I could arrange for larger and earlier supply. The cost of carriage on seed will not much affect the price of the out-turn which ought to be at least twenty fold. If the potatos turn out better than the ordinary potato of the Calcutta market, they will probably realize a price which will more than pay for the seed carriage.

"The potatos I send are by no means the largest of the crop. I chose a medium size. There are, I think, 3 kinds, and the round ones I believe to be the old Nainee Tal stock, and not produce of my seed.

"I shall always be glad to receive any seed potatos which the Society can send me.

"If a few seers could be obtained for me, so as to reach Allahabad by January, I can have them sown next season at Nainee Tal, and supply you with some of the out-turn by the end of the following September.

"I ascertained 4 or 5 years ago that some Lucknow cultivators had already adopted the practice of procuring Hill seed for winter sowing."

The Secretary intimated that he had distributed these potatos to about 12 members in various parts of Lower Bengal, and there was still a small stock on hand, but it was not of a superior stock. Letters were read—

1. From E. S. Nuthall, Esq., Sylhet, alluding to the rapid growth of some teak trees in his factory grounds. "It may interest you to learn," observes Mr. Nuthall,—"the success of some teak I planted last year. I have about 30 plants, the largest of which is 15 feet high; it has grown 10 feet this year. There are a few not above 2 or 3 feet high. I cannot account for their smallness as they were all planted at the same time on the same ground; unless the seed being very old and dry when I received it has had anything to do with deficient growth."

2. From C. E. Livesay, Esq., Dehree, forwarding an abnormity, in the shape of the stalk of a *Petunia*. "By this post I send you a stalk of a *Petunia* cut some months ago and forgotten. The formation is very peculiar, the leaves growing on a broad blade of a stalk like the cockscomb surmounted by a bunch of about a dozen or more flowers at top. I would like to know if this has been seen before."

Mr. Kurz, of the Royal Botanic Garden, remarks, that this *Petunia violacea* is in a state of fasciation, such as occurs in many plants, of which Masters in his Teratology has given a list. *Petunia* is not included in it.

3. From C. E. Blechynden., Esq., submitting a mode of watering flower seeds in pots without injury to the seeds.

4. From S. Umeurah, Esq., Japanese Commissioner, applying for back copies of Journal and for seeds of sorts, and promising to reciprocate. To be complied with.

Thursday, the 21st December, 1876.

S. H. ROBINSON, ESQ., *V. P., in the Chair.*

The proceedings of the last meeting were read and confirmed.

The following gentlemen were elected members :—

Baboo Jogendro Nauth Roy and Dr. A. D. Cooper.

The names of the following were submitted as candidates for election :—

Frank Harding, Esq., c. s., Jungypore,—proposed by Mr. J. Perrin, seconded by Mr. S. J. Andrews.

J. J. Allen, Esq., Furka Ting, Assam,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

W. G. Parcell. Esq., General Manager, Dehing Company, Assam,—proposed by Mr. F. Jennings, seconded by Mr. S. H. Robinson.

CONTRIBUTIONS.

1. Administration Report on the Jails of Lower Provinces for 1875. Report on the Police of the Lower Provinces for 1875. Memoirs of the Geological Survey of India ; *Palæontologia Indica*. Ser. XI. I. Lac ; production manufacture and trade. From the Government of Bengal.

2. Administration Report on the Hill Tracts, northern Arrakan, for 1875-76. From the Commissioner of British Burma.

3. Report on Oil seeds and Oils in the India Museum. From Dr. Forbes Watson.

4. Notes on the complete utilisation of Indican in the Indigo-ferae. for the formation of indigo blue : by P. Michea. From the Author.

5. Memoirs on the Geological Survey of India, Vol. XII. Part 2. Report on the Administration of the Registration Department of Bengal for 1875-76. From the Government of Bengal.

6. A plant of *Erythrina Belangere.* From Mr. G. W. Bartlett. Mr. Bartlett states that the plant was imported by him three years ago, but he has only succeeded in increasing it this season. "It is of a dwarf habit, and quite a gem when in bloom, the delicate color being quite different to all the others we have. I have no hesitation in saying that it is the finest of the family as yet introduced in this country."

7. A small quantity of seed of the giant Balsam referred to in his letter read at last Meeting. From Mr. H. B. Beckett, Deputy Commissioner, Bannu.

8. A quantity of Rose cuttings from the public garden at Lucknow. From Dr. Bonavia.

GARDEN.

The Gardener's monthly summary was read, reporting progress in the Orchard department, the almost completion of a new plantation of roses, and the erection of new sheds, clearing of garden, &c. The Gardener forwards for exhibition certain kinds of vegetables such as turnips, carrots, lettuce, and peas raised from French and American seed.

TEA BLIGHT.

The Secretary submitted a printed copy of Circular on the above, as agreed to at last monthly Meeting, and a list of Agents for various Companies to whom it had been sent.

PROVISION OF SEEDS FOR 1877.

A report from the Special Committee on the above was next submitted. The Committee recommend that vegetable seeds be procured from America, vegetable and flower seeds from France, and flower seeds from Germany; and that Messrs. D. Landreth and Sons' attention be called to the general failure of the flower seeds supplied them last season, and that they be requested to make an allowance for the same. The total cost, irrespective of contingencies, freight, insurance, &c., is estimated at ten thousand Rupees. Confirmed.

CAOUTCHOUC.

A paper was communicated by the Committee of the Economic Museum, in reference to the yield in Bengal of caoutchouc from *Ficus elastica,* and a specimen submitted of the product obtained from Furreedpore, and forwarded by the Local Committee of that Station. The attention of the Chairman of the Local Committee at Furreedpore having been called to the subjoined extract from the Official Report upon the Royal Gardens at Kew, for the year 1875, with reference to the report of Dr. Bose, the Civil Surgeon of Furreedpore, wherein he states that a tree of *Ficus elastica* in the garden of the Chairman "yields pretty abundantly a fair quality of India Rubber," that gentleman (Mr. Weekes) furnished a further report, corroborative of the first, of which the following is an extract :—

"On the 19th November I went into my garden with Dr. Bose, and the

Judge of the District, and tapped my tree in several places. The next day, yesterday, Dr. Bose kindly collected the dried milk, which had exuded, and I forward the result for your inspection. The milk came out directly the tree was tapped, and hardened the same day almost immediately. It was allowed to stay on the tree till the next day in order that more might exude. I think there is no doubt from the above that the tree flourishes in the plains sufficiently well to be a success, and that it would pay to cultivate the tree at least in this district which is rather damp. The tree is an old one that has been partly blown down. I have raised several cuttings from it, and am planting the same along the district roads in the same way that I have done Teak and Mahogany, Sissoo, and many other timber trees."

The following is the extract from the Official Report upon the Royal Gardens, Kew, above referred to :—

"The production of different kinds of caoutchouc in India continues to engage the attention of the India Office and of this establishment. One fact in connection with it which seems to require very careful consideration has been pointed out by Mr. Mann, in his report on the caoutchouc plantations in Assam. It is found that although the *Ficus elastica* will grow with undiminished rapidity and luxuriance in situations remote from the hills, it fails to yield caoutchouc. Mr. Mann concludes that no greater mistake could be made than to start plantations of *Ficus elastica* in any part of Bengal. It appears therefore, judging from this case, that conditions which may ensure the successful growth of caoutchouc yielding trees may not be sufficient to determine their producing caoutchouc."

The Chairman remarked in reference to the above that there is an old tree of *Ficus elastica* in Mr. Stalkartt's garden at Goosree in the vicinity of Calcutta, which yielded milk freely.

Letters were read—

From the Under-Secretary, Government of India, Department of Revenue, Agriculture and Commerce, dated December 14th, intimating in reply to the Society's letter of 30th April last, that His Honor the President in Council "much regrets that under existing circumstances he is unable to sanction the application therein made for the renewal of the Government grant of five thousand Rupees per annum."

2. From L. A. Bernays, Esq., V. P., Queensland Acclimatisation Society, applying for a collection of Mango grafts from the Society's orchard. Complied with.

3. From the Secretary Economic Museum, forwarding certain papers connected with the cultivation and production of sugar and tobacco in the district of Bancoorah, as communicated by the Collector.

4. From the Superintendent Government Cattle Farm, Hissar, applying for information regarding the "Caucasian Prickly Comfrey."

The Secretary mentioned that he was unable to afford Col. Robinson the required information, and had pointed out the great improbability of this plant succeeding in the dry plains of India.

A. H. BLECHYNDEN,
Secretary.

REPORT

OF THE

Agricultural and Horticultural Society

OF

INDIA.

Report from the Council, at the Annual General Meeting held on the 1st February, 1877.

ANOTHER year has just closed, and the Council, as usual, are called upon to furnish their annual report on the working of the Society, its progress, its monetary position, and financial prospects.

The Council have much pleasure in stating that His Excellency Lord Lytton has been pleased to signify his acceptance of the office of Patron in succession to the late Viceroy and Governor-General, Lord Northbrook.

The Council regret to observe that the progress of the Society, as regards the election of new Members during the year 1876, as compared with the year 1875, contrasts unfavorably, *viz.*, 91 against 160 in 1875; while the declared resignations in 1876, *viz.*, 52 are equal to the number resigned in 1875. The number of names removed at the end of the year 1876, on account of non-payment of subscriptions for two consecutive years, is, 35, on account deaths* 18, on account of long absence from India, including the names of a few who have returned, but not responded to calls for subscription, 26, making a total deduction of 131 members; thus reducing the number of 827 members shewn in 1875, to 787 members in 1876, as follows:—

The total number of members at the close of the year 1875 was		827
Add elected and rejoined in 1876		91
		918
Deduct deaths...	18	
Declared resignations	52	
Failed to pay subscription for two consecutive years	35	
Absent from India for three years or returned, but failed to respond to calls for subscription ...	26	
		131
		787

* L. Berkeley, Dr. Robert Brown, A. Chardon, A. B. Falcon, Geo. Grace, Hera Lall Seal, H. T. Hynde, Irshad Ali Khan, F. Lamouroux, Percy W. Langdon, Hon'ble W. T. Lewis, Maharajah of Pattiala, A. J. M. Mills, Dr. R. M. Milne, J. G. N. Pogose, Shah Nurial Hussain, H. H. Sheodial Sing, and J Stephen.

comprised as follows:—Life Members 30, Honorary, Associate, and Corresponding 18, and nominal paying members 739; of the latter, there are 63 members absent in England, and 61 who have failed to contribute to the funds of the Society during the year under review; thus reducing the actual effective number of paying members at conclusion of 1876, to 615. This last contrasts favorably with the number as shewn in 1875, *viz.*, 604, but an unfortunate mistake occured in the returns of 1875, *viz.*, that in deducting the absentees no allowance was made for Life Members, Honorary, Associate, and Corresponding Members absent, which should not have been deducted; making a difference of 21 in the actual number of paying members for 1875, which ought to have been shewn at 625 and not 604, thereby making the number in 1876 ten less than in 1875. Of the total number of 787 Members of all classes 127 are resident in Calcutta, 576 in the Country, and 84 in Europe, bringing up the total as specified in the subjoined classified statement :—

Classification.	In 50 previous years.	In 1871.	In 1872.	In 1873.	In 1874.	In 1875.	In 1876.	Gross Total.	Total real number at the close of 1876 after deducting lapses.
Honorary Members ...	20	2	0	0	0	1	1	24	9
Associate Members	6	0	0	0	0	0	0	6	2
Corresponding Members ..	14	0	0	0	1	0	0	15	7
Civilians, Covenanted and Uncovenanted	693	21	14	10	14	16	14	785	106
Merchants and Traders ...	606	14	10	10	8	15	9	682	96
Agriculturists	596	22	27	19	41	90	30	825	270
Military Officers	639	34	12	15	4	4	6	714	86
Medical Officers	229	8	8	7	6	7	5	270	39
Asiatics	267	16	8	8	25	10	15	349	92
Clergy	39	0	1	1	0	0	0	41	5
Law Officers	121	4	4	2	6	6	1	144	28
Miscellaneous, Police and Civil Engineers ...	137	9	3	17	8	12	10	196	47
	3,367	133	87	89	123	161	91	4,051	787

It may not be out of place to record briefly that out of the three several returns, *viz.*, of members who have not paid subscription for the last two years, those who did not pay in 1876, and resignations, are included the names of several newly elected members.

The Council also regret to notice the very small proportion of town-members, as compared with the number in the country. The number of the former being less than one-fourth of that of the latter, *viz.*, 127 against 576; and further, that out of the 127, there are about 20 natives, leaving 103 European members resident in town and composed of all classes of the Calcutta community, which may be regarded as a small number for the large and daily increasing, wealthy, and influential community of Calcutta, who, it appears, are but meagrely represented in the 103 members of the Society resident in Town.

The monetary position and financial prospects of the Society are in no way different, as regards results, to the previous year. The amount of subscription realized in 1876 is Rs. 2,000 less than in 1875; other sources of income and receipt are about in the same proportion as in 1875. There is a falling off in the sale of fruit grafts; and the expenses of the garden, as hitherto, contrast disproportionately, both as respects its usefulness and the financial means at the command of the Society.

The Council have to acknowledge once more the annual donation of Rs. 2,400 from the Government of Bengal, which has materially assisted the Society in meeting its liabilities, and working its objects; and it is to be noted that such aid will be continued for another twelve months only. In connection with this help, the Council have to record, with much regret, that an application preferred in the early part of the year to the Supreme Government for a renewal of the annual grant of Rs. 5,000 has not been favorably responded to; but it is proposed to make further efforts towards the obtainment of this much desired object: and the Council trust the Supreme Government may be induced, at no distant period, to acknowledge by a grant the past services rendered by the Society to the State.

The collection of subscription and other dues from members on account of freight, &c., have had the usual care and attention of the executive, as the arrear list will evidence.

The balance of outstandings for the years 1871, 1872 and 1873, amounting in the aggregate to Rs. 542-11-9, has been written off to the debit of the profit and loss account; the average loss for the three years being about Rs. 180 per annum.

Following is the present state of arrears for the last three years, and the Council rely on the continued exertions of the Executive to bring out a result equally favourable to that accomplished in winding up the working of the Society for the three years previous to 1874.

Balance of arrears for the year 1874	...	Rs.	120 15 1
Ditto ditto ditto 1875	...	„	365 2 5
Arrears for the year 1876	...	„	1,424 11 9
Total, Rs.	...	„	1,910 13 3

The distribution of plants to Members has been steadily carried on during the year. Two hundred and nine applicants, against two hundred and forty in 1875, received 6,139 ornamental shrubs and rose plants against 7,835 in 1875, notwithstanding the great reduction in prices in 1876. Had the prices ruled the same as in 1875, the number of plants would have shewn at a still greater reduction as compared with 1875, for instance, plants, which in 1875, were valued and delivered at rates varying from 1 to 5 Rs. each, in 1876 were valued and delivered at considerably lower figures. There were only 440 cuttings of ornamental shrubs and rose plants in 1876 against 1206 in 1875, and 1594 grafts and seedlings of fruit trees sold in 1876 against 1858 in the previous year. The number of ornamental plants sold to non-members was 2019. This might have been larger, but it was found necessary, in the interest of the Society, to suspend, temporarily, in March last, the sale of plants to the public, in consequence of an insufficiency of rarer kinds, which appear to be particularly sought for by that portion of the Calcutta community who are non-members; and the fact that members entitled to free distribution were not sending their requisitions: and the year has since closed without three-fourths of them availing of the privilege.

This clearly indicates that for three successive years the Society's garden with all its introductions of new plants, and offered yearly in free distribution to members, is little availed of or appreciated; nor does the garden with all its advantages offer any inducement or attraction to the general public to become members, for when non-members are desirous of obtaining plants of rarer kinds, they resort to the Society's garden to obtain them by purchase, in preference to joining the Society and obtaining them gratuitously. Indeed, it may be observed, that the main inducement to join the Society is the obtainment of the supplies of seeds which are annually distributed.

The Society has been in correspondence with various gardens and exchanging plants with them, besides purchasing from English and Australian nurserymen.

The Council have to express their obligations to several friends for donations.

Various subjects of interest in connection with tea-blight, cultivation of wheat, Cuzco maize, &c., have been considered during the year. In respect to the first the Council have suggested combined action on the part of Agents of gardens and others concerned in this important industry. It is at present premature to allude further to this, but the result will be communicated next year.

Statement of Receipts and Disbursements of the AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA, *from 1st January to 31st December*, 1876.

RECEIPTS.

From	Members—Subscriptions collected during the year	...			20,996	11	1
„	proceeds of country vegetable—acclimated flower and other seeds	280	7	0			
„	proceeds of surplus stock of American and French vegetable and flower seeds ...	1,800	0	0			
„	proceeds of fruit grafts	1,048	12	0			
„	proceeds of copies of Journals of the Society	20	7	0			
„	proceeds of copies of other publications of the Society	111	0	0			
„	proceeds of seed cabinets sold ...	40	0	0			
„	proceeds of copies of Hand-book for Indian vegetable garden	19	0	0			
„	amount of freight repaid	702	8	9			
„	amount of suspense account in deposit for appropriation on various accounts ...	767	10	0			
„	amount of commission on Mahogany seedlings sold ...	33	9	6			
„	amount of copy of "Kemp how to lay out a garden" sold	12	0	0			
„	amount of loan recovered from Mr. Head...	374	0	0			
„	proceeds of sale of ornamental plants, grass, &c. &c., and cooly hire at the garden ...	2,113	6	3			
					7,322	12	6
	Agency Seed Department—Amount from Members in repayment of packing and forwarding charges, pots, boxes, &c. . .	...			3,573	11	9
	Total, Ordinary Receipts, Rs.	..			31,893	3	4

EXTRAORDINARY RECEIPTS.

From	Government of Bengal -Donation from January to November 1876 ...	2,200	0	0			
„	proceeds of sale of Government Securities .	5,043	6	5			
					7,243	6	5
	Total, Rupees ...	...			39,136	9	9
	Balance in the Bank of Bengal on 31st December 1875	...			9,322	15	8
	GRAND TOTAL, Rupees ...	...			48,459	9	5

DISBURSEMENTS.

PURCHASE OF SEED ACCOUNT.

By	Messrs. D. Landreth and Son, on account of consignment of seeds received in 1875, and in part for 1876 ...	2,226	1	6			
	Carried over	2,226	1	6			

	Brought forward...	2,226	1	6		
By Messrs. Vilmorin, Andrieux & Co. on account ditto ditto ditto ...		3,895	10	8		
„ Robt. Buist, Jr., on account ditto ditto ditto ...		1,558	5	2		
„ Messrs. Haage and Schmidt, on account ditto in 1875 in full		150	4	8		
„ Messrs. Law, Somner & Co., on account ditto in 1876 ditto		386	6	4		
„ Sundry parties for country vegetable seeds, potatos, &c. &c.		172	1	6		
					8,388	13 10

LIBRARY ACCOUNT.

By Messrs. H. S. King & Co., for sundry publications		122	9	6		
„ Sundry parties for books and newspapers ...		146	0	0		
„ Duffry for binding books ...		35	12	0		
					304	5 6

PRINTING ACCOUNT.

By Messrs. T. Black & Co., for printing letters of call, money receipts, annual reports, &c. &c.					115	8 0

JOURNAL ACCOUNT.

By Messrs. T Black & Co., for printing 750 copies of Journal Vol. V., Part II. New Series, &c &c.					514	15 0

ESTABLISHMENT ACCOUNT.

By Office Establishment, from December 1875 to November 1876		9,011	2	9		
„ Agency Seed Department, ditto ditto ...		3,000	0	0		
					12,011	2 9

ADVERTISEMENT ACCOUNT.

By advertising notices of meetings, seeds for distribution, and surplus seeds for sale, &c. ...					40	2 6

FREIGHT ACCOUNT.

By freight paid on Australian field seeds and Mr. Buists' American vegetable seeds ...		136	12	3		
„ freight paid on packages of seeds, plants, &c., sent to members		723	10	0		
					860	6 3

METCALFE HALL ACCOUNT.

By proportion of house rates, from October 1875 to June 1876, and police, lighting, and water rates to September 1876 ...		499	8	0		
„ Messrs. Burn & Co., balance in full for repairs to the building		3,813	10	1		
„ Sundry petty repairs to the building ...		34	6	0		
					4,347	8 1

STATIONERY ACCOUNT.

By sundry parties for stationery purchased					56	7 6
	Carried forward				26,639	5 5

						Brought forward	26,639	5 5
						Refund Account.		
By amount refunded balances of accounts due to members							189 14 0	
„	ditto	ditto	for seed cabinets sold				50 0 0	
„	ditto	ditto	for Hand-book for Indian vegetable garden				30 0 0	
								269 14 0
						Petty Charges Account.		
By postage on letters, copies of Journals, &c., sent and received							145 4 6	
„	Bank of Bengal commission and brokerage for Government Securities bought and sold						32 9 9	
„	Punkawallahs, hackery, boat and cooly hire, extra packerman, landing and forwarding charges, cost of wax cloth, sealing wax, twine, &c. &c.						391 8 3	
								569 6 6
						Purchase of Plants.		
By Messrs. Veitch and Son for new and rare plants supplied							777 13 3	
„	Messrs. Shepherd & Co. for	ditto	ditto				564 11 3	
„	Mr. W. Bull for	ditto	ditto				670 4 3	
„	Sundry parties for fruit grafts, flowering shrubs purchased						390 4 9	
								2,403 1 6
						Garden Account.		
By cost sundry materials and for propagation of roses, fruit grafts, orchids, &c.					566 4 3			
„	cost of tools, implements, and contingencies, &c.				1,727 5 9			
							2,293 10 0	
„	Salary of Head Gardener, from December 1875 to November 1876				2,150 0 0			
„	Commission to Gardener on sale of plants				247 4 0			
„	Wages of native establishment, mallies, coolies, &c.				2,765 0 0			
							5,162 4 0	7,455 14 0
						Investment Account.		
By purchase of Government Securities for Rs. 5,000								5,100 8 10
						Total expenditure, Rupees ...		42,438 2 3
By balance in the Bank of Bengal on 31st December 1876								6,021 7 2
						Grand Total, Rupees		48,459 9 5

MEMORANDUM.

DISBURSEMENTS.

To amount of ordinary disbursements during the year 1876, as per statement	29,891	11	5
„ Amount of Garden Expenditure during the year 1876, as per statement	7,435	14	0
„ Purchase of Government Securities.. ..	5,100	8	10
Total Expenditure, Rs. ..	42,438	2	3
„ Balance in the bank of Bengal on 31st December, 1876	6,021	7	2
GRAND TOTAL, Rupees .	48,459	9	5

LIABILITIES.

Messrs D. Landreth and Son, for balance of vegetable seeds supplied in 1876 £ 8 0 0					
And for flower seeds .. ... „ 110 0 0	£ 118	0	0		
„ Vilmorin, Andrieux and Co., for balance of seeds supplied in 1876 .. .. .. „	19	15	11		
Robt. Buist, Jr., for ditto ditto „	2	2	3		
Messrs. James Carter and Co, for potatoes in 1873 .. .. „	24	0	0		
„ Shepherd and Co., balance for plants supplied .. .. „	7	3	3		
TOTAL .. £	171	1	5,	@ 1*s.* 10*d.*	
or say in Rupee ..					1,866 3 5

RECEIPTS.

By balance in the Bank of Bengal on 31st December, 1875					9,322 15 8
„ Amount of ordinary receipts during the year 1876, as follows:—					
Subscription, &c. ..	28,319	7	7		
Agency Seed Deptement ..	3,573	11	9		
				31,893 3 4	
Sale of Government Securities	5,043	6	5		
Government of Bengal Donation	2,200	0	0		
				7,243 6 5	
Total Receipts. Rupees..					39,136 9 9
GRAND TOTAL, Rupees					48,459 9 5

ASSETS.

Amount of Cash Balance					6,021 7 2
Balance of subscription, &c., due from members for 1874 and 1875				486 1 6	
Ditto ditto for 1876, as follows:—					
Balance of subscription Rs.	855	2	0		
Balance of seeds, grafts, freight, &c.	569	9	9	1,425 11 9	1,910 13 3
Total Rupees ..					7,932 4 5
Metcalf Hall					
Society's proportion cost of erecting the Metcalf Hall				23,557 15 9	
In landed property including building at Alipore				20,646 6 0	44,204 5 9

LIST OF MEMBERS

OF THE

Agricultural and Horticultural Society

OF

INDIA.

DECEMBER 31st, 1870.

ALPHABETICALLY ARRANGED,

CLASSIFIED,

AND

DISTINGUISHING THE YEAR OF ADMISSION.

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Vice-Presidents:

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List of Members.

* This mark denotes Members who are absent from India; and therefore non-contributors.

† This mark denotes Members who, though absent, are desirous of continuing their subscriptions.

HONORARY MEMBERS.

	Don Ramon de la Sagra, Island of Cuba ...		
	The Right Hon'ble Sir Lawrence Peel, London	1842	1856
	R. Fortune, Esq., London		1856
	A. Grote, Esq., London	1837	1868
5	The Revd. T. A. C. Firminger, London ...	1851	1868
	Raboo Peary Chand Mittra, Calcutta ...	1847	1871
	John Scott, Esq., Patna		1871
	J. A. Crawford, Esq.	1857	1874
	F. L. Beaufort, Esq., England	1838	1876

CORRESPONDING MEMBERS.

10	D. J. MacGowan, Esq., M. D., Ningpo		1851
	Mons. Natalis Rondot, Paris		1858
	Lieut.-Col. W. H. Lowther, Jubbulpore ...		1864
	Dr. H. Cleghorn, Stravithee, St. Andrews, N. B. ...		1867
	Vause Fretwell, Esq., Supdt. of Model Farms at Bhurgaums, Kandeish		1869
15	C. Brownlow, Esq., Cachar		1870
	Samuel Jennings, Esq., London		1874

ASSOCIATE MEMBERS.

Capt. E. P. Nisbet, London		1842
Geo. Bartlett, Esq., Calcutta		1870

LIFE MEMBERS.

	Admitted.
Anund Rao Puar, His Highness, the Rajah of Dhar, Dhar, *viâ* Indore, C. I.	1872
Bentall,* Edward, Esq.	1837
Bhopal, H. H. the Begum of	1870
Bhowany Sing, Maharajah, Duttea	1864

LIFE MEMBERS.—*(Continued.)*

		Admitted.
5	Bishop,* Major H P (Artillery)	1853
	Bishnath Sing, Rajah Bahadoor, Chief of Chutterpore, Bundlekund	1875
	Brodie,* Major T.	1836
	Buller,* Frederic Pole, Esq.	1837
	Carew,* R. R., Esq.	1846
10	Chatter Patti Rao, Jagirdar of Alipoorah ...	1876
	Colvile,* Sir J. W.	1849
	Gopaul Sing, Rajah of Jabooah, *viâ* Indore ...	1874
	Hawkins,* John Abraham Francis, Esq. ...	1837
	Joy Sing, Deo Bahadoor, Maharajah of Chikari ...	1868
15	Jung Bahadoor, Maharajah, G. C. B., Nepal ...	1860
	Lowther,* Robert, Esq.	1836
	Maharaj, Dheraj Matabchunder Bahadoor, Rajah of Burdwan	1836
	Maharajah of Johore	1868
	Manikjee Rustomjee, Esq., Merchant, Calcutta ...	1837
20	Mohender Pertab Sing, Maharajah, Bahadoor of Orcha, Tehri	1876
	Munsier Ali, H. H., The Nawab Nazim of Bengal ...	1874
	Palmer,* T. A. G., Esq.	1861
	Rajkissen Mookerjee, Baboo, Landholder, Oterparah	1836
	Richards,* J., Esq., Merchant	1834
25	Roodurpurshaud, Chowdry, Nanpere, Tirhoot ...	1867
	Roop Deo, Rajah of Ali-Rajpore, *viâ* Sirdarpore, C.I.	1874
	RoordurPurtabSing, Rajah Bahadoor, Dewan of Punna	1868
	Suttyanundo Ghosal, Rajah Bahadoor, Bhookoylas...	1869
	Thompson, Dr. R. F., Hooghly	1865
30	Wigram, Percy, Esq., C. S., Muttra	1871

ORDINARY MEMBERS.

A.

		Admitted.
	Abbott, Horace, Esq., Rajapore, *viâ* Koosteah ...	1858
	Abbott, A. E., Esq., Tikala Factory, Tirhoot ...	1874
	Abbott, H. E., Esq., Manager, Jauntpore Factory, Tirhoot	1874
	Abdool Gunny, Kajee, Nawab Zemindar, Dacca ...	1860
5	Ady, Charles, Esq., Merchant, Moulmein ...	1864
	Agabeg, Thadeus, Indigo Planter, Baraset ...	1875
	Ahmed, Dr. Z. A., Civil Surgeon, S. P. Doomka ...	1875
	Aitchison, W., Esq., Manager, Dooloo Tea Garden, Cachar	1869
	Ainslie, W. D., Esq., Kimidi, Ganjam	1875

		Admitted.
10	Alexander, N. Stuart, Esq., C. S., Tipperah ...	1864
	Allen, W. G., Esq., Asst. Conservator of Forests, Madhopore, Punjaub	1876
	Alone, B., Esq., Distt. Supdt. of Police, Jounpore ...	1876
	Ambler, C. T., Esq., Merchant, Monghyr ...	1876
	Ameer, Allee Khan, Moonshie, Bahadoor, Calcutta	1869
15	Amos, W. G., Esq., Calcutta	1876
	Anderson, Col. F. C., Depy. Supdt., Revenue Survey, Banda	1876
	Andrews, S. J., Esq., Gadee Zillah, Moorshedabad...	1876
	Angelo, E., Esq., Cossipore...	1873
	Anthony, Adam, Esq., 1st Assistant Accountant-General, Allahabad	1870
20	Arbuthnot, The Hon'ble Sir A. J., K.C.S.I., Calcutta	1876
	Archer,* Revd. J. B.	1869
	Armstrong,* T. W., Esq., ...	1862
	Armstrong, Joseph Samuel, Esq., C. S., Pooree ...	1865
	Assistant Manager, Ting Ling Tea Co., Darjeeling...	1875
25	Assistant Manager, Singbulli and Nurmah Tea Co., Limited, Darjeeling	1875

B.

	Baird, Lieut.-Col. A. F., Jullunder ...	1861
	Bance Madhub Roy Chowdry, Zemindar, Allahabad	1873
	Bance Madhub Sen, Baboo, Calcutta	1875
	Bannerman, Major P. W., Pol. Agent, Bhagelkund...	1876
30	Barber, H. W., Esq., Deputy Magistrate, Contai ...	1875
	Barker,* Dr. R. A., Civil Surgeon, ...	1870
	Barlow, G. N., Esq., Civil Service, Bhaugulpore ...	1864
	Barron, Capt. W., Dy. Supdt., Revenue Survey, 4th or Moradabad District, Nynee Tal	1871
	Barstow, H. C., Esq., Civil Service, Allyghur ...	1868
35	Barton, E. J., Esq., C. S., Bogra	1874
	Bayley, The Hon'ble Sir E. C., Civil Service, Calcutta	1863
	Bayley,* Stuart Colvin, Esq.	1859
	Beadon, Henry, Esq., Civil Service, Midnapore ...	1867
	Beaumont, Dr. Thomas, Residency Surgeon, Indore	1870
40	Beckett, W. O. A., Esq., Dy. Commr., Sylhet ...	1871
	Beckett, H. B., Esq., Depy. Comm., Edwardsabad, *viâ* Bunnoo	1876
	Beeby, G. O., Esq., Solicitor, Calcutta	1866
	Beer Chunder Manick, Bahadoor, Maharajah of Tipperah	1870
	Behari Lall Pyne, Baboo, Calcutta	1876

B.—*(Continued.)*

		Admitted.
45	Bennett, Walter H., Esq., Supt., New Tea Concern, Assam	1873
	Benson, George, Esq., Pleader, High Court, N. W. P., Bareilly	1868
	Benwell, W. M., Esq., Calcutta	1876
	Beveridge, H., Esq., C. S., Rungpore	1865
	Bhugwan Chunder Bose, Baboo, Deputy Magistrate, Cutwa	1875
50	Bhugerutee Mohendra, Bahadoor, Maharajah of Killoh, Dewkonull	1871
	Bignell, R. A. D'O., Esq., Assistant Superintendent of Police, Hazarecbagh	1867
	Billings, G., Deputy Magistrate, Meerut ...	1875
	Bimala Churn Bhuttacharjea, Deputy Collector and Magistrate, Nowada, *viâ* Behar	1870
	Blandford, A., Turtipore Indigo Concern, Malda ...	1875
55	Blathwayt, Capt. L., Assistant Commissioner, Hazareebaugh	1871
	Blechynden, R., Esq., Merchant, Calcutta ...	1858
	Blechynden, A. H., Esq., Secretary, Agri-Hort. Society of India, Calcutta	1851
	Blissett, T., Esq., Govt. Tel. Department, Dacca ...	1874
	Blyth, W. D., Esq., C. S., Nattore	1876
60	Boddam, Col. Hungerford, Hazarecbaugh ...	1871
	Boileau, G. W. K., Esq., Surdah Silk Concern, Rajshahye	1874
	Bond,* T. T., Govt. Engineer, ...	1873
	Bonnaud, Arthur, Esq., Merchant, Calcutta ...	1873
	Boulderson, A., Esq., C. S., Bijnore	1872
65	Bowers, Mrs., Bhuptani, Protaubgunge, Bhaugulpore	1872
	Bowser, Dr. H. C., Balasore	1876
	Boxwell, J., Esq., C. S., Nya Doomka	1874
	Brae, T., Esq., Dabracole, Commercolly, E. B. Railway	1854
	Brander, James, Esq., E. B. Railway, Sealdah ...	1865
70	Brandis, Dr. D., Inspector-General of Forests ...	1874
	Branson, J. H., Esq., *Barrister-at-Law*, Calcutta ...	1874
	Bridgman, J. H., Esq., Goruckpore	1868
	Brodhurst, M., Esq., Civil Service, Benares ...	1859
	Broucke, W. J., Esq., Indigo Planter, Bhugha Factory, *viâ* Chumparun	1859
75	Broughton, E., Esq., Merchant, Calcutta ...	1865
	Brown, Forbes Scott, Esq., Merchant, Penang ...	1840
	Brown, T. Allen, Esq., Deputy Collector, Allahabad	1873
	Brown, H. F., Esq., Merchant, Calcutta... ...	1875
	Brown, Lord Ulick, Civil Service, Rajshahye ...	1876

B.—(*Continued.*)

		Admitted.
80	Brown, Rudston, Bhikanpore Factory, Tirhoot ...	1875
	Bruce, H. W., Esq., Planter, Tezpore, Assam ...	1876
	Buck, E. C., Esq., C. S., Allahabad	1870
	Buckley, Lt. Col., F. A., 37th N. I., Dharmsala ...	1874
	Bull, Alexis, Bambarria Tea Estate, Seebsagar, Assam	1875
85	Burkinyoung, H. H., Oating Factory, Golaghat, Assam	1875
	Buskin, E. G., Esq., Calcutta	1864
	Buskin,* M , Esq., Serepore Factory, ...	1870
	Butler, Walter, Naga Doolia Factory, Jorehaut, Assam	1858
	Butt, Geo., Esq., Civil Service, Shajehappore ...	1866
90	Byrne,* William A., Esq.	1870

C.

	CADELL, Alan, Esq., Civil Service, Banda ...	1872
	Calder, G. L., Esq., E. B. Railway, Kanchraparah ...	1871
	Campbell, N. I., Esq., Elambazar, Bhulpore ...	1875
	Campbell, D. W., Esq., Locomotive Supdt., E. I. Railway, Jamalpore	1870
95	Campbell, A., Esq., Tea Planter, Selim Tea Estate, Kurseong	1872
	Campbell, W. A., Esq., Manager, Sungoo River Tea Plantation, Chittagong	1874
	Cantonment Magistrate, Cawnpore	1873
	Cantonment Magistrate, Lucknow	1876
	Carew, R. H., Esq., Tea Planter, Cachar ..	1874
100	Carleton, C. F., Esq., Indigo Planter, Meerpore, Moteeharry, Chumparun	1868
	Carnac,* C. F., Esq., Civil Service	1865
	Carnac, H. Rivett, Esq., C. S., Ghazepore ...	1869
	Carey, J., Esq., C. E., Indore	1875
	Carter, F. McL., Esq., Chandpore Tea Estate, Chittagong	1875
105	Carshore, Walter B., Nundinee Fy., Shapore, Oondee	1875
	Carnegy, P. T., Esq., Assistant Comr., Gowhatty, Assam	1872
	Carritt, Alfred, Esq., Merchant	1873
	Castle,* C. T., Esq., Supdt. of Police, ...	1865
	Chamarett, A., Esq., Surveyor Genl.'s Dept., Calcutta	1874
110	Chardon, W. B., Esq., Seepah Factory, *vid* Arrah ...	1864
	Charriol, F., Esq., Merchant, Calcutta	1875
	Chairman, Kishnaghur Municipality, Kishnaghur ...	1875
	Cheetham, W. H., Esq., Merchant, Calcutta ...	1870
	Chennel, Thos., Esq., Dewen Tea Estate, Debrooghur, Upper Assam...	1870

C.—(Continued.)

		Admitted.
15	Chester, Major, H. D. E. W., Officiating S. A. C. G., Mooltan	1869
	Christian, A., Esq., Putterghat Factory, Mudheepoorah, Bhaugulpore	1872
	Christian, E., Esq., Bugha, Champarun... ...	1875
	Chunder Caunt Mookerjee, Baboo, Calcutta ...	1866
	Chunder Coomar Roy, Baboo, Norail	1876
120	Chunder Kirtee Singh, Maharajah of Munnipore ...	1874
	Clark, Col. E. G, Settlement Officer, Kheree ...	1872
	Clarke, The Hon'ble Sir A., K. C. M., G. C. B. ...	1876
	Claxton, E., Esq., Dy. Controller of Accts., P. W. D., Allahabad	1875
	Cogswell, W. H., Esq., Calcutta, *Vice-President* ...	1866
125	Cole, Conductor Thos., Secundrabad, Deccan ...	1873
	Cole, Revd. J., Supdt., Lawrence Asylum, Sanawur	1865
	Collins, Capt. W. B., Calcutta	1873
	Collis, F. S., Esq., *Barrister-at-Law*, Calcutta ...	1871
	Collier, F. R. S., Esq., C. S., Kungram, Rungpore...	1875
130	Comley, J. M, Esq., Calcutta	1871
	Commandant* Deolee Irregular Force, Deolee ...	1871
	Cooke, F. C., Esq, Taleah Factory, *viâ* Burhuj, Goruckpore	1866
	Cooper, Dr. A. D., Civil Medical Officer, Naga Hills	1876
	Cornell,* W., Esq., Civil Service	1861
135	Corse-Scott, Lt. J., 37 N. I., Bareilly	1876
	Cosserat,* Lewis, Esq., Indigo Planter... ...	1859
	Courneuve, F. E. T. dela, Esq., Raneegunge ...	1876
	Cowie, E. H., Esq., Merchant, Calcutta ...	1874
	Cowley,* F. W. R., Esq., Civil Service ...	1867
140	Coxhead, T,, Esq., Agartollah, Tipperah ...	1875
	Craven, James, Esq., Monghyr	1871
	Crawford, J. A., Esq., C. S., Calcutta	1876
	Creaton,* W. E., Esq., Merchant, ...	1875
	Cresswell, W. S., Esq., Merchant, Calcutta ...	1874
145	Cresswell, H. T., Esq.. Shahpore Oondy Factory, Barrh, Tirhoot	1874
	Crowdy, Charles, Esq., Adrukt Factory, Beguserai, Monghyr	1875
	Crowdy, L. J., Esq., Manghot Factory, Beguserai, Monghyr	1875
	Crosthwaite, R. J., Esq., B. A., C. S., Allahabad ...	1869
	Cumming, W., Esq., Indigo Planter, Muniharee Factory, Sahebgunge	1851
150	Currie, G. M., Civil Service, Esq., Dacca ...	1868
	Curtis,* J. F., Esq., Indigo Planter	1860

D.

		Admitted.
	DaCosta, Joseph, Esq., Pleader, Civil Court, Bhaugulpore	1865
	Dalbusset, E., Esq., Merchant, Calcutta... ...	1871
	Dalgliesh, E. W., Esq., Tea Planter, Dulsing Serai, Tirhoot	1873
155	Daly F. D., Esq., Manager, Simla Bank, Umballa...	1867
	Daly, R. M., Esq., H. M., Bengal Marine, Calcutta...	1869
	Dando, Capt. A. Cunningham, Calcutta... ...	1872
	Dashwood, H. W., Esq., Civil Service, Meerut ...	1860
	Davies, Lieut.-Col. J. S., Judicial Commissioner, Chota Nagpore	1857
160	Davies, Lieut.-Col. F. J., Barrackpore	1869
	Davies, A., Esq., Calcutta	1874
	Davis, C. T., Esq., Solicitor, Calcutta	1874
	Davis, W. P., Esq., Bengal Police, Hazareebaugh ...	1870
	Davison, Capt., 15th King's Hussars, Meerut ...	1872
165	Davidson, James, Esq., Debrooghur, Assam ...	1870
	Dear, Herschel, Esq., Monghyr	1860
	Deas, C., Esq., N. B. State Ry., Luckunhatty ...	1874
	Debendra Nath Mullick, Baboo, Calcutta ...	1870
	Denham, C. H., Esq., C. E., Howrah	1874
170	Dennison, W. T. M., Esq., Kurian Estate, Baitenzerg, Java	1873
	Deputy Commissioner of Sumbulpore	1866
	Deputy Commissioner of Ellichpore	1869
	Deputy Commissioner of Woon	1869
	Deputy Commissioner of Bassim, West Berar ...	1871
175	Deputy Commissioner of Akola, Berar	1875
	Desaran, Edwd. Dubois, Esq., Dariapore Factory, Purneah	1874
	Determens, T., Esq., Merchant, Chittagong ...	1873
	Deverell, H., Esq., Indigo Planter, Ackrigunge Factory, *viâ* Berhampore	1854
	Dickens, Col. C. H., Artillery, Calcutta ...	1856
180	Dignam, S., Esq., Solicitor, Calcutta	1876
	Ditmas, J., Esq., Tea Planter, Belleeparah Garden, Assam	1874
	D'Oyly, W. H., Esq., Civil Service, Rampore Beauleah	1872
	Dodgson, W., Esq., Kallygunge Factory, Rungpore...	1864
	Dods,* Jas., Esq., Merchant	1873
185	Dombal, M. E. Durup-de, Esq., Mymensing ...	1876
	Dombal, Rchd. De, Esq., Katchee Katta, *viâ* Chooadanga	1872
	Donaldson, Peter, Esq., Supdt. Jail Manufacture, Alipore	1876
	D'Silva, E. A., Esq., Asst. Dispensing Chemist, Calcutta	1873

D.—*(Continued.)*

		Admitted.
	Duff, W. P., Esq., Merchant, Calcutta ...	1867
190	Duff, P., Esq., Sirrcoah, Naroduggur, North Bhaugulpore	1875
	Dunn,* Lt. T. D. W., 62nd Regt.	1873
	Dunne, M. P., Esq., Zemindar, Sumshabad, Azimgurh	1872
	Dwarka Nath Dutt, Baboo, Calcutta	1874

E.

	Eden,* Hon'ble A., Civil Service	1873
195	Edgar, E. L., Esq.	1872
	Egerton, R. E., Esq., C. S., Lahore	1864
	Eisenlohr, F., Esq., Merchant, Calcutta	1870
	Eldridge,* F. G., Esq., Merchant	1867
	Erskine,* H. C., Esq., Indigo Planter	1855

F.

200	Farquharson, J. F., Esq., Nunmati Garden, Gowhatty	1874
	Fearon, C. J., Esq., Chupoorah Factory, Manghone, Monghyr	1875
	Feltwell, J. W., Esq., Managukookee, Cherra, Cachar	1875
	Finch, W. R., Esq., Shahpore, Oondee, Tirhoot ...	1875
	Firth, H. A., Esq., Emigration Agent, Calcutta ...	1873
205	Fisher, Lieut.-Col. G. B., Commandant, Fort Michni, near Peshawur	1865
	Fisher, J. H., Esq., C. S., Raepore, C. Provinces ...	1871
	Foley, E. G., Esq., Cullecherra Garden, Sylhet ...	1873
	Forbes, Capt. W. E., Settlement Officer, Gonda, Oudh	1873
	Foster, G., Esq., Asst. Conservator of Forests, Saugor	1876
210	Fox, Michael, Esq., Khajoul-Dinapore	1873
	Francis, T. M., Esq., Solicitor, Muzufferpore, Tirhoot	1871
	Fraser, G. G., Esq., Indigo Planter, Sumbulpore ...	1875
	Fraser, Ronald, Manager, Margarett Hope Tea Estate, Hope Town, Darjeeling	1875
	Freeman, G. S., Esq., Lohoriah Factory, Champarun	1876
215	Freeman, H., Esq., Lall Serriah Factory, Seegowly, Chumparun	1866
	Fuller, Daniel, Esq., Tea Planter, Chittagong ...	1874
	Fyz Alee Khan, Nawab, Bahadoor, Jeypore ...	1871

G.

	Gale, M. H. L., Pundoul Concern, Tirhoot ...	1873
	Galiffe, J. F., Esq., Chundernagore	1856
220	Gamble, J. Sykes, Esq., Asst. Conservator of Forests, Darjeeling	1872
	Garbett, Lieut. C. H., Asst. Commr.	1868

G.—(*Continued.*)

		Admitted.
	Gardner, D. M., Esq., Civil Service, Allahabad ...	1872
	Gardner, E. B., Dr., Civil Surgeon, Jounpore ...	1876
	Garrett, C. B., Esq., C. S., Dacca	1875
225	Garth, Hon'ble Sir Richard, Chief Justice, High Court, Calcutta, *Vice-President*	1875
	Gibbon,† T. M., Esq., Indigo Planter	1874
	Gibbon, W. F., Esq, Senr. Doolha Factory, Goruckpore	1870
	Gibbon, W. F., Esq., Turcoleah, Chumparun ...	1874
	Gilman, J. H. S., Esq., Sonapore Tea Factory, Gowhatty	1874
230	Glass, J., Esq., Ex-Engineer, D. P. W., Kamptee, C. P.	1866
	Gocool Nath Chatterjee, Calcutta	1874
	Gokul Chunder Dutt, Calcutta	1874
	Goonendra Nath Tagore, Zemindar, Calcutta ...	1872
	Gopal Chunder Bose, Baboo, Kuranpal, *viâ* Cuttack	1876
235	Gopeenath Roy, Baboo, Calcutta	1871
	Gordon, D. T., Esq., Surdah	1859
	Gordon, John, Esq., Bank of Bengal, Calcutta ...	1865
	Graham, Wm. Francis, Esq., M. C. S., Chicacole ...	1871
	Grant*, Thomas, Esq., Indigo Planter	1848
240	Grant, G. H., Esq., Indigo Planter, Bhaugulpore ...	1859
	Grant, C., Esq., Lebong, Darjeeling	1864
	Gray, Dr. E., Jorehaut, Assam	1875
	Gray, W., Esq., Merchant, Calcutta	1875
	Grees Chunder Sing, Coomar, Zemindar, Pikeparah, near Calcutta...	1867
245	Gregory, Gallastan, Esq., Solicitor, Calcutta ...	1875
	Grey, E., Esq., Civil Service, Patna	1868
	Grey, Lieut. L. J. H., Asst. Commr., Dum-Dum ...	1871
	Griffith, Ralph, Esq., Principal, Queen's College, Benares	1870
	Grimley, J. E., Esq., Supt. Nizam's Garden, Hydrabad	1875
250	Groundwater, R., Esq., Tea Planter, Gowhatty, Assam	1875
	Guise, J. J., Esq., Merchant, Calcutta	1867

H.

	Hadenfeldt,* R., Esq., Merchant, ...	1874
	Halford, Charles, Esq., Bill Broker, Calcutta ...	1872
	Halsey, F., Esq., Madhopore, Punjaub	1863
255	Hamilton, T. F., Esq., Merchant, Calcutta ...	1870
	Hankin, Col. G. C., Meerut	1864
	Harlow, Wm., Esq., Manager, Eastern Cachar Tea Company, Cachar	1871
	Harman, A. L., Esq., Jatapore Factory, Sarun ...	1876
	Harris, G. L., Esq., C. S., Jessore	1863

H.—*(Continued.)*

		Admitted.
260	Harrison, Augustus S., Esq., Principal of the Minor College, Allahabad	1873
	Harrison, H. A., Esq., Civil Service, Futteghur ...	1863
	Harrison, Rewd. H. J., Tollygunge	1872
	Hartigan, H., Esq., Court-Keeper, High Court, Calcutta	1875
	Hartnell, M., Esq., Calcutta	1876
265	Harwood, H. L., Esq., Waga Laurea Tea Estate, Chittagong	1875
	Hawkins, Major E. L., R. A., Mean Meer ...	1871
	Hay, John, Esq., Merchant, Calcutta	1876
	Hayes, G., Esq., Zemindar, Purneah	1876
	Head Gardner of the Ram Nawas, Jeypore ...	1876
270	Health Officer, Calcutta	1865
	Helps, W., Esq., Manager Fallodhi Tea Co., Darjeeling	1875
	Henderson, Dr. Geo., Rawul Pindee	1876
	Henderson,* M., Esq., Merchant	1864
	Henderson, W., Esq., Pathicharra, Cachar ...	1876
275	Herschell, Sir W. J., Bart., Civil Service, Hooghly...	1870
	Hill, Edgar, Esq., Indigo Planter, Beylah Concern, Benares	1874
	Hill, Dr. J. H. G., Turcooleah Factory, Moteeharee, Chumparun	1865
	Hill, R. H., Esq., Seraba, Tirhoot	1865
	Hindmarsh, Thomas, Esq., Eastern Bengal Railway, Kancharapara	1866
280	Hittoll Messer, Baboo, Zemindar, Mauncoor ...	1864
	Hobhouse, Hon'ble Arthur, Legal Member of the Supreme Council, Calcutta	1872
	Hobson, E. A., Esq., Merchant, Calcutta ...	1875
	Hogg, Capt. T. W., Asst. Commissioner, Jubbulpore	1868
	Holl, F. W., Esq., Nundeekotee, Hope Town ...	1874
285	Hollingberry, R. H., Esq., Asst. Secy., Financial Dept., Calcutta	1874
	Holmes, R. A. K., Dr., Supdt. Central Prison, Meerut	1876
	Holroyd,* Col. Charles	1866
	Home, Major R., Supdg. Engineer, Umballa Cantonment, Kussowlee	1873
	Home, A. L., Esq., Deputy Comservator of Forests, Bengal	1875
290	Hudson, C. K., Esq., Dacca	1874
	Hume,* A. O., Esq., C. S., C. B., ...	1875
	Hunter, J. K., Esq., Kopili Tea Estate, Assam ...	1876
	Hurst, J., Esq., Mussoorie	1870
	Hutchinson, Col. A. R. E., Gwalior, Morar ...	1862

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		Admitted.
295	Hutchison, J. H., Esq., Merchant, Calcutta ...	1870
	Hutchison, John, Esq., Merchant, Calcutta ...	1876

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	Ingels, Lionel, Esq., Chogdah	1872
	Inglis, A. B., Esq., Merchant, Calcutta... ...	1873
	Ingram,* T. L., Esq., *Barrister-at-law*	1874
300	Inskip, C. T., Esq., Merchant, Calcutta... ...	1870
	Imthurn, Dr. A., M. D., Civil Medical Officer, Tezpore, Assam	1873
	Irving, Dr. James, Civil Surgeon, Dinapore ...	1867
	Irwin,* Lieut.-Col. W., Stud. Dept., ...	1864
	Ishore Pershaud Narain Singh, Bahadoor, Rajah of Benares	1854

J.

305	Jack, E. A., Esq., Merchant, Calcutta	1863
	Jackson, Hon'ble L. S., C. S., Calcutta, *President* ...	1852
	Jackson, C. E., Esq., Manager, New Mutual Tea Co., Lallmookh, Hylakandy, Cachar	1873
	Jackson, W. G., Esq., C. S. Bustee	1876
	Jameson, W., Esq., M. D., Saharunpore ...	1852
310	Jarrett,* Capt. H. S., ...	1871
	Jefferson, W. E. S., Esq., Debroghur, Assam ...	1875
	Jenkinson, E. G., Esq., C. S., Saharunpore ...	1874
	Jennings,* F., Esq., ...	1874
	Jerdon,* C.M., Esq.,Sub-Deputy Opium Agent, ...	1872
315	Jogendra Nath Roy, Baboo, Norail	1876
	Johari Mull, Baboo, Zemindar, Mahomedpore, Bijnore	1876
	Johnson, H. Luttman, Esq., Civil Service, Shillong, Assam	1873
	Johnstone,* Capt. J., Assistant Commissioner ...	1871
	Jones, W. H., Esq., Calcutta	1863
320	Joykissen Mookerjee, Baboo, Zemindar, Ooterpara ...	1852
	Juggut Sing Koer, Tajpore, *viâ* Bijnour ...	1874

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	Kalee Kissen Tagore, Baboo, Calcutta	1869
	Kali Narain Roy Chowdry, Raja Bahadoor, Bhowal, Dacca	1876
	Kally Prosono Roy, Baboo, Zemindar, Cossipore ...	1867
325	Kalberer, J., Esq., Kotahi Factory, Goruckpore ...	1875
	Kemp, Geo. Lucas, Esq., F. R. G. S., Calcutta ...	1871

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		Admitted.
	Kemble, W., Esq., Civil Service, Purneah ...	1872
	Kidd, Dr. H. A., Civil Surgeon, Mundla ...	1871
	Kilby, W., Esq., District Supdt. of Police, Pubna ...	1875
330	Kincaid, Lieut.-Col. W., Bheel Agent, Sirdaspore, *viâ* Indore	1867
	King, Dr. Geo., Supdt. Royal Botanical Garden, Calcutta, *Vice-President*	1872
	Kirkpatrick, Clarence, Esq., Delhi	1874
	Kisch, H. M., Esq., C. S., Manbhoom	1876
	Kishen Chunder, Bhunge, Rajah of Killoh, Mohurbhunge, Cuttack	1874
335	Kishen Chand, Baboo, Pleader, Beadwarn, Delhi ...	1875
	Knox, G. E., Esq., C. S., Kirwee	1875
	Knyvett, Major, W. L. N., District Supdt. of Police, Purneah	1864
	Komul Krishna Deb Bahadoor, Rajah, Calcutta ...	1874
	Krauss, Henry, Esq., Rangoon	1865
340	Krishnadhun Ghose, Dr., Civil Surgeon, Rungpore ...	1874

L.

	Landale,* Geo. A., Esq., Indigo Planter... ...	1868
	Langlois, J.P., Esq., Durrung Tea Co., Tezpore, Assam	1866
	Langlois, P. L. F. C., Esq., *Barrister-at-law*, Vizagapatam	1873
	Larminie, W. R., Esq., Civil Service, Bancoorah ...	1862
345	Laruleta, J., Esq., Rampoorah Factory, *viâ* Jeagunge	1876
	Lawford,* H. B., Esq., C. S., ...	1865
	Lazarus, F. A., Esq., Calcutta	1874
	Lees, Lieut.-Col., W. M., Under-Secretary, Govt. of India, Military Dept.	1871
	Leibert, M., Esq., Tea Planter, Hazareebaugh ...	1868
350	Leitch, Henry Joseph, Esq., Broker, Calcutta ...	1872
	Lepper, Chas. H.	1873
	Leslie, S. J., Esq., Solicitor, Calcutta	1873
	Levinge,* H. C., Esq., C. E., ...	1863
	Llewhellin, Stanley, Esq., Chitwarrah Factory, Mozufferpore	1876
355	Llewhellin, W., Esq., Regai Factory Mozufferpore ...	1871
	Lindesay,† H. G., Esq.	1873
	Livesay, C. E., Esq., Asst.-Engineer, Irrigation Dept., Baroon, *viâ* Dehree	1868
	Lloyd, M., Esq., Indigo Planter, Shapore Oondee, Tirhoot	1863
	Lloyd, W., Esq., Darjeeling...	1869
360	Lloyd, Trevor, Esq., Narath Factory, Madhobanie, Tirhoot	1857

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		Admitted.
	Lockhart, Capt., W. S. A., Simla	1871
	Lovell, Thos., Esq., Deputy Chief Engineer, Lucknow	1869
	Lowis, Capt. N., Manager, Chota Nagpore Estate, Ranchi	1875
	Luchmeeput Sing, Roy Bahadoor, Banker, Calcutta	1864
365	Luchmessur Sing, Bahadoor, Zemindar, Durbhungah, Tirhoot	1861
	Lukin, Major F., 3rd Hussars, Mhow, Central India	1860
	Lushington, H., Esq., C. S., Allahabad	1865
	Lyall, D. R., Esq., Civil Service, Dacca... ...	1869
	Lyall, R. A., Esq., Merchant, Calcutta	1875
370	Lynam, John, Esq., Supdt., Reserve Police Force, Calcutta	1866
	Lynch, Dr. Sydney, Supdt. of Jail, Alipore ...	1872
	Lyon, W., Esq., Asst. Commr., Sambhurlake, Rajpootana	1875
	Lyons, A., Dr., Civil Surgeon, Furidpore ...	1874

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	MACALLISTER, R., Esq., Merchant, Calcutta ...	1872
375	MacBean, Duncan, Esq., Paror Tea Estate, Kangra Valley	1876
	MacDonald, M. N., Esq., Pertipore Factory, Saran...	1869
	Macdonald, Æneas J., Esq., Lohurreah Factory ...	1872
	Macdonald, James, Esq., C. E., Allyghur ...	1874
	Macdoland, Lt.-Col. John, Survey Department ...	1871
380	Mackenzie, Dr. S. C., Superintendent, Presidency Jail, Calcutta...	1871
	Mackenzie, W. S., Esq., Belsund, Tirhoot ...	1873
	Mackillican, J., Esq., Merchant, Calcutta ...	1865
	Mackinnon, D., Esq., Merchant, Calcutta ...	1874
	Mackinnon,* John, Esq., Merchant, ...	1875
385	Maclachlan, J. E., Esq., Calcutta ...	1861
	Maclean, A. T., Esq., Civil Service, Allipore ...	1858
	Macmillan, J., Esq., C. E., Cuttack	1865
	Macnaghten,* Chester, Esq., Principal, Rajkumar College, Rajkote, Kattywur	1869
	Maconochie,* G. B., Esq., ...	1873
390	Macpherson, Hon'ble A. G., Judge of the High Court, Calcutta	1867
	Macpherson, W., Esq., Civil Service, Cuttack ...	1861
	MacTier, Capt. S. C., Delhi	1876
	Magor, R. B., Esq., Merchant, Calcutta ...	1875
	Maharajah of Betteah, Tirhoot	1870
395	Maharajah of Cooch Behar	1864
	Manager, Balasun Tea Co., Darjeeling ...	1875

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		Admitted.
	Manager, Bengal Tea Company, Cachar ...	1864
	Manager, Bishnath Tea Co., Assam	1875
	Manager, Borsillah Tea Co., Assam	1875
400	Manager, Brahmapootra Tea Co, Assam ...	1875
	Manager, Burrumsal Garden, Sylhet	1876
	Manager, of Boroomcherra Tea Garden, Cachar ...	1876
	Manager, Central Cachar Tea Co.	1875
	Manager, Central Terai Tea Co., Darjeeling ...	1875
405	Manager, Champdanee, Jute Mills Company ...	1874
	Manager, Chenga Tea Association, Darjeeling ...	1875
	Manager, Chincoorie Tea Co., Cachar ...	1875
	Manager, Chumta Tea Association, Darjeeling ...	1875
	Manager, Chunderpore Tea Garden, Assam ...	1875
410	Manager, Chundypore Tea Company, Cachar ...	1862
	Manager, Cutlee, Cherra Garden, Cachar ...	1865
	Manager, Dahingeapore Factory, Assam ...	1865
	Manager, Dessai and Purbuttea Tea Company, Jorehaut, Assam	1874
	Manager, East India Tea Company, Assam ...	1865
415	Manager, East India Tea Company, Cachar ...	1866
	Manager, Giell Tea Co., Darjeeling	1875
	Manager, Goomrah Factory, Tirhoot	1865
	Manager, Government Garden, Fyzabad, Oudh ...	1871
	Manager, Government Garden, Gondah, Oudh ...	1875
420	Manager, Greenwood Tea Garden, Assam ...	1875
	Manager, Halmara, Tea Estate, Assam ...	1870
	Manager, Heron Cherra Tea Garden, Cachar ...	1874
	Manager, Hoolmaree Tea Co., Assam ...	1875
	Manager, Hunwall Tea Estate, Jorehaut, Assam ...	1874
425	Manager, Jokie (Assam) Tea Co., Assam ...	1875
	Manager, Julnacherra Tea Garden, Cachar ...	1875
	Manager, Joypore Garden, Cachar	1865
	Manager, Kaliabar Tea Estate, Assam	1876
	Manager, Kallacherra Tea Company, Cachar ...	1862
430	Manager, Kallian Tea Garden, Cachar	1874
	Manager, Kamptee Gwallie Tea Estate ...	1875
	Manager, Kanchunpore Tea Company, Cachar ...	1862
	Manager, Kassomaree Tea Garden, Assam ...	1875
	Manager, Koeyah Factory, Cachar	1865
435	Manager, Koomber Tea Garden, Cachar ...	1875
	Manager, Koomtar Tea Garden, Assam ...	1869
	Manager, Lalla Mookh Tea Garden, Cachar ...	1875
	Manager, Local Funds, Betul	1874
	Manager, Luckimpore Tea Co., Assam ...	1875
440	Manager, Margaret Hope Tea Plantation, Darjeeling	1876
	Manager, Naga Dhoolie Tea Garden, Assam ...	1876

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		Admitted.
	Manager, Terihannah Tea Plantation, Darjeeling ...	1876
	Manager, Luckwah Tea Garden, Assam ...	1875
	Manager, Lutasil Tea Garden, Assam ...	1875
445	Manager, Majagram Tea Co., Cachar ...	1875
	Manager, Majulighur Tea Estate, Assam ...	1875
	Manager, Massempore Tea Garden, Cachar ...	1875
	Manager, Mesia Jan Tea Estate	1875
	Manager, Monacherra Tea Garden, Cachar ...	1875
450	Manager, Moran Tea Co., Seebsaugor, Assam ...	1875
	Manager, Munguldye Tea Co., Assam ...	1875
	Manager, Narainpore Garden, Cachar	1865
	Manager, New Golaghat Assam Tea Company, Assam	1874
	Manager, Noakacharee Tea Company, Assam ...	1865
455	Manager, Nuddea Ward's Estate, Kishnaghur ...	1875
	Manager, Panicherra Tea Garden, Cachar ...	1874
	Manager, Pattarcah Tea Co., Sylhet ...	1875
	Manager, Public Garden, Bareilly	1868
	Manager, Public Garden, Etawah	1874
460	Manager, Roopacherra Tea Garden, Cachar ...	1875
	Manager, Scottish Assam Tea Co., Assam ...	1875
	Manager, Selong Tea Estate, Shillong ...	1867
	Manager, Silcoorie Tea Garden, Cachar ...	1875
	Manager, Singbulli and Nurmah Tea Co., Ld., Darjeeling	1875
465	Manager, Singell Tea Company, Darjeeling ...	1874
	Manager, Springside Tea Garden, Kurseong ...	1875
	Manager, Tarrapore Tea Garden, Cachar ...	1871
	Manager, Teendarea Tea Company, Darjeeling ...	1874
	Manager, Teesta Valley Tea Association, Darjeeling	1875
470	Manager, Tingri Tea Estate, Assam ...	1875
	Mandelli, L. Esq., Tea Planter, Darjeeling ...	1868
	Mangles, H. A., Esq., C. S., Calcutta ...	1875
	Manook, Dr. S. J., Civil Surgeon, Chyobassa ...	1866
	Manuel, R. A., Esq., Rangoon	1876
475	Markby, Hon'ble W Judge of High Court, Calcutta	1866
	Martin,* John, Esq.	1874
	Martin, W. R., Esq. Tea Planter, Punkabarec, Darjeeling	1868
	Martin, C. P. N., Tea Planter, Tezpore, Assam ...	1875
	Maseyk, C. H., Esq., Jungypore	1876
480	McAlpine, Robert, Esq., Futtickcherry Estate, Chittagong	1865
	McFarlane, A. C., Esq, Merchant, Calcutta ...	1870
	McIntosh, A. R., Esq., Merchant, Calcutta ...	1872
	Meiselbach, J. F. R., Esq., Dhurropra Heront, North Bhaugulpore	1875

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		Admitted.
	Melvile, S. S., Esq., C. S., Futtehpore ...	1875
485	Meugens, J. G., Esq., Merchant, Calcutta ...	1865
	Mewburn,* G. F., Esq., Merchant, ...	1874
	Michea, P., Esq., Daodchurn Factory, Benares ...	1875
	Middleton, C. J., Esq., P. W. D., Gya ...	1876
	Millar, Lieut-Col. F. J., Kurnaul ...	1869
490	Minchin, F. J. V., Esq., Aska, Ganjam ...	1862
	Mitchell, R. W. S., Esq., Emigration Agent for Trinidad	1875
	Moir,* Dr. W., Civil Surgeon, ...	1872
	Mohima Rungun Roy Chowdry, Zemindar, Kakinia, Rungpore	1865
	Mohendrolall Khan, Koomer Narajole, Midnapore ...	1871
495	Moore, A. H., Esq., Dekai Jalue Factory, Jorehaut, Assam	1875
	Moore, C. W., Esq., C. S., Bareilly	1865
	Moran, F. C., Esq , Woodbine Factory, Debroghur, Assam	1870
	Morey, W., Esq., Ghuttal	1876
	Morris, E., Esq., Manager Hong-Kong and Shanghai Banking Corporation, Calcutta	1874
500	Morris, G. G., Esq., The Honorable, Civil Service, Judge, High Court, Calcutta	1872
	Mosely, T. H., Esq., Merchant, Calcutta ...	1862
	Mullen, Dr. T. Ffrench, Residency Asst. Surgeon, Ulwar, Rajpootana	1871
	Murdoch, A. W., Esq., G. E., Serajgunge ...	1870
	Murray, D. K., Esq., Nowgong, Assam ...	1876
505	Murray, J. L. K., Esq., Higli Mari Garden, Nowgong	1876

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	Narayan Rao, Maharajah of Dewass, Indore ...	1874
	Narendra Krishna Deb Bahadoor, Maharajah, Calcutta	1874
	Nassiruddeen Ahmed Moulvi, Behar	1876
	Neville, Geoffry, Esq., Indian Museum, Calcutta ...	1875
510	Newson, W. H., Esq., Merchant, Calcutta ...	1876
	Newton, Ernest, Esq., Pleader, High Court, N. W. P., Dehra	1875
	Newton, W. H., Esq., Merchant, Calcutta ...	1875
	Nickels, C., Esq., Indigo Planter, Pusewa Factory, Jounpore	1866
	Nilladhur Sing Deo Bahadoor, Feudatory Chief of Killa, Sonepore	1874
515	Nobin Chand Bural, Baboo, Solicitor, Calcutta ...	1874
	Nobin Chunder Nag, Baboo, Zemindar, Midnapore...	1866

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	Nolan* Phillip, Esq., Civil Service, ...	1873
	Notobur Singh, Rajah, Murdraj Bromobur Roy, of Killo-Khand Padda	1873
	Noor Khan, Huzrut, Minister of Jowrah ...	1871
520	Nundlall Bose, Baboo, Zemindar, Calcutta ...	1875

O.

	Obhoychurn Goho, Baboo, Merchant, Calcutta ...	1856
	Odling, C. W., Esq., C. E., Arrah	1871
	O'Keefe, J. W., Esq., Merchant, Calcutta ...	1871
	Oldfield, R. C., Hon'ble, C. S., Allahabad ...	1875
525	Oldham, Wilton, Esq., L. L. D., Civil Service, Gazeepore	1867
	Omesh Chunder Dutt, Esq., Calcutta	1874
	Orchard, Major M. A. D., B. S. C.	1871
	Orr, Major Alexander P., Roy Bareilly, Oudh ...	1868
	Osborne,* Col. Willoughby, F. R. G. S., F. G. S. ...	1862
530	Osborne, Captain J. H. Willoughby, Cawnpore ...	1870
	Ouseley, Gore, Esq.	1872
	Owen,* Brigdr. Genl. W. G.. (12th Madras N. I.,)	1846

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	Paddy, Capt. A. C., Royal Engineers, Mean Meer..	1871
	Peal, S. E., Esq., Tea Planter, Sapakatee, Seebsaugor, Assam	1867
535	Peel, Fredk., Esq., Merchant, Calcutta	1871
	Pellow,* F. H., Esq., Civil Service	1863
	Peppe, G. T., Esq., Manager, Dunwar Estate, Pachamba	1872
	Peppe, T. F., Esq., Chota Nagpore ...	1868
	Peppe, W., Esq., Birdpore, Gorruckpore ...	1875
540	Perrin, Monsieur J., Silk Filatures, Berhampore ...	1859
	Peter, James, Esq., Lydiacherra Garden, Cachar ...	1872
	Phear,* the Hon'ble J. B., ...	1867
	Phillips, J., Esq., Manager, Government Farm, Allahabad	1875
	Phipps, S. U., Esq., Custom House, Calcutta ...	1874
545	Pickance, Capt. W. John, Madras Staff Corps, Chutterpore, Ganjam District	1867
	Pigott, William, Esq., Broker, Calcutta ...	1864
	Pinney, G. F., Esq., Jorehaut Tea Company, Assam	1871
	Pirthee Sing, Rajah of Awah, Agra ...	1874
	Plowden, W. C., Esq., C. S., Meerut	1876
550	Political Agent for Supdt. Rajkumar College, Bundelkund	1876
	Political Agent of Morar, Gwalior	1873
	Ponder,* W. F., Esq.	1874

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		Admitted.
	Pope, C. H., Esq., Planter, Singhia Factory, Hadjapore, Tirhoot	1872
	Poorna Chunder Roy, Zemindar, Sarapooly ...	1870
555	Powell, G. F., Esq, Saharunpore...	1873
	Prataph Chandra Ghosa, Baboo, Calcutta, *Vice-President*	1869
	Prendergast, Lt. Col. G. A., 15th B. C., Cawnpore...	1876
	Preo Nath Sett, Baboo, Calcutta	1876
	Principal Raj Kumar College, Rajkote, Kattywar ...	1873
560	Pringle, R. B., Esq., Badalipur Tea Garden, Assam	1870
	Proprietors, Jugdispore Estate, Becheea, Shahabad...	1869
	Protheroe, Capt. Montague, Dy. Supdt., Port Blair	1869
	Prosono Coomar Banerjee, Baboo, Calcutta ...	1871
	Pryce, W. A., Esq., Station Master, E. I. R., Assensole	1876
565	Pyne, R. Esq., Neelgunge, Purneah	1867

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	QUINTON, J. W., Esq., Civil Service, Rangoon ...	1865

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	RABAN, Col. H.	1858
	Radcliffe,* John, Esq., Merchant, ...	1871
	Radha Persad Sing, Maharajah Coomar, Doomrah, Shahabad	1875
570	Rajah of Kuntil, Mirzapore	1871
	Ramdass Sen, Baboo, Zemindar, Berhampore ...	1869
	Ramanath Tagore, Maharajah Bahadoor, Calcutta ...	1842
	Ramanymohun Chowdry, Baboo, Zemindar, Rungpore	1861
	Rammell, Col. H. S., 29th M. I. Secunderabad ...	1876
575	Rampini, R. F., Esq., C. S., Julpigoori... ...	1875
	Rattray, Haldane, Esq., Arraria, Purneah ...	1871
	Ravenshaw, T. E., Esq., Civil Service, Cuttack ...	1865
	Reay, Col. Charles, Meerut	1871
	Reid, J. R., Esq., C. S., Azimgurh	1866
580	Reilly, Herbert, Esq., Dy. Magte., Maldah ...	1872
	Remfry, H., Esq., Solicitor, Calcutta	1874
	Riah, F. S. M., Esq., Rungagora, Debrooghur, Assam	1870
	Richardson, H., Esq., C. S., Kishnaghur ...	1872
	Ridge, W., Esq., Soorsah Factory, *viâ* Rajshahye ...	1866
585	Ritchie, D. W., Esq., Offg. District Supdt. of Police, Chyebassa	1871
	Robinson, S. H., Esq., Merchant, Calcutta, *Vice-President*	1854
	Robinson, W. A., Esq.	1876
	Romesh Chunder Mittra, the Hon'ble, Calcutta ...	1874
	Rooke, H. A., Lt.-Col., Bengal Army, Cawnpore ...	1874

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JOURNAL

Agricultural and Horticultural Society

INDIA.

Remarks on the adaptability of the soil and climate of the Malayan Peninsula for the cultivation of Tea. By WALTER KNAGGS, ESQ.

PERMIT me to avail myself of your kind offices, for the purpose of directing public attention to the adaptability of the soil and climate of the Malay Peninsula, for the cultivation of tea.

Tea was planted in the mountains of Pinang many years ago; but, as the experiment was made with the Chinese variety, it did not answer.

About the year 1869, however, Mr. Henry de Mornay, who was formerly Secretary to the Assam Tea Company, and who was at that time the Manager of this Estate (which, I may state, belongs to a London Company) planted about seven acres with seed imported from Assam.

This experiment turned out eminently successful; but a second batch of seed, got out by him, did not do so well, as it arrived in this country after the conclusion of the fall of rains; and having been planted out "in situ," it nearly all perished during the dry months of January and February.

On my arrival from England, to relieve Mr. de Mornay in 1873, seeing the promising state of the first seven acres, and

also the mistake made in planting "in situ" during the dry months, I determined to extend this cultivation; and I imported, with the kind assistance of Mr. Herrold of Darjeeling, some three hundred dollars worth of tea seed, which came to hand in the beginning of January 1874; and which I immediately planted in nurseries at a distance of four inches apart.

In July of the same year, the seedlings having attained a height of about ten inches, I commenced transplanting, and I was thus able to establish about forty acres before the dry weather set in.

In the fall of 1874, encouraged by such success, I again wrote for one hundred and fifty dollars worth of seed; and, assisted with some from our old seven acres, I again succeeded, notwithstanding the protestations of my Company against my going to such expense, in establishing some ninety acres more during the year 1875.

In 1876 I did not import any seed, and as my supply from the garden was very limited, I was only able to fill up vacancies, and no extension took place.

This year, however, I have been able, by a system of my own, which I shall presently explain, to establish successfully 100 acres from our own seed, so that we have original seven acres of old tea, which, being of very pure "jat," will probably be kept for seed. And we have, also, one hundred and thirty acres of young tea, ranging from two to three and a half years old, and one hundred acres just planted.

The whole garden looks very promising indeed, and it has been compared, most favorably, with those of India, by Tea Planters from that country who have visited it.

The Assam variety of tea will attain, in this country, a height of from five to six feet in two years; but it is most important that none but the best sort be imported, or, at all events, the nearest approach to it.

The plant, unless further hybridized in consequence of the neighbourhood of others of a lower "jat," will always have a tendency as all hybrids do, to purify itself by falling back to its original wild species as it existed in Assam.

Except as an experiment, we have not yet done much in the way of manufacture, beyond satisfying ourselves that we can produce tea here, fully equal to that made in any part of India; but we shall, probably, begin in earnest next year.

The soil which appears the best adapted for tea cultivation is situated on low undulating hills, a few miles inland, and extending almost throughout the Peninsula.

It consists of a yellow friable clay, and as it is covered with heavy jungle, it has a very fair coating of vegetable refuse; and land is so plentiful in the Malay States of Perak and Salangore (lately taken under the protection of the British Government) and the anxiety to see cultivation established is so great, that it may be obtained almost for the asking.

The rainfall consists of from 90 to 98 inches per annum; and with the exception of the months of January and February, which are usually dry, it falls pretty generally throughout the year: about 30 to 40 inches falling between January and June, and the remainder between July and December.

The trees flush from March to December, inclusive; and the transport of produce is very easy, as numerous large and navigable rivers penetrate far inland in all directions.

Labour is cheap and easily procurable, Klingo, Chinese, and Malays, and the climate of the soil being granitic is certainly the healthiest in the tropics, a point on which I am able to speak most emphatically, as I have passed almost all my life in the West Indies, and in some of the most unhealthy of the Islands.

There are one or two things to which I would particularly call the attention of Planters in India.

I have previously stated that I had adopted a system of my own in establishing one hundred acres in tea this year. I did this by providing for the young plants an efficient and at the same time a non-injurious and profitable shade so that I might, with all safety, plant my seed "in situ."

For this purpose I planted the land which I wish to put in tea about four months previous to the ripening of the seed, with the "manihot," the plant from which tapioca is made.

This grows very rapidly, and in that time it reaches a height of about four to five feet, and affords a light and effectual shade.

The manihot should be planted in lines, at the same distance apart as it is proposed to plant the tea, and at a distance of about 2½ to 3 feet in the rows; and the lines should, by preference, run North and South.

When the seed is ripe, I test it by keeping it in moist sand until germination commences, and I then plant out the selected seed between the lines of the manihot at such distances as I wish, putting three seeds into each hole.

Of course this is done when the rains have set in, and I find that nearly every seed, thus planted, will grow.

I leave the manihot in the ground for fifteen or eighteen months, during which it not only effectually protects the young tea from drought, but it will, at the expiration of that time, give a return in tapioca that will not only pay the expenses of cultivation but give a handsome profit as well.

During all this time, of course, the land has to be carefully kept clear of weeds, and the young plants cared for in the usual manner.

In the event of there being no conveniences for manufacturing tapioca, the roots of the manihot, if the edible variety only be planted, will form a wholesome and nourishing article of food for the coolies, containing, as it does, some 25% of starch, beside gluten, &c.

If this method of planting be carefully adopted, planting

in situ may be done with a perfect certainty of success; and if all the stalks, leaves, and other refuse of the manihot be returned to the soil, either directly, by burying, as we do here, or by putting it on the manure heap, no deterioration whatever will be effected.

The other point that I would mention is that of the propagation of the tea plant by means of cuttings, suckers, or dividing the roots.

I need hardly point out how desirable it must be to do this, as by it we can always insure the quality of the plant without possibility of deterioration.

The first is effected by stripping from the parent branch a small healthy twig of sufficient age to be hard and dark in color (not green in the stalk). The end of this slip must then be carefully trimmed by means of a sharp knife so as to remove any inequalities and thus lessen the chance of its rotting; and any incipient flower buds must be removed and the slip planted early in the rains under shade, such as the manihot—the earth being slightly raised to ensure drainage.

These cuttings will grow vigorously.

The other plan of propagating by suckers is to encourage their formation by tying a ligature round the stem of the young tea plant when about a year old.

This will cause the immediate sprouting of a number of suckers, and if these be slightly forced to spread outwards from their upright position, and if their roots be then well moulded or banked over, they will be found in the course of a short time to have struck a crop of rootlets; and if they be then planted out during the rains, they will all flourish even in the open and unprotected by shade.

They are removed by digging up the whole plant and carefully cutting off each sucker with its roots attached; the original plant being afterwards cut back and replanted.

I shall be very glad, if some of my brother planters in India, will try these experiments and advise me of results;

and on my part I shall be happy to reply to any queries that they may wish to put and to afford them all such information that they may require as regards lands and prospects in this part of the world, if they will address me "Care of Messrs. Wm. Hall & Co., Pinang."

ALMA ESTATE, PROVINCE WELLESLEY,
15*th December*, 1877.

Notes on Bengal Rice. By PEARY CHAND MITTRA, *Honorary Member.*

IN Sanscrit works the classes of paddy are five. 1*st*, White Shali grown in deep water and reaped in the cold weather, and Shali which is better and grown in a moist soil. 2*nd*, Vrihee dhanaya, common kinds, harvested in the rainy season. There are eight kinds, of which the black sort is the best. Shustika, growing in sixty days belongs to this class. 3*rd*, Shook dhanya (beard.) 4*th*, Shimbe or Shumudhanya, growing in pods. 5*th*, Khoodra or Trina dhanya as panic seed.

The crops in Bengal are autumn and winter crops, and in some places there are intermediate crops. The subsequent classification is as follows:

1. Aman or *Haimanti* sown on rich and loamy soil in April, transplanted in June or July and reaped in December. It is also sown on low lands, whence transplantation is not necessary.

2. Aoos (Asoo) sown on low lands from March to May, and harvested in August and September.

3. Boro (Voruva) sown on marshy lands in November and December, and reaped in February and March. In some places it is sown in April and May, and reaped in August and September. It is also sown near *bheels* or jheels, as it is dependent on irrigation. In Hooghly and Burdwan Chaiti Boro is sown in December and January, and reaped in March and April: from the paddy which falls to the ground, Jouda

Boro is raised and reaped in August and September without being transplanted.

4. Rowa is grown on high lands inundated during the rains. Transplanted in August, and harvested in December and January. It is very much like *Aman,* and produces finest kinds of rice.

The first and fourth are winter crops, and the second and third are autumn crops. Aman, Aus, Bora, and Rowa are the four leading kinds of paddy. There are numerous varieties of each of them and also hybrid varieties.

Ayeen Akberry says, " agriculture here is in the highest perfection, the rice being so excellent and of such a variety of species as are nowhere to be found." All the low kinds of rice come under Aoos. In Manickgunge, Furreedpore, &c., Aoos is only grown. In Nuddea it is one-third of the entire crop, and in Moorshedabad the cultivation is larger. Aoos and Aman are often grown in the same field, Rowa is scarcely known in Furreedpore, Vicrampore, and Manickgunge, because the land is said to be sandy. In some places Aoos, Aman Boro, and Aman are sown at the same time.

Aoos possesses black fat seed, and the seeds of the other kinds are slender and reddish.

In Orissa the above classification is not followed.

(I). Biali sown in June and July, and reaped in October and November.

(II). Sarad sown in July, and reaped in December.

(III). Dalia sown in November or December, and reaped in April. In Cuttack the Biali and Sarad are sown in May, and reaped in September.

In Bengal, Dacca produces Aoos, Aman of different varieties. Boro divided into Boro proper and Lipa (better than any kind.)

Backergunge produces more of Aoos and Aman and their varieties. Boro is not largely grown, but a variety of it. Shatea

is grown, as it can be reaped in sixty days.

Furreedpore grows Aoos, Aman, Boro, and Raida a species of Boro.

Raida can be well grown in Jessore, Backergunge, 24-Pergunnahs, and Dacca. Its grain is reddish.

Maimunsing grows Aoos and Aman.

Burdwan, ditto ditto and Boro.

Bankura, Aoos and Aman.

Beerbhoom, ditto ditto

Midnapore, Aoos, Aman and Boro, more of the varieties of Aoos. Tika or Chalu, smaller than Aoos grain grown in certain parts; also in Bancoorah and Purilia.

Hooghly, Aoos and Aman and Boro.

Jessore, Aoos, Aman and Boro.

24-Pergunnahs, Aoos and Aman, and Aridhan grown in water marshes.

Soonderbunds, Aoos and Aman.

The varieties of the leading kinds of paddy are also grown in all the districts.

The cultivation of Aman has increased in consequence of the gradual reclamation of the waste lands, and that of Aoos decreased owing to the cultivation of jute, potato, sugarcane, &c. The cultivation of both Aman and Aoos has decreased in districts which have been suffering from epidemic fever.

The average yield of Aman paddy per beegah is generally 12 maunds, and that of Aoos 8 maunds.

A maund of paddy generally yields on an average 26 seers of rice.

As to the quantity of rice which the paddy yields, the following results have been obtained:

Burdwan—About 10 annas in the rupee.

Midnapore—Twelve principal kinds of Aman paddy gave a little more than 28 maunds of rice.

At *Howrah* "the average of the experiments shows a result of less than 50 tolahs to 80 tollahs of rice, or about

10 annas on the rupee."

Contai.—The proportion of rice to paddy is one-half.

At the Port Canning Company's Mill.

100 mds. of paddy gave 67 mds. cargo rice* and 5 broken rice

Ditto ditto 63 mds. dressed rice do. do

Ditto ditto 52 do. do. do. do.

The result depends on the nature of the paddy, but a maund of paddy on an average gives two-thirds of rice, or say 26 seers. The rice is either scalded or unscalded. The scalded rice is more largely consumed and exported. Certain classes of natives and Hindu widows consume unscalded or *atab* rice. It is also offered to the gods and goddesses, and forms a part of religious offerings. The paddy to be scalded is first steeped in water; it is then partially or "parboiled," and being dried is husked. *Atab* paddy is husked after being dried in the sun.

The cost of a *dheki* by which paddy is husked, is about 8 rupees. A *dheki* husks daily say two maunds of paddy. It is worked by three persons. Their wages vary in different districts. In some places they are paid by so much rice or rice and *khood*. From certain descriptions of paddy, chira, moori, hoorum and khoi are prepared. They are largely consumed in the villages and towns. Paddy once boiled, steeped in water, and dried in the sun, gives chira. Paddy twice boiled, twice steeped in water and twice dried in the sun, gives moori. Paddy four times boiled, four times steeped in water, and four times dried in the sun, gives hooram. Khoi is made by frying certain kinds of paddy in a earthen pot. Khoi boiled in goor or sugar becomes moorki.

The varieties of paddy are immense, but the Chasas by looking at them can give their right names. The names given by them are in many cases fanciful, such as Radhini

* Cargo rice means three-fourth rice, and one-fourth paddy, and 10 mds. bhoosi.

pagul, (cook maddening), Muni Bhog, (food for saints), Kamini (Virgin), Gandha Malati (scented), Kanakachoor (gold dust), Haniman jata, (Hanimans matted hair), Jamai Bhog (son-in law's food), Doodshur (cream), Saudimini (lightning), Akashmani (sky jewel), Sumadra Fana (sea foam), &c.

The extension of the rail and the facilities in the means of intercommunication have accelerated the exchange of commodities between one district and another. We believe the two districts which export rice largely to Calcutta are Backergunge and Dinagepore. All the different kinds of ballam come from the former, and from the latter the different kinds of moongy. It is quite impossible to give an idea of the quantity annually received here from Backergunge which, when necessary, draws on Sylhet, Dacca, Mymensing, and Tipperah. Dinagepore has a number of marts on the Attrai river, from which Moongy rice is sent to Calcutta, which at one time was estimated at 10 to 15 lakhs of mds. But of late the supply has been shorter. It is noteworthy that of the supply to Calcutta a portion is from Rungpore *viâ* Dinagepore. This rice was sent in boats when the river was full, but now it is sent by the rail. From the marts of the other rivers of Dinagepore rice is exported up-the-country. The other districts from which rice is sent to Calcutta are 24-Pergunnahs, Hooghly, Jessore, Dacca, Sylhet, Tipperah, Soonderbund, Pubna, Furreedpore, Bogra, Moorshedabad, and the Eastern districts. Dacca, Pubna, Furreedpore and Cooch Behar are fed by Rungpore, Serajguuge has ceased to export rice largely to Calcutta. Before the opening of the rail Rari rice now received from Burdwan, Beerbhoom, &c., was scarcely known, but the supply now from those districts is large. Midnapore and Balasore also export rice to Calcutta.

There are several districts which export rice to other districts. Noakally to Chittagong and Dacca ; Tipperah to Dacca ; Sylhet to Assam and Cachar; Mymensing to Dacca and Assam ; Rajshahye to Moorshedabad ; Darjeeling draws on

Purneah, Julpigoree, Rungpore, and Dinagepore. Patna is supplied by Malda, Dinagepore, Rajshahye, Dacca, and Moorshedabad. Mirzapore, Benares, Ghazeepore, Tirhoot, and Sarun draw on the Central and Eastern Bengal.

The rice exported to Calcutta from the different districts of Bengal is either consumed or exported. There are many kinds of inferior rice which are readily brought for local consumption by the lower orders of the people. The middling class and the aristocracy buy superior kinds of ballam and table rice. Moongy as a rule is not consumed by them, as it possesses a sourish taste when boiled. The consumption of Calcutta and environs is estimated at 7,000,000 mds. annually, but the population of Calcutta is 4,29,525.

The descriptions of rice sent to the Calcutta markets are as follows :

From Backergunge.

1	Sollie	...	Arrives in September.
2	Aoos	...	Arrive in December.
	Khajla		
	Bathi Ballam		
	Lucki Surie		
	Dood Kalum		
	Ballam	...	

From Dinagepore.

Moongy of different kinds	These kinds of rice arrived here at the end of July or beginning of August, but will now come by rail in Dec. and Jany.
Dessi (Moongy grown in Bogra)	
Chini Sukur (table rice) ...	

From Mymensing.

1	Khayari	...	...	Arrive in December and January.
2	Bathi	...	...	
3	Rie Moongy	...	...	
4	Khyari atab	...	...	Table rice.
5	Atab	...	...	

Burdwan, Beerbhoom.

1	Rari of different kinds ...	Table rice....	Arrive in December and January.
2	Ram Shali		
3	Rari atab		

24-Pergunnahs.

1	Maza Ballam	Arrive in December and January.
2	Dessi Ballam	
3	Horo, (table rice)... ...	
4	Atab kurm shal (table rice)	
5	Atab Banktulsi, (ditto) ...	
6	Auskoli ditto	
7	Kookrahati (table rice.)	

We have given above a list of the different kinds of table rice grown in the 24-Pergunnahs. Table rice prepared in Dinagepore is called Chini sukur; in Backergunge, Balami atab, and in Burdwan, Burdwani atab.

The descriptions of the table rice sent to the Calcutta market are as follows:

1. Patna Horo (called so because the first seeds were received from Patna): it is the best sort. When sifted, is called Sita, in which state it is exported to Australia, Cape, &c. In unsifted state, it is exported to Bombay, England, &c.
2. Auskoolly, smaller grain, exported to Bombay & England.
3. Kukrahati ... ... ditto ditto
4. Dacca, white Ballam or Ballama atab, do. do.
5. Gross rice means unsifted with broken and rice dust. Mixture of Auskoolly and Patna Horo may be gross or sifted It comes to the market as gross like any other table rice. The sifting is done here.
6. Golan, siftings of Sita.
7. Kurimshal, reddish.
8. Banktulsi, small grain, used for local consumption, and sometimes exported to Great Britain and Melbourne.

9. Chini sukur, the older it is the more valuable.

The famine prices in Lower Bengal, as far as we can gather, are as follows :

In 1770, Rice best sort, 3 seers per rupee.
coarse 3½ „

Ordinary prices, 28 seers per rupee for good rice.
40 „ „ „ coarse rice.

In 1788, Rice 10 to 12 seers per rupee.

In 1866, (Orissa Famine) 3½ seers at Balasore, and in some localities 1 to 1¼ seer per rupee.

Although the Orissa Committee state "that the great extension of the breadth of cultivation is beyond dispute, the area has enormously increased."

In 1873-74.

Moongy sold	...	Rs.	5 per md.
Ballam	...	„	4-8 „

In 1877, (Madras famine.)

Moongy sold at	..	Rs.	4-8 per md.
Ballam	...	„	4-12 „

The export of rice between 1851-52 and 1862-63 shows that in 1862-63 it was the largest, being 11,132,666 mds., and between 1867 and 1877 the largest export was in 1876, being 13,602,977 mds. During the late Madras Famine. "Bengal exported 35,000,000 mds. of rice against a previous yearly average of 7,000,000 mds.," which is a conclusive proof that the cultivation has considerably increased, more especially as the consumption is larger owing to the increase in the population. The population of Bengal, including Assam, is say sixty millions (census return being 60,776,774), and allowing half seer per head, the annual consumption amounts to 270,000,000 mds. It is a question whether there are any stocks when the Aman comes to market, more especially when the prices are high. The growers and mahajans think it best to move off the paddy or rice ; as storing does not generally promote their interest.

Chittagong at one time was the Gangetic mart and the emporium of China and Bengal productions. During the last few years it has become a rice-growing district. It grows the following crops :

Cazla, Oush, Foolog, Ashene, Sheermotee, Ballam, Jabra, and Moatacara.

The Chittagong rice is shipped to Mauritius, Bourbon, Bombay, West Indies, Ceylon, Galle, Colombo, Malabar Coast, Cochin, Cannanore, Tellicherry, Naraingunge, Penang, Aden, Demerara, and Maladives.

The shipment of rice commences in December, and lasts till March. Besides rice Chittagong exports paddy. In 1875-76 16,425 tons were exported to Ceylon. The export of rice in 1873-74 was 1,03,711 mds.

From Balasore, Cuttack and Poorce, paddy is exported to Ceylon, and rice to Mauritius, Maladives, and Ceylon; also from the False Point, Chandbali along the Coast of Orissa.

Previous to the establishment of the Burmese rice in the English market, Bengal rice was exported to England and the Continent for being mixed with flour and for the purposes of distillation; but the Burmese rice being cheaper, it sells more readily in the English and Continental markets.

The Agricultural Exhibition was held here in 1864. It will appear from the "Rough List of Live Stock, &c., and of Agricultural produce," that samples were sent from the different districts and the competition was keen. For the scalded rice of different varieties grown in Bancoorah, Bhaugulpore, 24-Pergunnahs, Dacca, Chittagong, Dinagepore, &c., prizes were given. For the unscalded rice grown in Gya, 24-Pergunnahs, Goalpore, Rajshahye, Beerbhoom, Mooragacha, Bhaugulpore, Dacca, Bancoorah and Burdwan the prizes were more numerous. From several of the above districts, table rice does not come here, but must be exported to adjacent districts if not consumed in the growing districts.

There were also Exhibitions in some of the districts. At the Jessore Exhibition "there was a good show of rice;" at the Dacca Exhibition "there were upwards of 150 samples of rice of good quality." The competitors from Burrisal, Backergunge, and Dacca carried away prizes.

Bengal produces several kinds of scented rice which remind us of "the fragrant rice" in the Ramayan. But these come more under the unscalded rice than under the scalded rice. The Parsees consume bread made of rice reduced to powder. The table rice is more nutritious than the scalded rice, but it is equal to wheat. The Carolina paddy has been tried in Bengal, but without success. There is no doubt that the cultivation of rice has increased, but we are not aware that any efforts to improve the quality of the paddy have been made by the people or the Government, although the Government of India in one of the despatches says, "the cereals of the country demand similar attention. Rice, wheat, and other grains are frequently of an inferior description, and by the careful introduction and continued use of selected seed of a superior character great improvement might unquestionably be made." We are not aware that this subject has engaged the attention of the Department of Agriculture, or any steps taken to improve the cereals of Bengal.

Notes on a new fibrous plant: Malachra capitata. By J. E. O'Conor, Esq.

Among the specimens of raw produce collected in Bombay for the Paris Exhibition were samples of fibre extracted from *Malachra rotundifolia* (so named in the list of Bombay contributions).

Regarding this specimen the following remarks were made in a memorandum attached to the list of contributions:—

"From this plant, which grows abundantly during the

" rains in waste places in and near Bombay, Dr. W. Gray, " M. B., extracted a fine fibre and sent it to the proprietor of " the Bombay Hemp and Jute Mill for examination. It was " most favourably reported upon. At the beginning of " the last monsoons the proprietor was, at his own request, " taken to the Byculla flats in Bombay and the plant was " shewn to him. He remarked that the usefulness of this " plant was not known, and reported that the discovery is " a boon to 'Bombay! He has subsequently taken steps in " procuring fibre from this plant, and about forty day- " labourers were till now kept working by him at Chembur, " a village near Coorla.' A new industry has thus been " started. This fibre perhaps deserves special attention."

Struck with these remarks I asked the officer who was in charge of the Bombay collections for Paris and who had prepared the list (Mr. F. F. Arbuthnot, C. S., Collector of Bombay) to be good enough to furnish me with some further information on the subject and samples of the fibre as well as of the plant itself. Mr. Arbuthnot was not able to send me any of the fibre, the whole quantity prepared by the mill-owner referred to above after the monsoon having been already exhausted. He had mixed the fibre with jute and made gunny bags of the mixture. Mr. Arbuthnot sent me samples of the plant however and copy of a letter from the mill-owner to Dr. Gray, on the subject of the fibre. The letter was to the following effect: * * " I have received through your " friend, Mr. B., a sample of a nicely cleaned new fibre taken " from a jungle plant, and being new it gave me extra " pleasure in testing it, and I can safely say that the new " fibre is quite as good as jute. If this new fibre can be " grown in quantity, it will be a great thing and a boon to " this presidency. The fibre is actually not the yarn of " jute, nor do I know its true name. It seems like what the " natives call Ranee Bhendee, or jungle Bhedee, but even that " is doubtful, as Bhendee is scarcely so good as this fibre.

"The fibre is in length from eight to nine feet, thoroughly "cleaned from gummy substance and dirt, has a nice silvery "appearance with a peculiar lustre, and is almost as soft "as silk. In passing the fibre through the machinery "damped with oil and water as is commonly done with "Bengal and Konkan jute, yarn was produced strong "enough and nearly equal to that made from the second "quality Bengal jute. In the opinion of our European "spinning master, owing to the almost imperceptible "difference between the yarn made from the new substance "and Bengal jute, it is very suitable for weft, but if the "plant is carefully grown and well looked after, the fibre "would then no doubt rank fully equal to Bengal and "Bombay jute. Owing to the high prices ruling for jute "in Bengal and elsewhere, the new fibre, if carefully prepared, "would command a ready sale at Rs. 3-12 to Rs. 4 per "Indian maund."*

I submitted the specimens of the plant and the papers received from Bombay to Dr. King, Superintendent of the Botanical Gardens, Howrah, who had kindly offered to identify and name the plant. He says that the plant is *Malachra capitata*, not *M. rotundifolia*, which is found only in South America, and he adds: "*Malachra capitata*, "though probably originally a native of South America also "is now found everywhere within the tropics. It now grows "sparingly about Calcutta, but as it is not mentioned by "Roxburgh in his *Flora Indica*, it appears probable that it "did not occur at all here in his time. Wight and Arnott "do not mention it in their *Prodromus Floræ Peninsulæ "Indiæ Orientalis*, and it is therefore improbable that "it was common in Southern India when that book was "written. I should not anticipate any difficulty about grow- "ing the plant in Bengal, but whether it would yield as "good a fibre or be as valuable as jute I am quite unprepar-

* This letter was dated 20th July 1877.

"ed to offer an opinion. The plant belongs to the N. O. "*Malvaceæ*. It is an erect annual (or occasionally perennial) "shrub, covered everywhere with very stiff hairs. The "leaves are broadly heart-shaped, almost rounded, and are "borne on long stalks. The flower heads are also carried on "long cylindrical stalks which rise from the axils of the "leaves. The flowers themselves are yellow or white in colour. "There are about five or six of them on each head, and they "are surrounded at their origin from the flower-stalk by "three or four half-kidney shaped bracts. Each flower "produces five seeds."

The above is a popular description. Sir J. D. Hooker's description in the *Flora* of British India is to the same effect, though stated in botanical terminology. Sir Joseph Hooker writes of this plant (*M. capitata*) that it occurs "throughout the hotter parts of India from the North-West "Provinces to the Carnatic, probably introduced."

The members of this family are usually found in marshy places within the tropics. It would seem, therefore, that this species would thrive well in Bengal. In fact, it is already common about Calcutta, and Voigt (*Hortus Suburbanus Calcuttensis*, p. 112) refers to it as domesticated in his time (1841) about Serampore. Mr. Blechynden tells me that Graham, in his catalogue of plants in Bombay and its vicinity, alludes to *Malachra rotundifolia* as introduced by Mr. Nimmo about forty years ago.

The preparation of the fibre is the same as that of jute. When Dr. Gray operated on the fibre in Bombay, he steeped the stem in water for a week. It must be steeped when freshly cut, for, according to the experience of the mill-owner who tried the fibre, if the stem is exposed to the sun and allowed to dry, great difficulty is felt in getting rid of the external bark, and the fibre obtained is coarse and inferior in quality.

The utilisation of this plant would be specially advanta-

geous in the Bombay Presidency, where as yet attempts made to grow jute can hardly be said to have had any success. But the plant seems to merit attention in Bengal too. Growing as it does and flourishing without any attention in marshy soil of which we have more than enough for all purposes in Lower Bengal, it would seem to offer to spinners and to paper-makers an excellent substitute for an addition to jute. I believe the Bally Paper Mills Company are anxious to find some fibrous product capable of conversion into paper at low cost. Here is one to their hand, and I beg to recommend it to their attention, as well as to that of jutespinners and rope and twinemakers.

In Balfour's Class Book of Botany, p. 771 it is said that in Panamá the leaves of this plant are used as an anthelmintic.

April 15th, 1878.

Suggestions for guarding against the consequences of droughts of the future. By Capt. J. F. Pogson.

The earliest famine on record, and the manner in which its predicted advent was prepared for, and the seven years of dearth met, is to be found in the 41st Chapter of Genesis. The fertility of the land of Egypt, was even in those ancient times, due to the rising* of the waters of the Nile, and as they were then as now rendered hard by the *lime* and calcareous matters held in solution, they induced and produced abundant crops of corn of all kinds, also cotton and flax, and as the great agricultural prosperity of ancient Egypt was due to the waters of the *Nile* in flood, so must the long continued *famine*, have been due to some great convulsions

* "The rise of the Nile commences at the end of May and lasts through June, July, and August, up to about the middle of September, when the decrease continues till Christmas. From Christmas till May the amount is tolerably constant." (*Vide* "*Nature*," 21st October, 1875) page 541.

of *nature*, which choked up the course of the *Nile*, on its discharge from the vast fresh water lakes, or seas of Central Africa, and so reduced the annual inundation of the *Nile* to the lowest minimum.

The vast reservoirs, canals, and water-works of Egypt derived their supply of water from the *Nile*, when in flood, and it follows that when the phenomenon alluded to took place the *irrigation* water-supply of Egypt was cut off, the vast artificial lakes and reservoirs gradually dried up, and the great calamity foretold by Israel's son, after looming in the distance for seven years, became an accomplished fact during the eighth year of the young Hebrew's administration of state affairs.

The drought and dearth, which followed in Syria and Palestine about the same time, was due to a cessation of the periodical fall of rain, and this infliction may have been caused by solar influences. The sun spots of the period may have produced an upheaval in Central Africa, and continued drought in Syria and Asia.

The measures taken during the seven years of "plenty" must of necessity have included the construction of new and especial irrigation works, their contained water being employed to irrigate fresh land brought under the plough for the first time. The immense slave population of the kingdom was absolutely at Vizier Joseph's disposal, and it is highly probable that the great reservoir about to be brought to the critical reader's notice was approved and sanctioned by the sagacious Hebrew Prime Minister of Egypt before its construction. The magnitude of the work, which has never been equalled, proves that the resources of the Empire were freely placed at the Egyptian Hydraulic Engineer's command, and the work must have been of the best and strongest description for the site to be still recognizable.

In reference to the magnificent Irrigation and Canal works of ancient Egypt, which at some very remote period

of antiquity included a navigable canal connecting the Mediterranean * with the Red Sea, Sir John Hawkshaw, C. E. F. R. S., states as follows:—"Egypt was probably far "better irrigated in the days of the Pharaohs than it is now. "To cite one in Egypt,—Lake Moeris, of which the remains "have been explored by M. Linant, was a reservoir made by "one of the Pharaohs and supplied by the fload waters of the "*Nile.* It was 150 square miles in extent, and was retained "by a bank or dam sixty yards wide, and ten high, which "can be traced for a distance of thirteen miles. This reservoir "was capable of irrigating twelve hundred square miles of "country.† No work of this class has been undertaken on so "vast a scale since even in these days of great works."

To bring home to the mind of the general and non-professional reader what the above information practically means it is necessary to explain that twelve hundred square miles are represented by seven hundred and sixty-eight thousand acres, and as two crops of cereals, (rice, maize and millet, during the summer, and autumn and wheat, barley, &c., during winter and spring,) were sown and grown in Egypt during the agricultural year, an estimate of four quarters (lbs. 1,920) of produce per acre is very considerably under the mark. At this rate the lands irrigated by the reservoir in question would have produced annually three millions and seventy-two thousand quarters of grain, or pounds 1,474,560,000 (one thousand four hundred and seventy-four millions and five hundred and sixty thousand pounds.) And for five years the produce would have amounted to the sum of pounds 7,372,800,000, (seven thousand three hundred and seventy-two millions and eight hundred thousand pounds) or tons 3,291,428, or enough cargo for three thousand two hundred and ninety-one ships of one thousand tons each.

The Egyptians were given to idolatry and kept fasts as

* Herodotus, Book ii, Chapter clviii.

† M. Linant's "Mémoire sur le lac Mœris."

well as feasts, and if we allow five fasts and 360 days to the eating year and two pounds of grain per diem to each adult, or 720 pounds for 360 days, the above quantity (pounds 1,474,560,000,) would have sufficed to feed two millions and forty-eight thousand (*i. e.*, twenty lacs and forty-eight thousand) adults for one year, and supposing the grain to have been stored for five consecutive years, the stock in hand would have fed ten millions two hundred and forty thousand adults for one year.

The water nut (*Singhara*) so largely and profitably cultivated in Cashmere, was known to the Egyptians, and supposing the magnificent reservoir under notice to have been planted with it, the three months' harvest at the low rate of eight quarters of nuts (kernels) per acre of water surface would have yielded sufficient food for five hundred and twelve thousand adults at two pounds each for the year of 360 days.

The reservoir covered 150 square miles, and the expanse of water surface measured ninety-six thousand acres. Now eight quarters equal 3,840 pounds, which divided by 720 gives as quotient (5⅓rd) adults. Hence it follows that the nuts gathered from three acres of water surface are amply sufficient to feed sixteen men for 360 days, or one year including five fasts.

In Hindoostan seven rupees per acre may be obtained from the ryot, if he makes use of canal water for his crops, but if the rains are regular no water is needed and the canal income suffers. If *singhara* cultivation was systematically carried out, the Government would derive an annual income from its canals, whether the zemindars took water or not, and as this income would greatly exceed eight rupees per acre, the annual loss sustained by neglecting the cultivation of the *Trapa bispinosa* is something immense, for in round numbers eight quarters equal forty-six maunds, and at only one rupee per maund, the acre of water surface would yield forty-six rupees worth of nuts against eight rupees water rate drawn from one acre of irrigated land.

The embankment of the reservoir was sixty yards wide at

top and most probably fifteen miles in length, and we may be pretty certain that at suitable intervals the entire length was planted with the most productive kinds of plantain. It is a well-known and established fact that an acre of land under plantains is capable of producing a much greater quantity of food than even an acre of potatos under high culture.

India is the land of the plantain, and it grows to perfection from imperial Simla to Cape Comorin, and from Lahore to Assam. Burmah is famed for its plantains, and in Bengal proper it is used extensively as fruit when ripe, and as a curry vegetable in its green state. The people of India have not yet learned how to dry plantains, but as soon as the *modus operandi* is generally known, the plantain will be as much valued as a food producer in India as it is in the West Indies and South America.* The Canal Authorities have

* The Banana of Brazil.

M. Corenwinder, Analyser, Paris. He has reported the following results to the Academy of Paris : —

The ripe fruit was found to contain of

Water	73·900
Albumen	4·820
Cellulose	0 200
Fatty matters	0 632
Cane sugar, grape sugar, an organic acid, pectose, and traces of starch.	19·657
Phosphoric Acid	0·420
Lime, alkalies, chlorine iron	0 729
Loss	0 012
	100 600

The husk, or skin of the ripe fruit reduced to ash was found to contain of

Carbonate of potash	47·98
Carbonate of soda	6 58
Chloride of potassium	25·18
Phosphates of potash and soda and a little sulph.	5·66
Carbon	7·50
Lime, iron, silex	7·10
	100·000

"The large amount of two valuable salts, carbonate of potash, and chloride of potassium found in these ashes, ought to render them highly important as an article of commerce."—(*M. Corenwinder.*)

"The fruit of a single tree sometimes weighs 70lbs. or 80lbs. but averages from 30lbs., to 40lbs. and according to Humboldt the same space of one thousand square feet which will yield only 462 lbs of potatos, or 38lbs. of wheat, will produce four thousand pounds of plantains, and in a shorter period of time."—(*Vide* "Johnston's Chemistry Common life.")

only to plant the road and slopes,* on either side of the canal's course with plantain, to secure in perpetuity a very handsome annual income from the sale of the ripe, green, and dried fruit.

The water-logged canal lands under suitable treatment might easily be excavated to the depth of three feet, and the soil as removed made into an embankment three feet in height; and on water being admitted tanks six feet in depth and covering two or three (not more) acres of water-logged land, with solid embankments thirty-three feet wide, between tank and tank, would become available for singhara cultivation. The embankments throughout being planted with cocoanut palms and plantain. The large extent of once fertile land now sterilized by sulphate of soda and common salt (*kullur*) † might be similar reclaimed and turned to profitable account. In the canals ready existing the Government of India possesses most valuable property, and this value would be indefinitely enhanced if the measures suggested were adopted. To initiate the project all water-logged and sterilized (kullur) land, should be permanently resumed by the State, and, convict labour being freely em-

* "Slopes"—The planting of numerous rows of Sissoo trees on the roads and slopes of Canal embankments to preserve the soil from being washed away during the rains is by no means necessary, for the common asparagus, (indigenous or imported,) sends down a mass of roots three feet, and more in length, which is quite sufficient to protect the soil; whilst the annual crop of tender sprouts afford a good supply of wholesome food for all classes. The Canal, when densely planted with Sissoo trees, (as at present) causes it to act as a wall or barrier, and most effectually obstructs ventilation and onward circulation of air, whereas that covered with plantains would keep the air in constant motion, and by giving off vast quantities of oxygen, foul air, or malaria, would be decomposed, far and wide, and fever producing tracts would become things of the past.—J. F. P.

† "Kullur."—The plantain thrives on soils containing potash and salts of soda, hence by adding four ounces of common saltpetre to the "Kullur" excavated soil, and placing the young plant in the centre of the circular excavation, made on the embankment, a heavy crop of fruit would result. In like manner the cocoanut requires common salt to make the young plant grow and attain maturity. In Burmah the excavated soil is mixed with quantum suff of salt and replaced in the hole, in the centre of which the sprouting cocoanut is planted. Where the Date palm grows, the Cocoanut tree will do the same. The "Kullur" lands therefore are of value for the plantain and cocoanut.—J. F. P.

ployed, the valuable productive works advocated in this communication would actually be constructed at a nominal cost, for the convict must be fed under any circumstances, and his labour, if utilized in the manner indicated, will cause a flow of wealth to the coffers of the State, and render starvation from drought impossible. Financially speaking *deficits* would cease, and a sensible reduction of taxation be feasible.

The Gardener's Note Book, No. 17. By Col. W. H. Lowther.

I.—Indian Culinary Vegetables.

Foremost in Indian Kitchen Economy may be considered the "Pumpkin Tribe."

The "Vegetable Marrows" require a *very temperate* climate. I have had extraordinary success with these delicious gourds. ocalities wide apart, *i.e.* in Assam and in the Eastern Colony o: South Africa; some six or seven kinds rewarding my experiments in both these very opposite parts of the earth.

The Assamese cold season, far up north (as at Suddya) is cool, sunshiny, and free from frost in the valley of the Brahmapootra. Early in October I made maunds of rich soil with a low water furrow surrounding these heaps, in each three seeds were sown just above water level: *many* were the oly loads gathered during the season, and the surplus were left to ripen and then stored for months on the shelves of my kitchen as a resource for the bad months.

In South Africa I had even greater returns and knew not what to do with my supply, innumerable presents of these dainty luxuries were distributed, my store-room overcrowded, and the residue left on the ground. To encourage my Kaffir man of all works I loaded up a wheelbarrow and told him he might have all the money he could get for the sale of the contents: he came back with eleven shillings and odd pence as the result!!! Soon there was a cry that I had come

amongst the inhabitants as a *Market Gardener*, and I stopped all further sales, telling my man he had a splendid business before him. On my departure in the Central Provinces and here at Benares I have found the culture of all marrows, even from Cape seeds, as totally disappointing: east winds and frosts the two potent enemies of this desirable esculent.

In the Punjab, by dint of great precautions and exertions, I managed to raise a few good specimens for the table. I grew the plants on a rough frame covered with newspaper during the cold months and transplanted to the open ground late in January, guarding them with hand-baskets at night. Then to windward I had prepared a row of tall large leaved *Beares* to avert the east winds and dust storms, and I had marrows to eat by dint of hard work and watchfulness; nothing much but it was prized for its difficulty.

For some years I have grown the nearest Indian substitute for marrows, the nice little *Dil pusund* (hearts delight,) both here and in the Central Provinces, weighing about two pounds each, very soft and with some flavour, highly acceptable, as it is on the table in May and June, when green vegetables are scarce: besides the shoots of this species (and indeed of all gourds) furnish an excellent *sâg* (or spinach), and their removal is of benefit to the plants. I also grow a middle sized *melo pepo* of native origin, good for the table, and which keeps well when mature; this is not killed by the monsoon (as *Dil pusund.*) Fruit hard, olive green with yellowish or cream colored stripes, covers much ground, bears very abundantly. Shoots excellent as a *sâg*, cooked like English spinach or put in a "fish curry:" all last rains I had a number on my shelves which lasted till the cold season; a good famine food I should say.

II.—On the culture of Leeks.

During my long sojourn in the East I have rarely seen a bed of this excellent economic vegetable, far surpassing

the common onion for all culinary purposes. Moreover, obtainable in a fresh and green condition when those esculent bulbs are unprocurable, or are in a deteriorated state from long keeping in the store-room.

Here, in the hottest time of the year, my plots of leeks only three or four months old, are supplying me daily with fine succulent specimens, a good long, with thick fleshy stems. This famous garden vegetable came from Egypt and is mentioned in the oldest records, sacred and profane,—as a popular article of diet on the Nile, hence it thrives in most parts of India where irrigation is practised. Why it is not known in Barrack use and served out instead of the miserable withered onions I know not, and can only hope that this article may meet the eye of the Executive Commissariat. Tons of filth are annually carted away from our military buildings and thrown away in some unfrequented hollow, which could be profitably employed in enriching suitable trenches for a market garden, wherever wells or ponds exist. The leek *cannot have too much water* during the hot months, indeed, the soil must be always muddy; *my* beds are put in a low ill-drained situation where nothing else will thrive, and there is always a great leakage going on from the main watercourse near the well: hence in the hottest weather the soil is saturated. Besides this constant flooding I often sprinkle wood-ashes, poultry dung, decayed stable manure over the beds, and then fork the stuff well on about the roots: after this the water is turned on. The first sowing of leeks, should be made about October, and for the sake of continuous moisture I prefer old packing cases to beds; a similar sowing should be made when the frosts cease. Have your beds ready to receive the seedlings when four or five inches high, and give plenty of room (not less than 1½ foot apart.)

I find English and American seed very good, but I should think a more hardy variety could be found in Egypt.

At Jubbulpore, in artificial soil, leeks in two years attained an enormous growth and rather puzzled the natives; one *mallee* saying he had waited patiently all that time for the plant to grow a "bulb"—*an onion* in fact!

III.—Indian Vegetables.

Hibiscus Okro; *Bindhee, Ram Turahi.*

This is a hot weather esculent as much sought after by some individuals as *detested* by others, the latter object to its *shiny* and *sloppy* appearance. I am among the former, but have often been requested *to eat it elsewhere!* No more nutritive or emollient vegetable exists in the whole world, and I frequently make a hearty meal on the same with only the addition of pepper and salt. The plant dislikes *freshly manured* soil, but thrives well on one well enriched in a former season, such as cauliflower ground, or lettuce beds, and I have always found the quality of the capsules dependent on these circumstances. I have come across three or four species (or perhaps only *varieties*) thorny and thornless: the former nice flavored but objectionable to the gatherer who requires gloves and scissors to save his hands.

Some years ago I found in the markets of the Central Provinces, a monster species, green, succulent, and like a cucumber at a distance; at table they were pronounced by all who tasted them as a delicacy. I tried in vain by the offer of money to get seed, or see the growing plants. I was plainly told that they were a monopoly, and that no seed would ever be sold as it would then become common. I suppose this kind was originally brought on to India by some returned cooly, probably from Demarara. Do any of your numerous members know the plant?

IV.—Notes on Flower Gardening.

Sowing in proper season and with regard to the climatic conditions of exotics, has much to do with success. All amateurs should have "Paxton's Botanical Dictionary," and

"Carter's Catalogue of seeds," giving the native country and month of flowering in Europe; besides these a little study of elevation and temperature obtainable, from modern travels and books of geography will prevent such frequent mistakes and disappointments as ordering natives of Siberia, the Andes or Northern Europe for their flower gardens of the Indian plains! This remark does not of course apply to "Annuals," those pretty quick growing short-lived ornaments of the parterre, but to perennials, shrubs, trees and bulbs, &c., requiring time for their development. In the hot moist districts of Hindustan, the flora of South America, West Indies, Western Africa, &c., can be grown with fair success; that of Southern Africa and parts of Europe, Australia, &c., in the mountainous tracts of the North-West Provinces; of the humid countries as Malacca, all the islands of the Indian Ocean, and the Pacific of the South Atlantic (localities with no winter season) in the Neilgherries, and Southern India, and so on. I look on travelling as yielding the best lessons on horticulture: how to see, how to grow, and how to gather the floral beauties of the world in natures great garden!

It is pleasant to behold in the great capitals of civilization, the glazed palaces devoted to the existence of exotic vegetation, but lately the prevailing weeds, and widespread vegetation on which the travellers' footsteps had crushed their path, *here* cultivated by costly appliances, and sold for their weight in silver! During one of my three sojourns in South Africa I made a growing collection of wild plants, bulbs, and ferns, and was thus enabled to study and admire them at my leisure,—the very best lesson in horticulture I ever received; but I was a source of amusement to the dull colonists, who could not imagine a *gardener growing weeds* to their wool-growing, cattle-breeding, money-making ideas. I was a fool to admire gladioli, ferns and such "bush" "weeds," which *they* ploughed up and burned unremittingly; nor could they comprehend my state-

ment that the great blue expanse of waste land covered with *Anchusa capensis* in full bloom was worth more than a cornfield, as its seeds were sold at one shilling a packet in Europe. There was another weed entirely restricted to a small strip of forest contiguous to my abode, so *local*, that botanical professors, curators of public gardens in the same colony could only obtain it through me. I mean a new dwarf fern known as *Cheilanthes Bengii*—("that green stuff" of my neighbours which was worth much money as I told them.) This beautiful little species defied all my attempts to domesticate, though I had every advantage of personal acquaintance, soil and climate to assist me; it was a real child of the woods.

A number of species among imported seeds are sown in the wrong season, besides being treated wrongly in matters of soil, over watering and bad drainage, aspect, overcare or neglect. The natives of rocky countries all prefer "pot culture," and will not even flower on the border. *Anchusa Italica* is one of many instances. In the cool months *Perilla Nankinensis* would not grow an inch, and gradually withered away. When the hot weather set in Mr. Ridley of the Lucknow gardens grew it successfully, and he writes that in the rainy season it is still finer, and has sent me a quantity of acclimated seed as a proof of his statement; another illustration of natural tendencies in a Chinese summer plant. In the long dry cold season of the Punjab stocks and wall flowers attain great perfection; at Jubbulpore they fail entirely, and here in Benares are wretched specimens. North African plants do not succeed in the moist air of the Central Provinces. *Lathyrus zingitanus* grew to a considerable height, but would not give one flower, and *Convolvulus mauritanicus* flowered shyly and gave very few blossoms, and only existed in tubs under shelter; while here in Benares it is a border plant, always gay with its lovely lilac blue inflorescence. *Gloxinias* multiplied and made a great

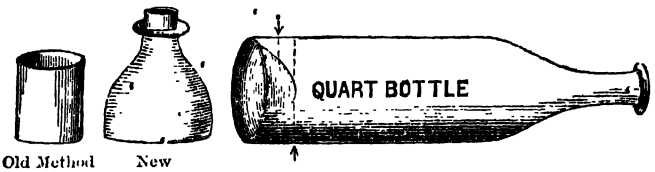
show in the Central Provinces, while here they will not do so. *Achimenes* require much care and are poor specimens at Benares, with small blooms; at Jubbulpore they form dazzling masses in out-door vases and multiply beyond all description, and may be often found self-sown in damp nooks and corners. I think I have given some hints to zealous Amateurs on the selection of species in gardening. It is an interesting experiment and often repays expense and labour, adding to the out-door pleasures of our exiled life.

I will here add that at Dehra Dhoon, that delightful South American bulb *Eucharis Amazonica* did not succeed and died out, and that I found some withered specimens in a garden here which had never flowered. I treated mine by book reference as *South American Aquatics* in pots, and now annually I am rewarded in the hottest time of the year (June) by delightful snow white scented clumps of bells. While all outside is bare and dusty my garden just now is lively with a mass of all the new Gaillardias, Helichrysums, double Hollyhocks, Lychnis fulgens, Scabious of sorts, Centaurea Americana, Amaryllids, Callirhoe, Cannas, Ipomœas, especially I. Leari (which has been in bloom for months past,) Roses, Amaranthus, Petunias, Portulacas, Russellia, Pancratium, Campanulus, Datura Huberi, Ipomopsis, Cuphea, and many other gay species; and I am often told by persons they thought gardening could only be done in the cold season! I am certain there are many scores of new plants which will be found well suited to the hotter parts of India. I must not omit the new plant *Romneya Coulteri* which seems to enjoy the hot north west winds, being a cousin of our troublesome weed the *Argemone* (*Sial kanta*), while Eucharis Amazonica, treated as an Aquatic on the verandah, blooms splendidly in June!

V.—On cheap hand Glasses and their improvements.

About a quarter of a century ago I sent to the A. and H. Society of Calcutta a cheap and useful substitute for the

costly bell glasses imported from Europe, accompanied by a rough sketch. (Journal Vol. IX, p. 11 old series.) In those days I used to cut my bottles as in the undermentioned illustration at the slope of the cylinder, *i. e.* towards the neck; *now*, I always divide them near the bottom; with a little practice it is not a difficult or troublesome job.



First tie a piece of stout whipcord round the bottle at the mark ↓, then with one of the new regimental steel glass cutters go deeply round the tie, as correctly as possible; remove the whip-cord, soak some raw cotton yarn (about four threads) in turpentine, wrap it over the cut line; hold the bottle by the neck, and with a match set fire to the thread. Turn the bottle slowly round, so that the fire may burn equally, just as the yarn is nearly burnt out with a feather, drop a little of the coldest water procurable exactly on the line of fire, generally a click will be heard and the glass is separated: sometimes a gentle tap of a wooden hammer requires to be struck on the thick bottom below the line, which causes vibration and parting of the section. I use all kinds of bottles, some of the *tinted* glass kind are best for shade loving cuttings, those of clear glass for the hard wooded sorts, and I have added a simple "dodge" to preserve continual moisture, as with fern shoots, aquatic species, forest plants, begonias, &c. &c. Instead of the cork stopper I use a small tin funnel, a piece of cotton loosely stuffed in the neck, and which plan gives a continual drip. For some stubborn seeds of slow germination it answers well also for fern seeds. At sales one frequently meets with cracked or slightly damaged chemical bottles of pale green-glass, stout and wide in shape, these are the best of all

bottles, wall shades are still better but fragile and expensive. Whenever glass apparatus is used, it should be guarded from accidents. My chief losses were by cats, dogs, and crows, and on one dark night my array of cheap tumblers (an auction bargain) was swept away by thieves. Wire netting is a sure preventive to all the above annoyances, and is not very expensive. A champagne quart will cover three good cuttings of most plants, a clear glass whiskey quart will serve for two, and a tinted hock bottle for one choice species. The apothecary's bottles will make a cover for several or for tender seeds, but for the latter I prefer the newly-invented boxes with sliding panes on the sloping top, *miniature Wardian cases*, which can be made very cheaply of brandy or claret boxes by any bazar *mistry*. I have found them great auxiliaries during the tropical rains.

VI.—Hot Weather Flowers.

During all May the following have been very gay ornaments of the garden. *Ipomopsis*, various in pots and beds, the best are those which were not transplanted. *Cannas*, many choice kinds have been flowering with abundant irrigation since March. Every known kind should be brought from Europe, the roots travel well. *Gaillardeas*, including all the new kinds, have enlivened the borders ever since the hot winds set in.

Heliohrysums, ten or twelve pretty sorts, are only now going out of season; some showers of rain have hastened their end. Grouped in the borders they made a great show and delight in drought. I have seen them on the tops of mountains, getting no kind of moisture except occasional dew. *Cupheas* have been cut down several times, and continue to give flowers, hundreds of self-sown seedlings are springing up. *Amaryllids*, several bloomed during the month, *Lobelia*, *Marvel of Peru*, *Salvia coccinea*, *Convolvulus mauritanicus*, *Callirhoe*, *Hibiscus* (several kinds), *double flowered Pomegranate*, *Plumbago Capensis*, *Centaurea*, *Antirrhinum*, *Petunias*:

China pinks, Datura (double flowered) Huberi, Hollyhocks, (double flowered), Nienembergia gracilis, Ipomœa Leari, Celery, (since February), *Pentapetes,* &c. &c., nearly all have yielded good seed, some *abundantly.*

Foliage plants in season, *Amaranthus,* several thriving. *A Henderi,* a lovely specimen, in full beauty.

Euphorbia variegata (in the borders) yielding seed now, but wants rain ; *Bidens* species growing fast and throwing out its delicately cut leaves—a nice decorative plant for ball-rooms, &c., *Coleus,* vigorous shrubs in pots and cuttings, strike well just now.

Arundo variegata, lately cut down and irrigated, gives fine particoloured shoots, otherwise it grows rank, and green.

Solanum pseudo *capsicum* all in flower now and plants vigorous, but fruit does not set, requires rain.

Hot weather vegetables, a few heads fit for the table. *Leeks,* good and growing fast. *Onions* dwarf, for pickling, just dug, very plump and perfect.

Beetroot, still good and fit for table from English seed.

Pumpkins, native.

Hearts Delight, and the striped kind yielding nice marrow like fruit, which should be cooked when small and soft seeded, certainly not larger than an ostrich egg.

Tomatos, a few late stragglers are ripening on the shelves. Plants are dried up, though here and there in damp places some of the round berried kind are germinating and should be potted for the rains or they will perish. My well has deteriorated, and I can only irrigate three or four hours daily : it is all *hand work* now with coolies. With an unlimited water supply I could have exhibited a better stock of plants and vegetables.

VII.—Heat-loving Plants which should be introduced.

Cochliostema Jacobianum allied to the *Commelynas* and from the same region as *Eucharis Amazonica,* first introduced by

Williams of Holloway into Europe. *Ixora Fraseri*, a lovely dwarf kind for vases and tubs, a mass of continuous flowers. *Nepenthes Hookeriana*, native of Sarawak, a wonderful plant.

Erythrochiton hypophyllanthus and others; flowers growing from the leaves; odoriferous tree full of essential oil, South America.

Dioscorea retusa, a pretty climber, a yam of South Africa, much cultivated there to cover trellises, is common now in England.

Ouvirandra fenestralis (or "Lattice plant") *Aquatic*, and the water must be *always warm*, native of Madagascar, whence introduced by the Missionary "Ellis," one of the most wonderful plants known, having *Netlike skeleton* leaves, in which insects are entrapped! I saw the original plant as it arrived at Mauritius and was offered young specimens; possibly it has been naturalized there.

Ricinus, all the new kinds of castor oil plant are exactly suited to India, they require much space on open exposed ground, and stand drought well. I have grown several kinds from Henderson's Firm, but not one of them can compare with the full red leaved and scarlet flowered species from the Punjab which I have not been able to procure for many years, I first found it near Jullundur in 1845. Late endeavours to trace the plant have been unsuccessful, it is the largest and most attractive of all the castor oil tribe.

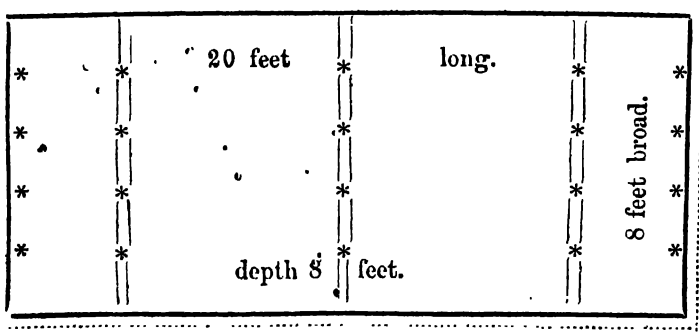
Poinciana elata, very elegant tree of Southern India. The flower spikes cream colour common about Bangalore, and there is a tall specimen in the Madras Society's Garden; they yield seed.

Barringtonia, two or three kinds, beautiful ornamental trees, requiring *hot moist* climates. At Ceylon I saw them flowering in all their pride at a distance, the tree seems to have wreaths and garlands suspended from the branches.

VIII.—A few Notes on the introduction of some beautiful plants to our Hill Stations in India.

When I lately visited Mussoorie, I noticed so many types of European and North China Vegetation in a wild state that I felt at once convinced much more might be done by enthusiastic horticulturists towards the introduction of Ornamental Flora than has hitherto been attempted, though I was told by many of the old residents that the severity of the Himalayan winters destroyed all choice exotics. In the autumn I observed that planks, matting, gunny cloths, old floor cloths, &c., were collected round a verandah for the purpose of shutting up ornamental plants, and shielding them from snow-storms and hailstones (so severe in those altitudes.) I saw conservatory glass which in spite of an external wire netting had been smashed wholesale. No local horticulturist appeared to have tried the English method of "cold pits," a very simple and economical excavation which I will now describe.

In some dry piece of ground near the edge of a slope (or *khud*) draw the lines of dimension as follows :—



it will resemble a cellar, in fact, and if expense be no object I recommend that it should be lined with a thick coat of Portland cement. To avoid all risk of flooding by melted snow or continuous rain, put a raised ledge of stiff clay or cement work wash round the edges with a slope on 3 sides

marked - - - - -, thus 3 timbers about 4 inch square should be built into the ledges: across these beams nail male bamboos * * * * *: all this framing will be necessary to resist the great pressure of snow, the dead weight of which is enormous; leave at one corner a gap for ingress and egress during the period of stowing the plants—nailing it up when full. Prepare the floor of your pit by spreading a layer 6 inches deep of fresh wood-ashes and charcoal refuse from fire places and kitchens. This is to prevent the ravages of woodlice and slugs, (the mortal enemies of plants in dark corners.)

Quantities of dried green moss, the straw cases of bottles, fallen leaves, and such like clean material should have been previously collected: rough hill-baskets too will be found very useful in which to paste the lesser bulbs, tubers and plant-roots, placing tickets of the contents on each. Geraniums, and such like may be lifted with some earth adhering to their roots and then wrapped in moss and straw. Indeed, everything may be so secured, except any plants growing in small pots which need not be removed: when the bottom of your pit is entirely packed, throw in a quantity of the dry leaves sufficient to cover the plants within: if you have driven some nails (or better still made shelves round the wall of the pit) you can put away the packages and baskets thereon, so economising space. Then again throw in a quantity of leaf and dry grass rubbish so as to cover the contents; the frame-work should then be overspread with dry branches of trees, interlaced, over which put any old matting or cloth, worn out tents, and gunny pieces, or damaged *durrees* would do well. Last of all some sheets of "Croggon's Patent Felt" (wool saturated with tar) will make a sound and durable roofing, to be secured against winter storms by a few pieces of stone-slab, acting as weights on this roof. The Himalayan summer is extremely hot, and plants grow rapidly in proportion; hence the horticulturist will reap speedy returns for this hybernative treat-

ment, and be enabled to preserve many delicate exotics when mature.

The *Bauvardias, Begonias, Pæonies, Hortensias, Fuchsias,* and a host of other summer flowering plants thus wintered will occupy little space. Those glorious new lilies, *L. Auratum, L. superbum, L. Canadense,* and a countless number of others will make fine summer growth in tubs or pots for the verandah, the bulbs being removed, when the foliage withers, to this cold pit. All the African and South American "*Amaryllids*" are now cheap in the English market, and may be treated the same as the *lilies.*

The South African *Crassulas* and such fleshy leaved plants with gaudy flowers travel well, and will be found great additions to the verandahs. As an auxiliary to the above system I recommend "frames" on hot beds to give the plants a good start and hasten their development. When removed from the pit, these may be heated by fermenting substances as horse-dung, grass, leaves, &c., or better still by any simple hot-water apparatus. Such an adjunct will not cost much, and add to the satisfactory results of pit preservation.

IX.—Culture of Strawberries.

Nearly everything thrives here, seeds too. We are still gathering strawberries (June). Forty-six years ago when my father was Judge here, (Benares) (who was a great horticulturist,) he introduced a particular way of growth which I have reintroduced. He used to send out large baskets full of the fruits daily as presents, so an old native, over 80 years of age, the son of one of his mallees tells me. I had a large manuscript book of my father's gardening operations in India, began early in this century, but I lost it with other treasures in my baggage, left at Cawnpore during 1857. A great loss to me indeed, but I remember many important items.

Brick kiln residue (full of potash) being the strawberry bed compost. I have been burning earth in kilns lately for my

roses and flower borders. Since I have used it I have not lost one rose by white ants or rats; it must not be overburnt to a red color like bricks, but only heated sufficiently to render the lumps of clay,—as big as your fist,—*black*: Thus weeds and insects are destroyed, the soil rendered friable; the quantity of charcoal, carbonic matter conducive to drainage and nutrition alike. All the leading plant-dealers in Europe now-a-days largely employ it, (*vide* Hole's book on Roses) Fuchsia and many other choice shrubs prefer it to all other soils. I mix two parts of this, put through a coarse sieve with one-third of the strongest well-fermented manures (night-soil from an earth closet I prefer) to be well beaten together with a wooden rammer, and put under shelter till wanted. Everything seems to grow well in it. I collect hedge clippings, dry weeds, tree choppings, grass, dried horse, and cow-dung, stable litter, and combustible rubbish of every sort.

Build a semi-circular wall with alternate clay lumps and fuel about 4 feet high; then fill the hollows up *with fuel only* and a heap of the same all round the pile till it looks like a small haystack; then set fire to the base in several places. Should the pile burn too fiercely check the fire with a little mud thrown over the flames, then leave it to burn till cool. I find that plants which generally perish by root-rot, as thyme, sage, &c., go through much bad weather in this compost. For packing tender roots and fleshy seeds, I recommend a trial *without the dung.*

Notes on Reana luxurians syn., Euchlæna luxurians,—a newly introduced forage plant. By the Secretary.

Observing in one of the monthly Journals of the Acclimatation Society of Paris in 1876, a very favorable notice of a fine forage plant, termed *Reana luxurians*, which had been introduced into the Botanic Garden at Bourbon, I applied to the Director of the Royal Garden at Mauritius on the subject.

Mr. Horne kindly sent me a small quantity of the seed, and afterwards, on a second application, a further supply. This grass is a native of Guatemala, where it is known by the name *Teosinté*, an antique name signifying "grass of the gods." It is most favorably reported on by the Director of the Public Garden at Guatemala, as possessing most nutritive properties, the stalks containing an abundance of saccharine matter. It forms enormous tufts, a single one being sufficient to supply an ox with food for a day. The leaves resemble those of Indian corn, but are much broader. M. Ch. Naudin states in the Journal of the Acclimatation Society of Paris for September 1876, that this *Teosinté* is *Tripsacum monastachyum*. Both despatches of seed were distributed last year (1877) to several members of the Society (whose reports were altogether satisfactory), and a small plantation was established in the Society's garden. From this, a large quantity has been gathered, as the grass seeds profusely, and has been distributed during the first half of the current year to upwards of one hundred applicants throughout India for sowing in the rainy season.

The seeds should be sown, in a nursery bed, in June, and transplanted when two or three inches high, six feet being allowed on all sides for full spread, as it becomes very bushy, and the more space allowed the better for its development.

The following translation of a paper by M. A. Vinson which appears in the *Bulletin Mensuel de la Société d'Acclimatation de Paris* for December 1877, may be of interest in connection with the foregoing remarks :—

The *Teosinté* is a most valuable plant. It is a fine grass, of great height, holding a middle place between maize, sugar-cane, and joh (*Coix lachryma*), but approaching nearer to maize than any of these three kinds of grass. Following the procedure of Darwinism, we can easily see in the *Teosinté* the ancestor of maize. This plant has a strong

stalk, and as its specific name implies, the vegetation is luxuriant. Originally from America and the Republic of Guatemala, it has been known to us since the 14th July 1875, by the Acclimatisation Society, under the name of *Reana luxurians*. Its acclimatation in France, tried first under the care of M. Durien de Maisonneuve, Director of the Botanic Garden at Bordeaux, has been more recently renewed, thanks to the despatch of seeds by M. J. Rossignon, Director of Gardens and Public Promenades at Guatemala. The annual plant taking nine months for its complete development, perishes always from first coldness of the temperature, even if placed in a greenhouse. One would suppose till then, looking only at its dried stalks, that it was a bamboo or a sorgho. M. Thurent obtained at Antibes a first development of the inflorescence before, or just at the time of its being killed by the first frost. Then M. Durien de Maisonneuve was able to know for a certainty, that this grass belonged to the genus *Reana*, and that it constituted a twelfth species, the first being *Reana angustifolia*. Without having, says M. D. de Maisonneuve, a claim to give it a name, I have provisionally placed it under that of *Reana luxurians* on account of the wonderful development of its organs of vegetation.

The seeds of *Teosinté*, sent to us from Reunion, planted in September, have germinated in about seven days. The plant springs up like maize, with which one would confound it on its earliest stage. Afterwards, in its second period of growth, it seems like the Coix, and it is not till it has attained its third phase of development, that it takes a decided personal character, and only resembles itself.

The *Teosinté*, genus *Reana*, is quite on the side of maize, genus *Zea*. Its terminal male flower is quite like our great grasses, and its female flowers, more numerous, separated and hidden under them, in the axil of leaves of a beautiful green, are fecundated from above by the pollen which escapes from the male flowers situated at the end of the

stalk. The lateral stalks alternate, rising up from both sides towards the sky.

Each female inflorescence is composed of spikelets of five within, the middle with morsels of beard, as at the termination of the spikes in maize. The joints bear alternately a bunch of spikelets enclosed in one bract or common valve; and the seeds enclosed in their turn in an inner and proper glume are adherent, the one after the other in rows rather than in a garland. They have the appearance of the little canine tooth of a child, of the color of amber or greyish, of a slate color, or even brown when the grains are well matured.

The trunk of the *Teosinté* sends out a great number of stalks and many roots, white or reddish, of a purple color like dregs of wine. A field which I have planted by measurement, and two seeds for each hole prepared as for maize, without manure, has rapidly and completely closed up like a field of cane, between the furrows of which there is no passage. The tufts in it are admirable—splendid.

Mules, horses, oxen throw themselves on the cuttings and devour all, even to the stalks and roots; which shews a most saccharine vegetable.

It is as a forage plant that it recommends itself to us; but from its appearance, its growth and its resemblance to cane, its properties extend beyond extract of sugar from it; that is to say, from sugar and alcohol, because the stem is close and not fistulous.

It is said that one tuft is sufficient to feed two bullocks for thirty hours. This is no exaggeration. It is even below the truth.

The *Teosinté* likes cool and moist places; nevertheless, it flourishes in dry localities. In the island of Reunion its growth is remarkable; it seems suited to all parts. Mine were planted in September 1875 at St. Denis and at Salazie. During the month of May I gathered the ripe seeds. These

seeds are even finer than those we imported, which is a good sign of acclimation. My plants have resisted during development the heavy rain and cyclone which we experienced. As to the trunk, which measures many metres, it is very high, it lies down on the ground, and is straightened again like sugar-cane and is not broken.

This fine grass has an undoubted advantage over sugar-cane, maize, and joh : the leaves ripen during its growth, that is to say they evaporate excess of water in vegetation, so that animals run no risk of cholic, which is often experienced by them here from fermentation of green leaves of other grasses.

Every one to whom I have given *Teosinté* seed have been surprized by the profuseness of its vegetation and its suitability to our climate.

We have distributed the seed to many persons. We have done all we can to spread the culture of this useful and handsome grass. One plant alone, an ordinary one, partially eaten down by my mules, and on which there remained only five stalks, has yielded me 505 grammes of fine seed which I forwarded on 10th June to the Chamber of Agriculture, to be distributed to the residents of the Island.

These seeds, abounding throughout the length of the stalk, are excellent as food for draught cattle, for cattle reared for the shambles and for poultry. Owing to the hardness of the exterior envelope of the grain, the birds of the air will not attack them. Although the borer settles on the stalks of the *Teosinté* as on all the grasses we possess, yet it has not at any time hurt this luxuriant grass. It gives after cutting several shoots. The seeds falling naturally round the roots of my plants, have germinated spontaneously.

Since sugar-cane and maize, the *Teosinté* is the most important forage plant that has been introduced into the

island of Reunion. Its seed can replace maize and yam; as a forage plant it is without a rival.

*** While the above is passing though the press the following is communicated by the Director of Agriculture and Commerce, N. W. P. :—the letter is dated 21st May 1878 :—

In continuation of this Office No. 350, dated the 23rd March last, I have the honor to report on the experimental cultivation of *Reana luxurians* during the year 1876-77.

2. In February 1877, the Agri.-Horticultural Society of Calcutta sent to this office a small packet of seed with instructions how to sow it. This was distributed among the three gardens of Saharunpore, Cawnpore, and Allahabad, and the Superintendents were desired to cultivate the grass very carefully, and to take steps for producing a sufficient quantity of seed for future experiments.

3. From the reports received, it appears that *Reana luxurians* has thoroughly succeeded everywhere, and promises to be a valuable acquisition to the fodder supply of these provinces. Mr. Halsey of Sujanpore, Punjab, a practical agri- "culturist, who also tried the plant, writes as follows:—"My "*Reana luxurians* is in flower and seed forming. If it will only "ripen, it will be the most valuable plant introduced into "India for years. It is something like Indian corn, bearing "the male flower at the end of the stalk, while at every joint "a cob forms like Indian corn." The plants did ripen, and we have now a sufficient supply of seed for carrying on more extensive operations during the present year. Besides the Government gardens, the canal *Rajbahas* near Cawnpore will be the field of the present year's operations.

4. The following is an abstract of the reports received from the different gardens.

Saharanpore.—Twenty-five seeds received from this department were sown in pots on the 16th of April, of which 13 germinated. When the plants attained a height of about one

foot they were transplanted to different parts of the garden, care being taken to vary as much as possible the conditions of soil and exposure. Those planted on the edge of a pond succeeded best, their foliage being much more luxuriant, and yield of seed greater than those on drier soil at a distance from the pond. On November 18th the plants were in full flower, and one of them measured upwards of 14 feet in height. Some cuttings made in September were in flower in December. The plants on other parts of the garden were artificially irrigated, necessarily intermittently, the ill-effects of which were further intensified by the severity and long-continuance of hot weather last year. The Superintendent promises to make further trials this year, and to observe the behaviour of the plant growing in damp jungle. Many self-sown seeds have germinated this year on the edge of the pond.

Cawnpore.—Eighteen seeds were sent to the Cawnpore farm which were sown on garden soil (manured with leaf mould) on 8th May. In eight days 13 germinated, of which two subsequently died, and the remaining 11 plants throve well considering the extreme dryness of the season: seeds were sown six feet apart, the plants rapidly spread, and the Superintendent has no doubt that had the season been a usual one, they would have covered the intervening space. Two of the plants were given to cattle which eagerly ate it, the rest were kept for seed. In December the plants were 5½ feet high, when flowers appeared at the crown. Seed-cobs similar to those of maize formed themselves, but unlike the Indian corn it had a cob on every joint of the stalk. The plant being an annual, the Superintendent recommends that two or three stalks in each stool be left for seed, the rest being cut for fodder as often as they become fit for the purpose, and that when in seed, they should be carefully tended as the birds are very partial to it. Here also self-sown seeds have germinated, and if these thrive it will be proved that the plant is capable of reproducing itself.

Allahabad.—Twenty-three seeds were sent to this farm, 12 of which were sown on the vegetable ground in the Khasru Bagh on 6th July 5 feet apart each way. Nine germinated about the sixth day after sowing; but owing to the very unfavorable dry weather prevalent at the time and some field-rats which got into the ground, only three remained alive, which were watered ten times during the season. On 27th November these three plants attained a height of 12 feet and tillered well, some of them having as many as 42 stems. They were then cut and produced ½lb. of seed and 120lbs. of fodder.

On 10th August the Superintendent sowed the remaining 11 seeds as above, of which five germinated. The plants grew away very strong, were kept weeded and watered four times during the season. They grew to a height of 7 feet and also tillered well, one of them showing 47 stems. These plants were cut on 28th December and produced 1½lbs. of seed, and 109lbs. of fodder. The Superintendent remarks:—"It will "thus be seen that the late sown plants produced the greatest "quantity of seed, and the first sown the greatest quantity "of fodder. Owing to the dry season, however, the experi-"ment was not at all conclusive; but having sufficient seed now "on hand I purpose sowing one acre this season, side by side "with *sorghum*, which is our heaviest fodder-producing crop. "This will enable us to taste exactly its capabilities as a "fodder crop against the *sorghum*. I have already sown in "February a small quantity of both seeds, *i. e.*, *Reana luxu-"rians* and *sorghum*, to determine which of them is the "most suitable as a fodder crop, during the hot weather "months where food for cattle is so scarce."

5. A packet of seed received from the Government of India has been forwarded to this Department with G. O. endorsement No. 616A, dated the 7th March last. This seed has been kept for sowing on the banks of the canal Rajbahas near Cawnpore. A report on the results will be submitted to Government in due course.

Notes on a new variety of Cotton (Bamiá), from Egypt.

By the Secretary.

At the commencement of 1877 a correspondent of the *Times* at Alexandria sent the following account of a discovery which appears to have excited considerable curiosity amongst a large branch of the manufacturing community :—

"The cotton world of Alexandria is just now immensely interested in the alleged discovery of a new species of the cotton-plant which promises to effect a revolution in the prospects of Egyptian cotton. Every one knows the story of M. Jumel, who, fifty years ago, walking in the garden of a Turk at Cairo noticed how well a certain cotton-tree flourished, and how he took away the seeds therefrom, and planted and replanted them until he founded the present cotton culture of Egypt. Well, it appears a Copt has now made a 'new departure' of a similar kind. The results already obtained from the new plant are most extraordinary. It compares with the old as follows :—An ardeb (270 lbs.) of ordinary cotton seeds sows on an average eight feddans (acres) and produces four cantars (100 lbs.) of cotton in seed, that is to say, the cotton with the seed inside it as it comes out of the cotton pod. Taking this yield as the average, every ardeb planted produces 32 cantars of ginned cotton and about 24 ardebs of seed. An ardeb of seed of the new species sows, like the other, eight feddans : but its yield is more than treble, and has even been stated at five fold. But my most trustworthy informant only gives ten cantars per feddan which I may add is the amount taken by one of the leading firms as the basis of their calculations as to the effect of the new plant. They add that it is difficult to say exactly what would be the ordinary yield as all returns hitherto are the result of exceptional culture on a small scale. On this calculation of ten cantars each ardeb of seed would produce 80 cantars of cotton in seed ; that is to say, over double the amount produced by ordinary seed. At present prices each ardeb would return about 240 lbs. in seed and cotton together, instead of 96 lbs. as it does now.

"The new cotton, I am assured by the best authority, is of good appearance commercially speaking, and quite equal in quality to ordinary Egyptian cotton. The plant grows in a different manner to the ordinary cotton plant. It grows to about the height of ten feet, has a straight vertical stem, without branches, with very few leaves

and is thickly studded with pods. Seventy are said to have been gathered from the first plant discovered. The ordinary cotton is found on a shrub, some four to five feet high with spreading branches. Nearly a yard must be left for air, light, and growing room between each shrub; whereas the new plant, from the absence of branches, requires only half the space. This fact is of material importance with a view to its capabilities of production in a given space. It is called here Bamiá cotton, from the resemblance of the plant to a vegetable of that name, and the Arabs maintain that it is the result of a cross between the two shrubs. But others say it has been brought from the Soudan or Equatorial Africa. Nothing, however, is positively known.

"The history of its discovery is curious. A Copt living in the upper part of Delta, at a place called Berket-el-sale (well of the Lion, a station on the Cairo Railway), in the province of Menouf, noticed in the autumn of 1873, a plant in a cotton-field wholly different to the rest. He collected the pods, separated the seed, and planted it in secret in an isolated plot of ground. For three years he has carried on the cultivation, and now there are said to be from three to four hundred ardebs in the country, and the seed is sold in the public market."

Attracted by this account I addressed Mr. J. C. Chapman, Agent of the P. O. Co. at Alexandria, on 25th April, of which the following is an extract:—

"My attention has been recently drawn to accounts in the newspapers regarding a newly-introduced cotton plant into Egypt, some of which has been raised in Alexandria or its vicinity. This kind of cotton is said to be not only superior in quality, but much more prolific than the ordinary descriptions of cotton known in commerce.

"May I request the favor of your good offices to procure a few seeds of this cotton for the Agri.-Horticultural Society of India who are desirous to introduce it into their garden. If successful, it may prove a most useful addition to our class of Indian cottons.

"I have been so many (40) years interested in the introduction into India of new kinds of cotton and improvements of the indigenous, that I naturally regard with pleasure all such attempts as that now under consideration."

Mr. Chapman was kind enough to send me a small packet containing about 300 seeds, with the following advice:—

"I am in receipt of your letter of 25th April, forwarded by Captain Lovell.

"I fear there are no seeds of the 'Bhamiá' cotton plant to be had now. They were all eagerly brought up and planted. If however I can obtain even a small quantity, I will with pleasure send some in our despatch box to your address.

"I have planted some in my garden, and am watching the result with interest. Unfortunately my water supply is rather salt, and I am afraid to give as much as is said to be necessary. However next season there will be large quantities grown, and I will report to you and send some seed. This or even the ordinary Egyptian cotton would be a great boon for India. I am interested in spinning mills at Bombay and know the disadvantage of having only one quality of cotton to work up. The article in the English papers on this new cotton was furnished by me."

The packet reached me in June, and I lost no time in distributing the seeds, as judiciously as possible, in small quantities, to about thirty persons resident in various parts of India, including fifty seeds to the Government of Bengal, and twenty to Mr. Buck, the Director of Agriculture, N. W. Provinces. As yet only two returns have been received, one from Mr. Buck and another from Mr. W. Masters, of the Opium Department, at Hadjepore. I placed six seeds in the soil, of which five germinated, one seedling was destroyed by a crow, and the other when about four feet high, by the falling on it of a large heavy plant of *Reana luxurians*. I had therefore only three plants to rear. The seed was sown about the middle of June, grew very vigorously (ten feet in height) throughout the rainy season in the manner detailed in the above quoted letter. Began to blossom in September, yielded first ripe pods in October and November, and continued flowering and podding freely till the end of February, and sparingly during March. These three plants have yielded rather less than two ounces of clean cotton. It has now (end of April) recommenced to flower, and I propose allowing the plants to remain as a biennial, to ascertain if the quality of the next season's produce retains its character or deteriorates.

The following are the reports of the experiment at Cawnpore, communicated by the Director of Agriculture N. W. Provinces :—

From the Director Department of Agriculture and Commerce, North-Western Provinces, dated Allahabad, 29th March, 1878.

I have the honor to advise despatch by to-day's packet post a parcel containing 6 ounces of Egyptian cotton seed produced from the 20 seeds supplied to this Department by the Society.

2. A small sample of cotton, and a copy of the report on the experiment by the Superintendent of the Government Experimental Farm, Cawnpore, are sent herewith.

From the Superintendent Government Experimental Farm, Cawnpore.

I have now the honor to report results of an experiment made with Bamiá cotton.

2. Twenty seeds received from Agri-Horticultural Society (through your No. $\frac{T}{114}$ A, dated 18th June 1877) on the 24th June.

3. A small patch of land measured 7 by 17 feet was prepared on the vegetable gardens and thrown up into ridges 2½ feet apart, and the seeds planted 2½ feet in the row. The seed was sown on the 19th July, and began to appear above ground on the 24th.

4. Of the twenty seeds sown thirteen germinated : the first bolls were picked on 20th December, and picking went on at intervals till the beginning of this month.

5. The quantity of Kapas collected from the thirteen plants, 2 seers 8 chittacks, of which four chattacks was sent to Bulandshahr Agricultural Show ; the rest on being passed the native churka cleaned cotton... ... 0 Srs. 11 cks.

Seed ... 1 „ 9 „

Total .... 2 „ 4 „

6. From the almost total cessation of rains the season cannot be said to have been a good one. Yet the plants grew to the height of 5 to 5½ feet and threw out long lateral branches. I am of opinion seed ought to be sown three feet apart at least.

From Mr. W. Masters.

Sowed six seeds of Bamiá cotton on the 7th July, 1877; one sprouted on the 10th, the other five on the 11th Idem: of the six plants one was destroyed by a carpenter-cricket, and two by an over-curious mallee. On the 31st July, 1877, transplanted one of the remaining three, four and a half feet from the others.

On the 24th September, 1877, observed buds appearing. On the 5th October flowers were out. On the 2nd December, 1877, counted 150 pods and flowers on the transplanted plant; the other two appeared injured, the leaves and pods withering and turning black. In January, 1878, the three plants produced flowers, but a very few, the pods ripened slowly. By 24th of the month only two ripe pods had been gathered from the transplanted plant, several poor ones from the others. On the 27th January, 1878, pulled up by the roots one of the untransplanted plants and sent to the A. and H. Society. Towards the end of March, 1878, cut away the main stems to within two feet of the ground and the seed branches to within a foot of the main stems, leaving however three branches uncut on the transplanted plant. On the 16th May, 1878, counted 138 fresh flowers and pods on the transplanted plant, the other one had died off.

Of the three plants the transplanted one was the healthiest and most bushy, it had a main stem, tapering upwards to a height of about ten feet with seven side branches issuing from it within the space of one and a half feet from the ground; the three branches afterwards measured eight and half feet, the flowers grew on the axils of the leaves, as many as three from

one axil being common; on the main stem above the highest branch small shoots or leaf stalks about six inches long appeared, the flowers sprung from the base of these. The untransplanted plants had three branches, and its main stem stood about twelve feet high; the stems and branches of all bent over considerably, many of them touching the ground at their ends. After pruning, new branches sprung from those cut near their bases, or quite from the bases but not from the main stem; the flowers and pods of these are very small, but the new flowers and pods on the uncut branches are large and blooming: seventy-two pods gave two ounces of cotton and one thousand three hundred and seven seeds. Many flowers and pods shrivelled and turned black in a bright hot sun. Rain falling on a ripe open pod stained the cotton yellow. The soil on which the plants were grown was a poor and sandy one.

Messrs. W. Haworth & Co. of this city have kindly furnished a report on the quality of the specimens raised at Cawnpore, Hadjepore, and Calcutta, of which the following is a copy:—

We have pleasure in returning your samples of Bamiá (Egyptian) cotton with the following report:

1. Bolls similar to Egyptian cultivation and like it as regards its seed, both as to formation and freedom with which the fibre can be separated. (*Cawnpore Model Farm*).

2. Not of a particularly good color, but as regards length, softness, strength and fineness of staple, every thing that "could be desired, and would rank as good fair, Egyptian cotton, valued at about 7 to 7½ per pound." (*Ditto*).

3. Not equal to No. 1 either in size of the boll or the quality of the cotton, but similar in all other respects. (*Mr. Masters*).

4. Equal in color to No. 2, but containing considerably more stains, harsher in staple, which is also wanting in length and strength: value about 6 to 6½ per pound. (*Mr. Blechynden*).

I have placed as an appendix to this note some particulars from the *Gardener's Chronicle* regarding this cotton from the pen of M. Delchevalerie, the Inspector of Agriculture of Cairo. Also a few details regarding experiments at Texas:—

"M. Delchevalerie, the Inspector of Agriculture of Cairo, laid before the recent Congress of Amsterdam some specimens of a new cotton plant found growing in Egypt, in a field of cotton, among which were found some Bahmiehs (Hibiscus esculentus). A certain Cheik-el-Celed of the environs of Chibui-el-Kom, in Lower Egypt, noticed some specimens of fastigiate cotton plants, quite different to the others, and similar in habit to the Bahmieh, or Bamiá plant. The stems are about 8—10 feet high, straight, and with relatively few branches, and those ascending not spreading as in ordinary cotton plants. Hence the planters of that region did not hesitate to call them 'Kotn-Bahmieh.' They collected the seeds carefully in order to plant them separately. The following year they obtained nearly half a *feddan* (about half an acre) of them, of which the seeds were collected in the same way, and Egypt this year already possesses important plantations of this new variety of cotton. The first samples which arrived in the market of Alexandria were distributed among several merchants, who sent them to Liverpool, where they were classed above 'fair cotton,' and nearly fetched the price of 'good fair.'

"M. Delchevalerie, in a note addressed to the Congress, suggested the idea that this cotton is a hybrid production between Hibiscus esculentus and the Egyptian cotton itself, and he proposes this summer to make some experiments at Cairo, in order to ascertain if this be so. If this hybridisation has really taken place between the Hibiscus (Abelmoschus) esculentus and the cotton, the fact will be of great importance from a scientific point of view, for it may give rise to other experiments in artificial fertilisation between other genera of the same family. Similar facts are not unprecedented in the records of horticulture. However this may be, the new cotton plant is taller than the ordinary cotton. It is erect, and scarcely branched, with the exception of two or three small branches at the base, which allow of the plants being planted closer. It has not the shrubby form of the ordinary cotton plant, which has numerous branches, themselves branched and producing here and there at the joints a capsule of cotton on a long peduncle. On the contrary, in the new cotton plant, the principal branch

is straight and not branched. The capsules grow on the principal stem in the clusters in the exils of the leaves, and are likewise borne on long axillary stalks. The roots are more tap-shaped than those of the ordinary cotton, whose root fibres moreover spread more horizontally. And what is more important is, that the new variety produces much more cotton. The cultivators of this new cotton plant have assured M. Delchelaverie that they have obtained fifteen quintals of it per *feddan*, in the rich soil of the Delta, while the ordinary cotton does not produce half that quantity.

"The Bamiá cotton of Egypt, to which we drew attention at p. 561, Vol. VII of the *Gardener's Chronicle*, seemed after the subsidence of the first great excitement in its favor destined to pass into oblivion which is so often the fate of many newly-introduced products. Our contemporary *Cotton*, however, draws attention to the fact of recent experiments that have been made in its cultivation in Texas. The seeds were planted on 4th May, in a garden situated in lat. 29° 40', at an elevation of thirty feet above Galveston Bay, and about 300 yards from its margin. The soil was a light, fertile sandy loam. The seeds germinated, and the plants made their appearance above the surface of the soil in six days, namely, on 10th May. The first blossoms appeared on 8th July, and the first open fruits on 30th August. The average height of the plants was about eight feet, but some grew up to ten feet. After the plants had ceased growing the fruits perfected themselves, increasing in size. It is stated that the fruits are very abundantly produced from near the base of the plant to its very top. In the space of four months and ten days from the time of planting, the open fruits were of sufficient size for picking in any quantity. From as careful and safe an estimate as could be made the yield was found to be fully equal to 2,500 lbs. of cotton in the seed per acre. The habit of the plant is described as being very singular in its outline. Unlike the American Upland, and Sea Island cottons it does not send off branches regularly from near the ground to the top of the plant; but the main stem bears close to the ground two, three, or more branches, and then rises to a height of eight or ten feet without a branch. Leaves only are given off along the stems, and in the axil of each leaf are from two to five, and sometimes six long petioles each bearing a fruit. The branches described at the base were also very heavily fruited, as many as five large fruits growing so close together as to touch each other. The cotton or wool contained in every fruit on the plantation was of a pale

yellow color, which was difficult to be accounted for, as there had been no heavy rains during its growth to stain it; it is suggested the profuse dews may have been the cause. From the record of these experiments it seems that we may still hear something favorable about Bamiá cotton with regard to its becoming an article of commerce."

The late Mr. Kurz, of the Royal Botanic Garden, Calcutta, was kind enough, at my request, to examine the plants raised there from seed received from the Society, with reference to the supposed hybridisation between *Hibiscus esculentus* and the ordinary Egyptian cotton; and in a note now before me he writes:—"The Egyptian Bahmiá cotton is *Gossypium vitifolium*, a variety very near to the G. *acuminatum Roxb.*, both which are now reduced to G. *Barbadense* L. These two varieties are contrasted in the Flora of British India, and I see really little difference between the two."

Some stress is laid, it will be seen, on the advantage that this variety of cotton possesses in running up as it does to ten or twelve feet with little or no branching. The plants in my garden, though not so bushy as the ordinary Egyptian or other exotic kinds, are not of such a spare habit as has been represented; and I quite agree with the Superintendent of the Model Farm, Cawnpore, that the seed ought be sown three feet apart at least. If grown closer together, a larger quantity of produce may be obtained per acre, but it is questionable if the quality will be so good; for cotton instead of being crowded together is, like most other plants, the better for having a sufficiency of air and light. All the samples received have a cream-like tinge, similar to the finest Sea Island; this is not caused, apparently, by the climate but is the natural color. A small portion is stained, but such is of a darker color.

May 1878.

Since writing the above I have perused a letter from the Alexandria correspondent of the *Times*, on the subject of cotton cultivation generally in Egypt, in which the following remarks occur in respect to the Bamiá variety:—

"The feeling that whatever they (the cultivators) gain goes generally to pay the Government taxes, is also said to make them very reckless in their system of cultivation. The way in which the seed is mixed is admirably illustrated by the recent experiments made in the Bamiá cotton plant, which was to revolutionize the cotton market by its productiveness and quality. The seed ran up to 10, 20 and even 30 times the price per ardeb of the ordinary seed. This was too much for the sellers. In every case there was adulteration, and no experiment has proved decisive on account of the admixture of other qualities."

P. S.—Mr. Chapman, in a letter just received (8th June) forwarding a further supply of seed (about 12 pounds), writes as follows:—

The seed is difficult to procure genuine, being generally mixed with Ashmouni, and sells at £ 30 the Kantar. The package sent is genuine, and will, I hope, give good results. Here the Bamiá plant is mostly a failure, requiring an immense deal of water, and growing too tall, as high as 15 feet.

*** *The following Extract from the Report of the Horticultural Garden, Lucknow, for the year* 1877-78, *communicated by the Director of Department of Agriculture and Commerce, N. W. Provinces, on the 5th July, has reached whilst the above is passing through the press:—*

Bamiá Cotton.

22. "This is said to be a cross between ordinary Egyptian Cotton and 'Bamia' (*Hibiscus esculentus*) or 'Bindi.'

"A small plot of it was sown, July 14th 1877. The seed "was sown in rows three feet apart, and two feet in the rows; "this space was found to be required, as by the time growth "ceased, the whole of the ground was covered.

"Owing to the scanty and irregular rainfall, the crop had "to be frequently watered from a well: this with regular

"weeding and ploughing with a native plough previous to "sowing, was the whole of the cultivation given. The plants "maintained a healthy and vigorous growth till checked by "cold in November, by that time some of the tallest plants "were nine feet high, and the average height of the plot from "five to six feet.

"There were two distinct kinds of plants which I have "labelled, No. 1 and No. 2. No. 1 was of tall upright "growth with few side branches, and which I take to be the "true hybrid. No. 2 was of bushy spreading habit with several "side branches nearly as large as the centre stem, and which "appears to be ordinary Egyptian.

"Whether the seed was mixed or has a tendency to revert "to the cotton parent, is a point to be settled by future trials; "to this end the seed of the two kinds has been collected and "kept separate. It is however possible that the flowers of "both were cross fertilized as the plants were grown side "by side, and should the seed No. 1 again produce two kinds "of plants, it must not be concluded that the hybrid is want- "ing in fixity and permanence of character.

"Should the crop be of two kinds and pure seed be desired, "care should be taken to pull out all plants of bushy spread- "ing habit before they come into flower, and if the crop is "grown at some distance from the other kinds of cotton true "seed is likely to be produced.

"As the seed was late in being sown and the season alto- "gether an unusual one, I have thought it undesirable "to give the out-turn as it could not by any means be "taken as a guide to what the results would be in ordinary years.

"I cannot say that either kind bore heavy crops, the bolls "though large were nothing like so numerous, as such large "strong plants seemed capable of yielding.

"It is possible, however, that the deficiency in quantity "is more than made up in the quality of the fibre which is

"soft and silky, and at least twice the length of common "country cotton.

"The following quantity of each kind of seed is available "for distribution as you may direct.

"No. 1, 4½ seers.
"No. 2, 7 „"

The Introduction of the India-rubber Tree into India; BY MR. H. A. WICKHAM. (*Communicated by the Government of India, Department of Agriculture and Commerce.*)

The introduction into India of the true Pará india-rubber (*Hevea*) may be said to be now fairly inaugurated. If it is not a great success, I think, without doubt, the fault will be that it has not been planted out in suitable localities.

The india-rubber tree (*Hevea*) grows naturally throughout the Amazon valley, with the exception of certain localities. I found it very abundant high up on the Orinoco, above the junction of Guaviare (the latter stream by right indeed should be styled the Orinoco). It is plentiful on the banks of the Cassiquiare, that curious bifurcation of the Orinoco by which it contributes water to the Rio Negro, and converts Guagána into an immense island. I do not know how far it may extend up the Maranon, into Peru, never having been there. It is abundant and very fine about the cataracts of the Tapajos, and it was on this river that I obtained the seeds which produced the plants now to be despatched from Kew to India.

I also found it growing in the interior between the Tapajos and Xingu. The rivers from which the largest supply is now brought by the traders are the Purús and the Madeira.

In its native forests it grows dispersed among the other forest trees, two or three trees rarely being found in juxtaposition. In appearance the *Hevea* are handsome trees, with straight cylindrical trunks. They differ wholly from the Ulé

trees—the Central American india-rubber tree (*Castilloa*), which I had seen in Moskito and Nicaragua. The wood is soft and perishable. As in the great majority of tropical American trees, the bark is not very thick. It is of a grey colour on the surface, but when scraped (as has frequently to be done before it is possible to tap them in some of the moister districts, owing to the thick growth of the moss ferns and orchids on the bark) approaches in appearance and colour the coat of a light bay horse. Under the native mode of tapping, however, they soon present a worty disfigured appearance. The seeds grow, three together, in a sort of hard pod. This pod bursts when it is ripe and becomes heated by the sun with a sharp popping sound, and scatters the seed for a considerable distance around the trees. I have been assured by an Englishman, long resident in the country as a trader, than an oil closely resembling linseed oil in its properties is to be extracted from the seed.

It is worthy of notice that the tree casts its seed *at the same time of year* both on the Orinoco and Amazon, although the wet and dry seasons are reversed in the two valleys. It would be interesting to note whether the seed continues to fall at the same time of year in their new home in India.

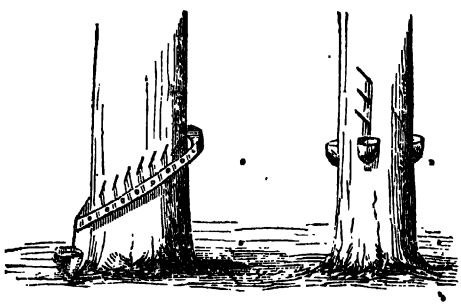
The rain-fall varies considerably in different districts where the *Hevea* are found. In some districts the year is nicely divided into wet and dry seasons, each of about six months duration. In others it rains more or less the year round. In such districts it is more difficult to collect the *caoutchouc* profitably. If the stem of the tree be wet when it is tapped, the milk spreads over the surface of the bark and is lost. Again, if a shower should come on before the milk is collected from the cups, and it become mixed with water, it will not congeal, and so is also lost.

The range of temperature in the india-rubber country is from about 73° to 88° throughout the year; on the lower Rio Negro it increases in the afternoon to 100°.

From what has been said, it may be seen that the main part of the rubber must be collected during the dry season, although the "ciringeros," who live near their "ciringals," or india-rubber walks, improve their opportunity by tapping their trees whenever fine days occur during the rainy season. The "ciringero" occasionally gives his trees a rest, but the trees are always tapped excessively. It is astonishing to what a degree they will stand tapping. I have seen large trees apparently none the worse, further than that they were somewhat disfigured by the knarled appearance of their bark, the owner of which assured me he had tapped for 20 years successively, but then he tapped them himself, and had an interest in their preservation. These same trees scattered their fruit in abundance. An industry more in accordance with the character of the South American it were difficult to find, the labour so small and yet so remunerative. I have myself collected 10 lbs. of rubber per day, tapping 70 or 80 trees of various size. An experienced Tapuyo Indian can collect much more. If such be the case in the woods, where the trees are scattered and much time is necessarily lost in getting from one tree to another, what will be the profit of a well arranged plantation of these trees under good supervision? In the "igapo," or low lands off the rivers, flooded during the rise of the waters, there is a spurious kind of *Hevea*. It is called by the natives "ciringa do igapo" or "barigordo," from its habit of growing with a bulged stem. The seeds of this species are much longer and larger than those of the true rubber. The milk appears to be worthless.

When the native has discovered for himself a district in which "ciringa" trees are sufficiently numerous and near together, he first connects them together by cutting a "picado," or path, with his bush knife. Having thus discovered their relative bearing, he next straightens and clears out his paths, endeavouring at the same time to take in as many trees as possible in each path, and to make all the paths converge, to

a certain spot where he has put up his "rancho" or "barrâca." This done, and having collected a supply of the old nuts of the inaja (*Maximiliana Regia*), or other palm trees, or of the outer shell of the Brazil nut, he is ready to commence operations on the first fine day. There is some diversity in the manner of taking the rubber milk on the Amazon. In some districts long strips are procured from the inner pith of the foot stalk of the leaf of the inaja or the Bacaba palm. These are tacked obliquely round the stem of the trees, with sharpened pieces made out of the hard covering of the same leaf stalks. This being smeared on the inside with wet clay serves to form a channel to collect and conduct the milk into the cup placed to receive it. In the other manner, which I consider the better, three or four cuts about an inch long are made in the back with a minute axe. The cups are put on in a ring round the trunk, usually a span or more apart. In this way the number of cups is proportioned to the size of the tree.



Tin cups are used. They are made slightly concave on one side in order to fit the convexity of the tree trunk. These are fastened to the tree with a piece of kneaded clay, of which the "ciringero" carries a supply in his bag. The tapping always takes place as soon as there is light enough in the forest to see by. One man is apportioned to each path, say, containing 100 trees. When he has tapped and cupped his trees he sets down at the end of the walk for half an hour or so. As soon as he perceives that the tree last tapped has ceased to drip the milk, he starts at a trot on the back track

detaching and emptying the cups into his calabash as quickly as possible. The cups he leaves up side down at the base of the trees. Speed throughout is a great object, as the milk speedily coagulates; then it can only be sold for an inferior price as "sernambí." When the men arrive at the central hut, from their different paths, they empty their milk into one of the large native earthenware pans. Care is taken to squeeze out with the hands all the already coagulated curd-like masses. These are thrown to one side to be made up into balls of "sernambí." Earthen pots resembling miniature kilns are placed over small fires and the "ciringero" sits down to the really tedious part of the business. He drops a handful or so of the palm nuts down the narrow neck of his little kiln and forthwith arises a dense smoke. He now takes his wooden mould—not unlike a fives bat in form—and holding it over the pan pours some of the milk over it, keeping it turned, so that it shall not run off before he succeeds in drying it in an even surface, as it soon does as it is passed backward and forward through the smoke; this is continued, one coating of milk after another, until he has finished the supply of milk for the day, he then sticks his mould up in the thatch for the repetition of the process next day, and until he is satisfied with the thickness of the "burcuit."

I believe very good rubber might be made by simply allowing the milk to congeal in moulds during the night of the day on which it has been tapped, if, on the following morning, it were placed under a very powerful press in order to expel the fluid contained in the cheese-like cells. When fresh, the milk has a very agreeable smell and taste, but it soon becomes putrid. The child of an Indian woman employed on my "ciringal" used to drink considerable quantities of the fresh milk; I suppose it was rendered harmless by becoming mixed with saliva, as it will not congeal if mixed with water.

There are many trees in tropical America which produce milk from the bark yet more copiously than the *Hevea*. Who knows but that some day equally economic use may be made from some of them?

With regard to the success of the introduction of the *Hevea* into India, much will, of course, depend on the nature of the soil on which they are planted. In Venezuela and Brazil, I found the *Hevea* growing on two classes of country; on the high clayey uplands embraced by the branching rivers, but still at considerable distances from them, and on the low alluvial lands immediately bordering on them.

From the far greater size and apparent age of the trees, I cannot but imagine that the original locality of the tree was in these uplands. The fact of their being so generally found on low lands bordering on the waters may be accounted for. The seeds are scattered widely when they burst; many of them fall into ravines and gullies and are carried by the watercourses of the rainy season into the rivers, to be cast up by tide and windy squalls, and readily take root on the rich soil of the alluvial islands and shores of the back waters. In illustration of this I have frequently seen a string of *Hevea* growing even on a beach, backed by sandy lands, far from their proper localities.

Although I know nothing personally about the climate of the Eastern Indies, yet I imagine, from what I have read, that the Malay peninsula is most likely to combine the climatic conditions required by the india-rubber tree of the great valley of South America.

It is a mistake—naturally fallen into by the travellers who have passed up and down the great water-ways of South America, without having penetrated far into the interior high clay lands enclosed by them—to suppose that the *Hevea* are confined to the low, often flooded islands and margins of rivers. Growing on these clayey uplands, I met with the

largest of these trees, rivalling in height and girth all but the very largest trees which grow in these parts.

At the same time, perhaps, on rich alluvial lands would be found the best localities for establishing plantations of these trees. Nor do I think it would prove a serious drawback if they should be planted on lands which become annually flooded, to the depth of a foot or so, for a few weeks in the year. The land selected should, I think, be heavily timbered. The timber to be cut down some eight or nine weeks before the first rains are expected, in order to give time to get a good burn over the ground. The ground also should be cleaned up sufficiently, by piling and burning the logs; those remaining to be rolled on one side. The plants might be set out in walks, converging to a central point, in order to facilitate the collecting of the milk. I would strongly advise that the *Hevea* should be planted alternately with cacáo; these low bushy trees would shade and keep the ground moist, without interfering in the least with the *Hevea*, which would soon tower above them. This plan would also much increase the value of the plantations.

Another thing I would recommend. The milk of these trees is yielded in much greater abundance near the ground, and when, by some chance cause, an elbow of root is protruded above the ground, the flow of milk from it, on its being tapped, is very much greater than from any other part of the tree. Now would it not be possible to devise some method by which the roots might be induced to put up elbows above the surface of the ground? Great caution must be used, in tapping the trees, not to penetrate beyond the bark into the wood. Great numbers of trees are destroyed in this manner on the Amazon. As soon as the wood is injured, certain species of boring beetles attack the tree, and it soon dies.

From what I have seen of these trees in their native country, where I have occasionally known them planted, and have made some experiments on their growth myself, I

have ventured on the foregoing remarks, feeling, at the same time, satisfied that this will be found to be quite the best manner of forming a plantation on a large scale. If this plan were followed in a suitable locality on rich alluvial soil, the tapping of the young trees might commence gradually in from seven to ten years after planting out, and would soon become the source of a great revenue.

The late Mr. Sulpiz Kurz.

In the previous number of this Journal was published the first portion of an interesting and useful paper, extending over 50 pages, entitled "The Banana—a pomological contribution." Its contributor, Mr. Sulpiz Kurz, intimated his intention just before leaving Calcutta, at the close of last year, for the Straits Settlements, of preparing the concluding portion, during the voyage, adding thereto such additional information, as he might be able to obtain at the several places he intended visiting, and thus rendering his paper as exhaustive as possible. His death at Penang, in January last, has frustrated this intention, and also deprived the Society of a zealous contributor to the pages of its Journal, and science of a most ardent votary.

The following brief sketch of his life, by Dr. D. Brandis,—re-printed from the Proceedings of the Asiatic Society for February 1878,—seems the most appropriate mode of closing this number of the Journal:—

Sulpiz Kurz, Curator of the Herbarium at the Botanic Gardens, Calcutta, was born at Augsburg, in Bavaria, on the 5th May 1834. His father died early, and the boy attended school at Munich, where his mother had settled. At an early age he commenced collecting objects of natural history, especially insects. After leaving school he attended lectures at the University of Munich, and chiefly devoted himself to the study of Botany, Mineralogy and Chemistry. In 1854 misfortunes in his family compelled him to abandon his studies, and he went to Holland where he worked as an apothecary and, after mastering the Dutch language, enlisted in the subordinate Medical Service of the Dutch Colonial Army. He landed at

Batavia in September 1856, and was sent to Banka in March 1857; where he remained two years. During that time his work was light and he was able to explore the island and to make botanical collections. In 1859 he was recalled to Batavia and joined the Military expedition to Bori in Celebes. In September 1859 Kurz returned to Batavia, and was appointed as an Assistant on the Staff of the Botanic Garden at Buytenzoorg. Here for the first time in his life he had the advantage of working under the guidance of other botanists, and with the assistance of a large library and a rich herbarium. He devoted himself principally to Ferns, Bamboos, Musaceae, Pandaneae and other difficult groups A few years later Dr. Thomas Anderson, the Superintendent of the Botanical Gardens, Calcutta, came to Java in order to study the system of Cinchona cultivation which had then for some time been established by the Dutch authorities. He induced Kurz, with the permission of the Dutch Government, to accept the appointment which he held at the Herbarium of the Calcutta Botanical Gardens until his death. In October 1863 Kurz left Java, and joined his new appointment at the Gardens early in 1864.

Before his transfer to Calcutta he had not published much, a few papers only on the vegetation of Banka and other matters had been printed in the "*Naturkundige Tydschrift voor Nederlandsch Indie.*" In Calcutta, however, he commenced a series of important botanical publications, which appeared in English and continental Periodicals chiefly in the London Journal of Botany, the Proceedings of the Linnean Society, in Miquel's Annales, the Flora of Regensburg and the Botanische Zeitung. But his later and most important papers were published in the Journal of the Asiatic Society, of which he became a member in 1869.

In 1866, Kurz was deputed by the Government of India to Port Blair, in order to study the vegetation of the Andaman islands. He spent the months of April and May on that duty, and the result of his explorations were recorded in a most valuable Report which was published by Government in 1870. While engaged in examining the interior of South Andaman, he was seized by the Burman convicts, whom the Superintendent of Port Blair had given to assist him in his work, and was left tied hand and foot in the jungles on the ground. These and subsequent circumstances, which prevented the more extensive excursions which he had projected through the islands, obliged Kurz to return to Calcutta sooner than he had intended.

In 1867, the Government of India decided to employ him on the preparation of a hand-book, intended chiefly for the use of forests officers, of the trees, shrubs and climbers growing in the forests of British Burma. To this new task, Kurz devoted himself with his usual ardour and enthusiasm, and his researches regarding the Flora of Burma may justly be regarded as the most important work of his life. From December 1867 to June 1868, Kurz explored the forests in the province of Pegu and part of those in Martaban. But when after his return to Calcutta he examined and arranged the rich materials collected by him, he found that many doubtful points remained, and he was accordingly deputed on a second tour to the same districts, which lasted from December 1870 until May 1871.

Besides the materials collected by himself, Kurz had the advantage of consulting large collections made by others in Burma, and he was thus enabled to describe numerous new genera and species. A number of Burmese plants collected by him are described by other Botanists and deservedly bear his name. Between 1872 and 1877 he contributed two series of valuable papers to the Journal of the Asiatic Society. One series he called "New Burmese plants" and the other, "Contributions towards the knowledge of the Burmese Flora." A general account of his researches was embodied in a quarto volume published by Government in 1875, under the title "Preliminary Report on the Forest and other vegetation of Pegue." This work contains an admirable account of the vegetation in all parts of that province as well as a most useful list of vernacular (Burmese) names of plants with their systematic names.

The chief results of his labours in regard to the Burma Flora, however, were embodied in his Forest Flora of British Burma, a work, regarding which it is not too much to say, that it has placed the name of Kurz in the first rank of Indian Botanists. This work was published towards the close of last year in two volumes, by order of the Government of India. It contains full and clear descriptions of 2,000 species, and will for a long time to come remain a standard work of reference for all interested in the vegetation of British Burma and the adjacent countries.

In 1875, Kurz took three months' leave and devoted it to a botanical exploration of the Nicobars, but exposure and fatigue in the unhealthy climate of those islands brought on a severe attack of fever which much weakened his constitution. In 1876, he contributed to the Journal of the Asiatic Society, a paper on the vegetation

of the Nicobars, based chiefly upon the collections made by the Austrian Naturalists, attached to the Novara expedition. These collections had been sent to him for publication by the Director of the Imperial Museum at Vienna.

On the 12th November 1877, shortly after his Forest Flora had been published, Kurz left Calcutta on leave to visit the Straits Settlements. He reached Penang on the 12th December, but was taken ill and died at that place on the 15th January 1878, at the age of 43 years. An uninterrupted residence in the tropics of 21 years and constant exposure on his botanical explorations had undermined his constitution. His ardour in the pursuit of Botany was irrepressible, and he, rarely thought of health or comfort on his expeditions.

He was Member of several learned Societies, his fellow Botanists in England, the Continent of Europe and in India will mourn his loss, and by many of his friends outside the circle of those interested in science, he will long be remembered by his enthusiastic and single-minded devotion to the science, which from early youth was the aim and object of his life.

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Part II., Volume V

Cultivation of Sun-flower and of Ground-nuts.

From the Chief Commissioner of Mysore, No. 5502-G133, *dated the* 30*th August* 1877, *forwarding a report by the Superintendent of the Experimental Farm at Bangalore on the cultivation of the Sun-flower* (Helianthus annuus) *and the uses of the oil extracted from the seed.*

1. The cultivation of the sun-flower plant was undertaken in this country to test its value in the reclamation of marshy land and the removal of malaria.

2. In Bangalore the plant has now been in continuous cultivation for some years, without any particularly successful results. As a destroyer of malaria, it is certain that the plant possesses no special value, and the statements on which the experiments were first undertaken have been found to be fictitious. The truth seems to be that the marvellous effects which are sometimes attributed to plants (as in the case of the sun-flower and the blue-gum of Australia) as sanitary agents are due more to the clearing and drainage which are required before the plants can be successfully grown than to any peculiar virtues inherent in the plants themselves.

3. Oil of a very beautiful appearance has been extracted from the sun-flower in Bangalore, but the cost of extraction is prohibitive against its use; and, moreover, it has been generally condemned by those to whom samples were furnished for experiment as being ill-adapted either for table use or for machinery. It is understood that large quantities of sun-flower seed are produced in Russia for the sake of the oil, which is in considerable demand for the lubrication of machinery. But, however, this may be, it is clear that the cost of production in this country, so far as the experiments have gone, will not permit of the profitable cultivation of the plant.

4. The Chief Commissioner of Mysore thinks that, in order to investigate the properties of the plant to the fullest extent further experiments, suggested by the Superintendent of the Government Farm in Bangalore should be made, the objects to be determined being (1) to ascertain whether the plant can be grown as an ordinary agricultural crop, so as to compete with the usual oil-seed crops cultivated by natives, and (2) to determine the value of the oil by chemical analysis in England.

5. The Governor-General in Council does not object to the proposed experiments being undertaken, a quantity of the oil being prepared for chemical analysis and for submission to the trade. But this quantity having been prepared, it does not seem necessary to continue the experimental cultivation,

pending the receipt of reports on it. If they should be favourable, the cultivation may be easily resumed. In the proposed experiment, particular attention should be given to the matter of cost, which should be carefully recorded.

6. In connection with this subject, the Governor-General in Council, thinks it opportune to record his opinion that it is of more importance to stimulate and develope the production of articles already known in the country than to initiate costly experiments in articles not commercially known and of which the ultimate success is problematical. One of these articles is the ground-nut (*Arachis hypogæa*). The kernel of the pod of this plant produces a very large proportion of excellent oil, extensively used in Europe as well as in this country. The plant grows abundantly in the Madras Presidency and elsewhere, but it does not seem to be fully utilized. The exports of the nut to foreign countries in 1875-76 were—from Madras 6,994 cwt. value Rs. 29,774, and from Bombay 3,721 cwt., value Rs. 13,845. From Bengal the exports have been so trifling that they have not been separately distinguished. The plant is grown to some extent in Burma, but not sufficiently for local consumption, and quantities are imported from Madras.

Although the exports to foreign countries from British India are trifling, considerable quantities are sent from Pondicherry to France, as will be seen from the following figures which have been extracted from the French Trade Returns of 1875 :—

Imports from British India—1,231,803 kilos., value 406,494 francs.
Imports from French India—6,404,899 kilos., value 2,113,616 francs.

The total imports into France in the year from all countries were 101,524,468 kilos., or nearly 100,000 tons, worth 33,503,000 francs.

Thus out of this total value of 33½ million francs only 2½ millions stand against India, of which French India has by far the largest share. Nearly all the rest is imported from the Western Coast of Africa.

7. The French trade in ground-nuts is a large and increasing one, the extraction of the oil, which is in considerable demand for the manufacture of soap, for consumption as food, and for other purposes, being conducted on a large scale at Marseilles. If the cultivation can be developed in this country, it seems probable that British India should be able to compete with Africa and supply France with a very considerable part of her requirements of this article, adding the ground-nut to other oil-seeds, such as gingelly and rape, which are now exported to France in great quantities.

8. The Governor-General in Council requests that the local Governments will be good enough to obtain particulars of the extent of its cultivation in their provinces, and to report them with any particulars they can ascertain as to the consumption of

the seed and oil in the country. His Excellency in Council will also be glad to be favoured with any suggestions they may wish to make as to possible development of the cultivation and trade. In the maritime provinces it is desirable that the export trade should be recorded in the monthly and annual returns, and this should be done with effect from the 1st of April next in both foreign and coasting trade returns.

Notes and recollections on Tea cultivation in Kumaon and Gurhwal.

By J. H. Batten, B. C. S., *retired, formerly Commissioner of Kumaon, August* 1877.

The cultivation of tea in Kumaon has become so important and profitable that it is interesting to trace the early history of this industry, and the duty of placing on record as true an account as possible of its introduction, rise and progress, is one which ought not to be neglected by those who are acquainted with the real facts; yet, after all, there is not very much to be told, even by those in full possession of all the *data*, when they attempt to shew that in this case, more perhaps than in any other, belonging to the best interests of British India, the seed of the sower "fell upon good ground, and yielded fruit, some an hundred-fold, some sixty, some thirty."

The history, however, such as it is, may be conveniently and naturally divided into periods, comprising the seasons of, *first*, ignorance and indifference; *second*, guessing and conjecture; *third*, first actual official experiment; *fourth*, regular government exploitation; *fifth*, commencement and progress of private enterprise; *sixth*, abandonment of the official experiment; and *seventh*, the commercially successful result. Our own recollections more particularly belong to the first four periods.

In regard to the *first* period, we need not be surprised that the tea plant, as a source of future wealth in the British Himalayan provinces, did not enter into the anticipations of the early administrators of those tracts, when we find that even the climate, which is now their chief attraction was treated with indifference. It is a fact that when Mr. G. W. Traill, then an Assistant under the Resident of Delhi, was first offered the appointment of Commissioner of Kumaon in succession to his first British ruler after the conquest in 1815, the Honourable Edward Gardner (promoted to the Residency of Nepal),—he hesitated as to its acceptance on the score of health, and bargained that he might have the option of returning to the plains of Hindostan in case the hills should be found unsuitable to his constitution. If we may not lay too strong a stress on this personal circumstance, we undoubtedly are met by the fact that in his statistical sketch,

of Kumaon, published in Vol. XVI, of the "Asiatic Researches,"* after nearly ten years' experience of the province, Mr. Traill, while alluding generally to the diversity of temperature and climate found at various degrees of elevation on the mountains, drew up for public information his tabular statement of the thermometrical range (which he described as indicating a "moderate heat,") from observations made in the valley of Hawalbagh at 3,887 feet above the sea. Almorah at 5,400 feet remained for many years the highest of the English hill stations, † and was quoted as the only Sanatarium by Bishop Heber in 1824, while Dehra in the Dhoon of that name in Gurhwal, and Sabathu in the North-Western mountains, both of them situated in almost sub-tropical climates, owing to their low elevation, were the head quarters of the Civil and Political Officers, then undiscerning the future sanitary and social importance of Major Young's "*potato garden*" at Mussooree, and Captain Kennedy's "*hot-weather bungalow*" at Simla. Nor, while regretting the delay which has occurred in the introduction of the tea plant into Kumaon, need we be accused of any unfair or captious display of what may perhaps be called "wisdom after the event" in pointing to the following facts, *viz.*, that Naini Tal, now the beautiful summer seat of the government of the North-West Provinces, was only discovered and established as an European station in 1843-44; that Ranikhet, now a large European military cantonment, was only known, until very recently, as forming part of the Choumoka Devi range, visited by Bishop Heber in December 1824; that the much-dreaded malarious Bhabar and Terrai, at the foot of the Kumaon mountains, formed a real and actual barrier to all intercourse, except that of the letter post every year, from April to November, but are now constantly traversed in comparative safety by European travellers, and afford a principal source of revenue to the Kumaon exchequer, under the able management of Sir Henry Ramsay, the present Commissioner; that the resort of English men, women and children to the mountains, formerly feared as somewhat of an invasion and visitation, has become a constantly increasing source of wealth and civilization to the "poor Paharris," and that, at the present date, the price of borax from Hundes, in the Almorah bazar, has almost ceased to be mentioned as a trade speculation, whilst the price of Almorah tea has become an important topic of conversation amongst the merchants of Cabul!

* *Vide* page 15, Official Reports on the province of Kumaon (Agra, 1851).

† The remote frontier post of Kotgurh, overhanging the Sutlej valley in the western hills, though well-known as the residence of the two Gerrards, who were among the first to explore and describe the Himalayan regions, is certainly higher in elevation than Almorah and its outposts, but it could not properly be called an English Hill Station.

As these notes are specially devoted to the subject of tea in Kumaon and Gurhwal, we need not concern ourselves with the general *speculations* as to the growth of the tea plant throughout the Himalayan districts, or elsewhere, which the valuable paper on tea culture read before the Society of Arts, by Mr. A. Burrell, on February 2nd 1877, may be said to exhaust. But we may be permitted to remark that, looking to botanical facts, which shew no true Thea or Camellia growing wild in the mountains west of Sikkim, it is highly probable that the specimens of Thea sent from Nepal in 1816, to Dr. Wallich, Superintendent of the Botanical Garden at Calcutta, by the Honourable Edward Gardner, belonged to Chinese plants, flourishing in the residency or other gardens at Khatmandu—a by no means extraordinary introduction, considering the political relations existing between China and Nepal. We may, also, observe that the traveller Moorcroft, whose deputation to Cashmeer and Thibet took place in 1819, and whose special vocation was to look after horses and wool, when mentioning the "tea of Bissahir" and comparing it with the "coarser teas of China," fell into the mistake of supposing that the tea plant grew on the banks of the Surlej.

Bishop Heber, who visited Almorah in December 1824, and, as previously glanced at, on his return tour to the plains, passed the site of the present cantonment of *Ranikhet* by the route of the Riuni, Kumhpur and Choumuka Devi range* wrote the following words in his journal :—"The tea plant grows wild all through Kumaon, but cannot be made use of, from an emetic quality which it possesses. This perhaps might be remedied by cultivation, but the experiment has never been tried. For the cultivation of tea I should apprehend both the soil, hilly surface and climate of Kumaon in all which it resembles the tea provinces of China extremely favourable."

This latter remark shows the observant eye, and prophetical wisdom of the good Bishop, and fully entitles him to an honourable place, perhaps the first on the list of tea pioneers in Kumaon, but the former statement was founded on a "vulgar error." It is now well-known that the plant alluded to is a species of *Osyris*, belonging to the natural order Santalaceæ, and it is as well to record in this place that in the *Transactions* of the Committee of Commerce, and Agriculture of the Royal Asiatic Society of London in 1838, Dr Royle states that "some specimens of the tea Bishop Heber referred to had been obtained by the Hon. Mr. Shore, from Mr. Traill, then Commissioner in Kumaon, and were found to be the dried leaves

* As bearing on our present subject, it is somewhat singular that the principal site, originally selected for this military station, was a tea-garden belonging to the Troup family, the members of which have been, from the first, conspicuous private tea-growers in Kumaon.

of *Osyris Nipalenses*, and produced a very disagreeably tasted nauseous infusion when used as tea." * The indigenous tea, therefore, of Kumaon must we fear take its place, in spite of episcopal authority, among the rosemary and nettle and other teas of our rural English housewives. Before closing this subject, we may add that the nearest ally to Thea in Kumaon is a species of *Eurya*, † belonging, according to Lindley, to the same natural family the "Ternstromiaceæ," but undoubtedly not the tea plant.

Amidst all these *guesses and conjectures*, the first real land which we descry in the history of Kumaon tea is the appointment, on the 24th January 1834, of Lord William Bentinck's "Committee for the purpose of submitting a plan for the accomplishment of the introduction of tea culture in India, and for the superintendence of its execution." This Committee ‡ circulated important queries, and among the botanists and scientific men aroused by the enquiry, there happily appeared Dr. Hugh Falconer, Civil Assistant Surgeon of Saharanpore, in the North-West Provinces, then in charge of the Government Botanical Gardens at that station, and eventually the successor of Dr. Royle in that appointment. His ardent

* The late Captain Edward Madden, Bengal Artillery, subsequently better known under the name of Major Madden, as the author of numerous highly interesting botanical and other notes of his tours in the Himalayan districts, and more particularly in Kumaon, published in the Journal of the Bengal Asiatic Society in the years 1847-48-49, writes thus in his "Brief Observations on some of the Pines and Coniferous Trees of the Himalaya," printed in Vol. IV. of the Journal of the Agricultural and Horticultural Society of India at Calcutta (1845):—"Dr. Royle mentions that in Kumaon tea is made from the leaves of the shrub *Osyris Nipalensis*, and this is probably the green tea of Bisehur which Moorcroft (Travels, I 35, 2.) describes as being imported into Ladahk under the name of *Maun or Bisheur* tea, the produce of an evergreen shrub, 4½ feet high growing on a dry soil in Kooloo and Bisehur on the banks of the Sutlej, and especially about Jhagul between Rampoor and Seran. The leaves are gathered from July to November, and after infusion in hot water are rubbed and dried in the sun. They sell at the rate of three seers per rupee, and are not much in request. The first infusion is reddish and is reckoned heady; the second, which is used is yellowish green. The *Osyris Nipalensis* grows to be a large shrub ten or twelve feet high in the Kotar Khud above Sabathoo and between Kussowlee and Kalka, where it is called Krecoontee, Keoontee, and Kuneentee, and also Looukt. The fruit is known by the name of Peopla or Peopra also applied to that of *Murrya exotica*. The natives here use the leaves medicinally, but not I believe as tea. The black tea of Bisehur, Moorcroft describes as the produce of a deciduous shrub found near Usrung and Leehhee in Kunaur; of which the leaves are pulled in July and August. Usrung is very elevated, for a species of rhubarb flourishes in the neighbourhood."

† In Major Madden's Kumaon Botany *Eurya acuminata* is mentioned more than once.

‡ Among its members was Sir Robert Colquhoun, Bart., formerly Commandant of the Kumaon Lotal Battalion, and a Civil Assistant to Mr. Traill, the Commissioner; frequently, with lady Colquhoun, mentioned by Bishop Heber in his journal.

mind was at once aroused to the great importance of the subject as affecting the Himalayan districts which overhung the scene of his official labours.

The mantle of Royle had indeed fallen on worthy shoulders. If to that eminent naturalist at Saharanpore and to Wallich at Calcutta, presenting reports and urging arguments in the proper quarter between 1827 and 1834, we owe that formation of the Tea Committee in the latter year, which we have just ventured to name as the era from which to count our Indian tea chronology, it is to Falconer that the Kumaon and Gurhwal tea growers may undoubtedly look back as the founder of *their* history. We well remember on arriving at Saharanpore in January 1835, our own delight at our first introduction to this eager and enthusiastic votary of science. At that time, of course, the treasures of the Sewalik fossil ground were earliest displayed to our admiring eyes, and *Gantley*, *Durand* and *Baker*, officers belonging to the Jumna Canals, were joined with *Falconer* in the enlightened circle * belonging to that small but interesting station, and its neighbour Dadupore; but geology was far from being the sole topic of animated discussion, and Falconer was full of his recent visit to the mountain country between the heads of the Jumna and Ganges, and of his hopes of permanently introducing the true tea plant not only there and in the Dehra Dhoon, but also in the district between the Ganges and Gogra, forming the British province of Kumaon. Our own earliest lessons in Himalayan botany and geology, were there taught us in Falconer's happiest manner, and the sight again of his MS. Journal then shewn to us, with which we have just been favoured, brings our thoughts vividly back to those instructive days, and sadly reminds us that, in 1834, as in following times, and alas! to the very end, attacks of illness cut short, or diminished the extent and usefulness of his most important tours of scientific enquiry. Much of the ground traversed and described in that Journal of 1834 was gone over by ourselves in 1835; and, knowing the anxiety of our friend in the subject, we recollect our disappointment in finding at one garden—Rama Surai † in the heart of the Tirhi Rajah's territory—that the tea seeds sown by the Saharanpore gardener had not yet successfully germinated.

To return to the Tea Committee. The report ‡ received by that body early in 1834, from Dr. Hugh Falconer, was acknowledged as leading them to adopt the sub-Himalayan

* The future world-wide distinction of this circle was not confined to Canal Officers and men of natural science; for the coming hero, Lord Napier of Magdala, then a young Lieutenant, was Civil Executive Engineer at Saharanpore.

† Subsequently one of the most favourable, though small, sites of tea as reported by Dr. Jameson in July 1847.

‡ 22nd February 1834.

regions * as entirely suitable for the projected culture; and so rapidly was this followed by action, that their deputed secretary, Mr. Gordon, was able to send to them from China a large supply of seeds of the true Bohea tea, which, early in 1835, besides being despatched to Madras, Mysore, the Nilgherries, and Assam, were distributed in Foreign Gurhwal (Tirhi), the Dehra Dhoon, Sirmur, and Kumaon.

It was extremly fortunate for the cause of which we are treating that the Commissioner of Kumaon, in 1834, was Mr. George William Traill. This gentleman, as shewn by his published statistical reports on Kumaon and the Bhote Mehals, and by his great reputation as a Local Administrator, was eminently qualified to appreciate the economical importance of the tea question; and to give effect to any suggestions of the Tea Committee. It was also fortunate that he possessed on the spot an able co-adjutor in Mr. Robert Blinkworth, † who held at Almorah under Dr. Wallich, as he had previously held in Nepal, the appointment of Plant Collector for the Botanical Garden of Calcutta. On receiving the report of the Tea Committee Mr. Traill at once understood the conditions under which the Chinese tea plant would be most likely to flourish in his province; and he selected two most appropriate sites to sow the Tea Committee's seeds. All subsequent experience has shown that, as a general rule, he was quite right in the grounds of his selections—climatic and otherwise—and that any *extreme* departure from those grounds has been subsequently found to be unfavourable to the success of the tea experiment. These sites were Latchmeswar, near Almorah, and Bhartpur, near Bhimtal, the former occupying three acres of old and easily acquired Crown garden ‡ land on the north-west slope of the hill below the capital town at 5,000 feet above the sea, the latter occupying four acres at 4,500 feet above the sea, in the near neighbourhood of the Bhimtal Lake, which is situated on the first step of the mountains above the Bhamauri Pass. To these two sites the Kumaon official experiment was confined during the six quiet years following the eventful period of 1834-35. The close of 1835 witnessed the departure to Europe of Mr. G. W. Traill, § the Commissioner, to whom the province of Kumaon owes so much. "His name will live for ever among the posterities,"

* That is "the lower hills and valleys of the Himalayan range."

† A name not unknown to the nomenclature of the Himalayan Flora.

‡ Raj-barhi.

§ Mr. Traill was a member of the well-known Orkney family, and possessed landed property in those islands, but he preferred to lead a quiet life among old Indian friends in London, and he died suddenely at the Oriental Club in November 1847. . . Among his heirs and representatives is Sir Edward Colebrooke, Bt., M. P., the present President of the Royal Asiatic Society, the worthy son of a distingushed father, and himself in early youth like Mr. Traill, member of the Bengal Civil Service.

the descendants of those grateful Paharries, in whose memory their ealiest British ruler has been associated with the blessings of peace, kind dealing, and good government (blessings unknown under the hard rule of these Goorkhas), if not with that increase of wealth and civilization, moral and material which, with the advance of the times, has marked the administration of his successors.*

It is proper to confess that at Latchmeswar and Bhartpur the growth of the tea plants was left very much to Providence, and —Mr. Blinkworth; and that no very sanguine anticipations or anxious inspections disturbed the tranquility of the Kumaon authorities in regard to tea. It was seen, as a matter of ocular evidence, that the plants flourished in those two nurseries; and perhaps the first favorable circumstance connected with them and their seed-produce was, that many travellers through the province had opportunities of observing the tall flower covered, and seed-laden tea-trees growing in Mr. George Lushington's garden at his beautiful country residence of Ritea Sen † at Soniana, in Lohba, 50 miles to the north-west of Almorah, on the borders of Kumaon and Gurhwal. Similarly, visitors to the Saharanpore Botanical Garden were shown live tea tree plants, the offspring of seeds from the small patch of nursery ground at Koth, in Foreign Gurhwal.

At Paori, too, the official residence—it can hardly be called "civil station"—of the senior Assistant Commissioner in charge of the British portion of Gurhwal, situated on the north side of the range overhanging the old capital Srinaggur—very fine tea plants were growing in considerable numbers. At length, in the spring of 1841, Dr. Falconer himself paid a visit to Kumaon, and the regular formation and further extension of the Kapina nursery at Almorah which Mr. Blinkworth had commenced, in the immediate vicinity of Latchmeswar, and like that plantation having its nucleus in an old grown-plot of garden, was the first result of his personal inspection of the country. We well remember his hearty approval of the wisdom which had led Mr. Traill and Mr. Blinkworth to select the original tea sites; but it is fair to confess that Falconer quite as much as his successor, Dr. W. Jameson, at first strongly desiderated tea sites in more flat, and more easily and plentifully irrigated and irrigatable land.

The extension of the official experiment to the rich slopes adjacent to Naukurchia Tal, the sister lake of Bhimtal, not far from the Bhartpur plantation, followed in rapid course; and early in 1842 the Government was able to send to the Calcutta Agricultural and Horticultural Society the following cheering

* In 1836-37, Colonel G. E. Gowan, Bengal Artillery; 1838 to 1848, M. G. T. Lushington, B. C. S.; 1848 to 1855, Mr. J. H. Batten, B. C. S., formerly Assistant Commissioner; 1856 to 1877, the present Major-General Honourable Sir Henry Ramsay, C B., K. C. S. I., formerly Assistant Commissioner.

† Now a tea plantation belonging to Mr. J. Richards.

notices supplied by Falconer respecting the progress already made in the cultivation of the tea plant in the provinces of Kumaon and Gurhwal.

"The first place in which the plant may be seen is Paori, near Srinaggur, at the elevation of about 6,000 feet,* where there are some hundred stronge and healthy-looking plants and seedlings. The next place is in a garden at Lobha; here, at a height of about 500 feet are about as many plants, as at Paori, and all of the same healthy appearance. At Almorah there are two gardens belonging to Government; the first covers three acres, and contains 1,500 full grown trees yielding seed, and 20,000 growing seedlings. The second stands on eleven and a half acres and has 700 layers and 500 seedlings. The most eligible site nearest the plains is at Bhimtal, where there are two gardens; Bhartpur, or three acres, contains 300 trees yielding seed, 700 layers, and 200 seedlings; the other Russeah, on the Nowkoorcha Lake of six acres, has 5,846 thriving seedlings and 20,000 seeds sown. In the vicinity of this last garden, in the semicircular slope of the mountain to the north and east of the Nowkoorcha Lake, a great extent of irrigatable land, proved to be favourable to the growth of the tea plant, is to be had at the distance of only one march from the plains, and at an average elevation of about 4,000 feet. In the several gardens, not of too recent formation to have trees yielding seed, there are calculated to be not less than 50,000 seeds nearly ready to be gathered, and that nearly all of these will germinate, may be concluded from the produce of what have last year been sown, and are now coming up. On the whole, the experiment in, as far as the possibility of rearing the tea plant in the provinces of Gurhwal and Kumaon is in question, may be safely pronounced to have completely succeeded."

This quotation brings us naturally to the close of our period of *first official experiment*, and we now enter upon the period of *regular Government exploitation*†—and at this point of time the figure of Hugh Falconer begins to recede from our view. But before ill-health compelled him to leave Saharanpore, in December 1842, he had accomplished the main object which he had always in view, and proved the success of the experiment which had been initiated under his auspices, by the production of actual manufactured Himalayan Tea. He had concluded his Report on the state of affairs in Kumaon, at the close of 1841, by the following recommendation:—"I beg, therefore, strongly to recommend this to the favourable consideration of Government,

* This elevation is not correct. The height of Paori is about 5,250 feet.

† Dr. Falconer, on 2nd May 1836, forwarded to the Secretary of the Tea Committee at Calcutta, a *very full* Report on the five experimental tea nurseries which he had established in Gurhwal (Protected State) and Sirmur (Protected State), and on the condition of the tea seeds which he had received from Calcutta.

that two complete sets of Chinese Tea manufacturers be supplied for the nurseries at Kumaon and Gurhwal, especial care being taken in the selection, that these workmen be of the best description." In consequence of that application,* "the Indian Government determined upon sending him a small manufacturing establishment. The black and green tea manufacturers, however, who were engaged for this purpose by the Commissioner of Assam, subsequently declined together with their Superintendent to proceed to Kumaon. Dr. Wallich was fortunately enabled to procure other men in Calcutta out of a party of Chinese artizans returned from Assam. A set of manufacturing implements were also procured from Assam. These were forwarded to Kumaon in charge of Mr. Milner, the gardener, who was on his way to the Botanic Garden at Saharanpore. The Chinamen (nine in number) arrived at their destination† in April 1842."

These men made some tea from the Kumaon plants in the autumn of that year, and Dr. Falconer, who had been detained in the south of Europe by ill-health, brought a specimen of the manufacture to England in June 1843. As shown in Dr. Royle's report just quoted, it was submitted for examination to the eminent tea-brokers, Messrs Ewart, MacCaughy, and Delafosse, and their report of 8th September 1843 is thus worded: "The tea brought by Dr. Falconer as a specimen of the growth of the China plant in the Himalayan Mountains resembles most nearly the description occasionally imported from China under the name of Oolong. This resemblance is observable in the appearance of the leaf before and after infusion. The color of the liquor is also similar, being paler, and more of the straw color than the general description of black tea. It is not so high flavored as the fine Oolong tea with which we have compared it, and has been too highly burnt in the preparation, but it is of a delicate, fine flavour, and would command a ready sale here." We ourselves well remember the arrival of the Chinamen; and in our printed account of Almorah, in June 1843, where we described the beauty of the scenery at Hawulbagh, and recorded the fact that Major Corbett's large estate at that place had been purchased by Government; and our hopes that under the superintendence of Dr. Jameson, the *horticultural* garden would yield large supplies of fruit, such as apples, pears, and plums, of better quality than then existed, we added, "Thousands of tea plants are thriving very well in the Almorah and Hawulbagh nurseries, and the Chinese tea-makers amuse the puharree popu-

* *Vide* Report on the Progress of the China Tea Plant in the Himalayas, from 1835 to 1847, by J. Forbes Royle, M. D., F. R. S., London, April 1849, Journal of the Royal Asiatic Society, Vol. XII. Part I.

† Hawulbagh, near Almorah.

lation by their strange figures, and still stranger propensities."*

It is no disparagement of Falconer's merit that it was subsequently discovered that these first imported artizans were not all of the right sort from the best tea districts of China, or that Dr. Jameson, who had relieved Falconer during the serious illness of the latter, had, as it would appear, also sent specimens of manufactured Tea to Calcutta and London, and received a favorable report thereon in September 1843 from Messrs. Thomson, of Mincing Lane.

We now come to the great *central name* which will always most justly be associated with the immense success which has attended the progress of tea culture in the mountain districts of India. William Jameson had not to make a name for himself. He came to India with all the *prestige* derived from the reputation in science of his celebrated uncle, and right nobly has he sustained, and extended from Edinburgh and Europe to the Himalaya and Asia, the honors of his family.

Having assumed full management everywhere as Superintendent, Dr. Jameson paid his first visit to Kumaon, in April 1843, and made his first official Report † on the tea nurseries of that Province on the 28th February 1844. From that date until the final abandonment of the Government exploitation, and the successful establishment of private enterprizes, the progress of the whole cultivation of the tea plant, and of the production and disposal of the manufactured tea formed the subject of the most complete and exhaustive reports, furnished regularly by the Superintendent, and published at first in the "Journal of the Calcutta Agricultural and Horticultural Society;" and after introduction of the system of Annual Administration reports by the several Governments of British India, in the official records of N. W. Provinces. It is no business of ours to transfer the statistical details thus furnished to the pages of these Notes and Recollections. We trust that they will be collected and embodied in one general history, either by Dr. Jameson himself, or by some other competent authority. But the following observations, founded on personal experience connected with the *earlier* reports, will not, we humbly think, be out of place.

With the exception of the garden at Hawalbagh, which, with its fine house and offices, were purchased by Government at a most convenient and critical period in the history of the experiment of which we are treating, and which became the headquarters of Dr. Jameson in Kumaon, and the site of the principal factory,—the new ground taken up for the first great extension of the tea nurseries was not all happily chosen. At that time a *copious* supply of water for irrigation of the tea plants was

* Among them their love of pork.

† Communicated by Government, N. W. Provinces, to the Agricultural and Horticultural Society, Calcutta, and published in their Journal, Vol. II., No. XII.

considered essential to their welfare, and Dr. Jameson, in his additions to the original plantations in the Bhimtal district, only carried out the selections and intentions of his predecessor. Russeah, Kooa Sar and Anoo Sar, especially these last, as their names imply, were situated in essentially *valley* land. The natives of Kumaon divide all land into *ooperaon*, or high, and *tulaon*, or low, which last division also includes *seera*, or actually wet or irrigated soil; and the original recommendations of the Tea Committee certainly did *not* point to the latter. But these nurseries also had another defect. They, for the most part, occupied land which the villagers of the Chukhatta district preferred to keep in their own occupation, and official pressure was undoubtedly used before the landowners agreed to take what was considered a compensating rate of rent.

We ourselves at that time filled a subordinate position; and in handing over wheat and rice lands for the planting of tea, we only acted under the orders of superior authority. But nevertheless, in our civil executive capacity, our hands, as duly recorded by Dr. Jameson, did deal the fatal blow, and we do not now wish to deny our responsibility; but the whole thing was a mistake, and we ourselves, some time before we resigned the Commissionership to its present philanthropic incumbent, having been instant in season and out of season in personally representing to the head of the local Government the claims and wishes of the zemindars, had the great satisfaction of restoring to them their lands, and receiving their thanks On this matter Mr. Robert Fortune, the celebrated gardener-traveller, to whom English florists owe so much, in his first report on the condition and prospects of tea cultivation in the North-West Provinces, dated September 6th, 1851, after objecting to the "low flat land" as unsuitable for tea, remarked:—"Besides, such lands are valuable for other purposes. They are excellent rice lands, and, as such of considerable value to the natives." And in his second report, in 1856, he made the following observation:—"In my former report to Government, it was necessary to express an opinion on some other plantations in this district, where the land, which had been chosen, was not suitable for tea. Since that time these plantations have very properly been abandoned, and the land returned to the natives for the cultivation of rice and other crops, for which it is well adapted." We have no wish to revive the controversies raised by what may be called the "Fortune Episode" in the general history of Himalayan Tea; but in recounting our own experiences on the subject of Kumaon tea in particular, it would have been almost dishonest to have maintained a complete silence on the *vexata quæstio* of moist and dry sites, or to have omitted some mention of the only remarkable official mistake committed in the course of the Government exploitation which at last culminated in such brilliantly successful results.

Putting aside the point of controversy, which, after all, chiefly referred to a temporary state of the Kaolagir* plantation in Dehra Dhoon, the earlier deputation of Mr. Fortune to the tea plantations—a most important and beneficial event in the history of Indian tea, being made by one thoroughly acquainted with China—brought to proof quite as much as did his second, the very great *impetus* which had been given to the spread of the plant by the energetical efforts of Jameson.

We ourselves, after the lapse of twenty-six years, still remember with the liveliest pleasure the visit of Fortune to Kumaon in 1851, and the enjoyment and profit we received from his interesting and instructive conversations at Naini Tal and its vicinity; while, of course, it was satisfactory to ourselves, then filling the principal official post in the province, to find that he sympathized with our own views as to the future sites of tea† in our districts.

We had been a little disappointed by the result of a visit paid by Dr Jameson in the autumn of 1846 to our pet tract, Kutyoor, concerning which he reported in July 1847:—"I accompanied Mr. Commissioner Lushington to Byznath, being informed by him and Mr. Batten that in its neighbourhood a large tract of country, well adapted to tea cultivation, was lying waste. Such, however, no doubt, was the case prior to the last settlement; now all the irrigable land is covered with rich cultivation. I must, therefore, extend the plantations in the Chukhata district." It was with corresponding satisfaction that we found Mr. Fortune in 1851 fully alive to the great importance of Kutyoor as a tea district; and we cannot refrain from quoting at length his recorded opinions on the same subject:—"Kutyoor is the name of a large district 30 or 40 miles northward from Almorah, in the centre of which the old town or village of Byznath stands. It is a fine undulating country, consisting of wide valleys, gentle slopes, and little hills, while the whole is intersected by numerous streams and surrounded by high mountains. The soil of this extensive district is most fertile, and is capable of producing large crops of rice on the low irrigable lands, and the dry grains and tea on the sides of the hills. From some cause, however, either the thinness of population or *the want of a remunerative crop*, large tracts of this fertile district have been allowed to go

* Formed by Dr. Jameson in 1844, and sold to the Rajah of Sirmur (Nahn) in 1867.

† Among other remarks in his first report occurs the following:—"There is no such scarcity of tea land (*i. e.* 'the hilly land, such as the tea plant delights in') in these mountains, more particularly in Eastern Gurhwal and Kumaon. It abounds in the districts of Paori, Kunour, Lohba, Almorah, Kutyoor, and Bhimtal; and I was informed by Mr. Batten that there are large tracts about Gungolee and various other places equally suitable. Much of this land is out of cultivation, while the cultivated portions yield on an average only two or three annas per acre of revenue."

out of cultivation. Everywhere I observed ruinous and jungle-covered terraces, which told of the more extended cultivation of former years. Among some hills near the upper portion of this district, two small tea plantations have been formed, under the patronage and superintendence of Captain Ramsay, Senior Assistant Commissioner. . . . . I never saw, even in the most favoured districts of China, any plantations looking better than these."

In our own Settlement Report, written in 1846, which will be found printed in the *Kumaon Official Reports*, published by the Government of the N. W. Provinces, Agra, 1851, we had stated as follows:—"At one time from the citadel of Runchoola above their capital Kutyoor the ancient rulers of the hills must have looked down and around on an almost unbroken picture of agricultural wealth, for not only in the valleys, but up three-fourths of the mountain sides, now covered with enormous forests of pine . . . . . , the well-built walls of fields remain in multitudinous array, terrace upon terrace, a monument of former industry and populousness, and only requiring the axe to prepare an immediate way for the plough. The valley of Byznath being situated on the frontier of Kumaon, with Gurhwal, and in the neighbourhood of Budhan Fort, was often, in all probability, the scene of border conflicts and military exactions, and the desertion of villages having once commenced, the deterioration of climate, originating in the spread of rank vegetation and the neglect of drainage, &c., may be supposed to have gone on from worse to worse, till finally the heat and moisture were left to perform all their natural ill-offices, unchecked by the industry of man. Viewing, however, the present slight improvement in a hopeful light, and remembering the less favourable situations in which nurseries are thriving, *we are of opinion that the district of Kutyoor* (Byznath) *would be found the one most deserving of selection for the future spread of the Kumaon tea cultivation.* Irrigatable unoccupied lands, at between 3,000 and 5,000 feet above the sea, abound on the lower slopes of the hills, while much of the good land in actual possession is occupied by migratory tenants-at-will, unattached to the soil, in whose place the Pudhans of villages could have no reasonable objection to see profit-paying, wealth-planting *gardeners*." In another place, after describing the desolation caused by tigers in the neighbouring pergunnah of Gungolee, and after showing the small amount and precarious character of its revenue, and the facilities for obtaining waste lands, we added—"We have named this pergunnah as one of those most favourable for the tea-growing experiment. We do not fear the expulsion of well-armed, and what is better, well-paid maleos from their fenced nurseries by the combined efforts of all the *fauæ naturæ* of Gungolee." We may, we trust, be permitted to look back with pride to these and other similar vaticinations of our own in regard to Kumaon tea, when in 1877

we are able, in recording our recollections of our "antiquæ sedes," to point to the long list of flourishing tea plantations in Kutyoor, and now, on the earliest possible occasion, publicly to thank those of the existing Kumaon planters who have given or sent to us *their* thanks for having been the first to declare the suitability of the sites now occupied by their estates, and to prophecy their future wealth. But our own greatest triumph, and the main cause of the present prosperity, are to be found in the fact—one most kindly and hospitably brought before our own eyes in 1865, when we took leave of Kumaon during a final visit from our last Indian station, Agra,—that Dr. Jameson himself established * a principal nursery and factory at Aya Tolee, near Byznath, which became the centre of the best and richest tea district in Kumaon.

The cultivation of the "Eucalyptus globulus" *and other Australian gums in India.*

[As for some years past applications for seed of *Eucalyptus globulus* have been made to the Agri-Horticultural Society, and as applications are still being received, and as the results have hitherto been very discouraging, it is deemed desirable to reproduce the following note for the information of Members and others who may still be desirous of attempting the introduction of this tree into Bengal.]

For many years past the Government of India has been importing large supplies of seeds of the trees of this family, and chiefly of the *Eucalyptus globulus* (blue gum). These seeds have been widely distributed with the object of acclimatising such useful trees in the parts of India best suited to their growth. The experiment has not been particularly successful, and in fact it may be said that the trees have lived only in two places—the Nilgiris and Ranikhet. In the Nilgiris their cultivation has long passed beyond the experimental stage. I have seen it stated somewhere that in places the growth of these trees has quite changed the aspect of the country. Official reports all testify to the rapid growth of the Australian gums. In the Madras Forest Report for 1868-69 it is stated of the blue gum that "its rapidity of growth on these hills exceeds that of any tree indigenous or introduced, and has been the admiration of all forest officers who have visited our plantation." This rapidity of growth was particularly noticed in the sholas, and it was recommended that as these were thinned out for firewood, they should be renewed with this tree. "It exhibits the most favourable growth when planted inside sholas of the indigenous trees (particularly in the ravines,) as it soon overtops

Madras.

* Under orders of Lieut.-Governor, N. W. Provinces, dated 31st July 1854.

all the native trees, and it has complete shelter from the wind when young. One tree in such a locality in the grounds of Gayton Parkat Ootacamund is quite a sight: it is upwards of 12 feet in girth and of enormous stature." The Commissioner of the Nilgiris wrote in December 1869:—"It may be said to be established that certain species of the *Eucalypti* grow splendidly on the Nilgiris and four times as fast as the teak tree grows any where, and that the timber of the *Eucalyptus* is at least equal to teak for the various purposes for which teakwood is wanted." The following is an account given in August 1868 by the Conservator of Forests in Mysore of the Nilgiri plantations of *Eucalyptus* visited by him in company with the Madras Conservator:—

1. I have the honour to report, for the information of the Commissioner, that I lately visited the Government plantations (at Ootacamund) of *Eucalyptus* and other useful timber trees chiefly exotics.

2. Major Beddome, the Conservator of Madras, at my request, kindly took me over them, and gave me much valuable information. I would respectfully suggest that, if the Commissioner should consider the experiment worth trying, seeds of the various kinds of *Eucalypti* might be obtained from the Australian Government, and these valuable timber trees be introduced into Mysore.

3. In the plantation we first visited about forty acres had been planted out with the *Eucalyptus globulus* (blue gum). The planting was commenced in August 1865, and the trees had grown capitally. I measured two trees planted out (seedlings) in 1865. One measured twenty-four feet, the other thirty feet, to the top of the terminal shoot, and in girth respectively thirteen and eighteen inches. Major Beddome tells me the timber is equal to teak, and, in spite of its rapid growth, is good close-grained wood. The growth in the Ootacamund climate of this tree is almost incredible. In the public gardens is a specimen of *Eucalyptus globulus* now twelve years old. It is about 100 feet in height and measures six feet in girth, nearly at three feet from the ground. This specimen branches low but it was grown as an ornamental tree, not for timber. To thrive well, the *Eucalyptus* requires an elevation of 4,000 feet; several sites could be found in Coorg, Munjerabad and Nagar for its propagation. It is very hardy. In the plantations I visited there had been scarcely one casualty in the first year; last year some young trees had been killed by frost, especially those in low and marshy ground. But apart from the frost, the tree flourishes best in damp ground; the largest tree in the plantation grew close by the side of a stream and its roots were entirely surrounded by water.

4. The manner of propagation is as follows: Nursery beds having been prepared, the seeds are sown broadcast (generally in December or January in Ooty), and covered lightly with earth to the depth of quarter of an inch. They are watered copiously. When about three months old, they are taken up, the roots covered up with earth, and then with moss, and the plants are in that state placed in fresh beds or even (in this climate) simply under pandals, without being put into the earth. Here they remain for about a month to recover themselves, and they are then planted out in pits or trenches, each plant being six feet distant from the next. The dimensions of the pits and depth of the trenches varied considerably. Some of the pits were three feet cube, others only eighteen inches cube. The depth of the trenches too varied from eighteen inches to thirty-six inches. A uniform depth of two feet and breadth of two feet for the trenches, or pits two feet cube, would perhaps be the best. If the spot where the seedlings have been planted out is well protected from the wind, they require no further looking after. Should, however, the wind get at them, it is found necessary to remove almost all the

leaves, as the plant is apt to get top heavy, is blown over and injured. Being planted out at only six feet apart they draw each other up, and require no pruning, the lower branches dying off naturally.

5. If introduced into Mysore, we could not moss the plants. Major Beddome advised my using bamboo pots, which have answered well up here. The young seedling, on being first moved, is put into the bamboo, which is then placed on the ground under the shade of pandals; when the time for planting has arrived, the young plant is pushed out with a stick.

6. We then went on to Major Morgan's plantations. Here I saw a thriving plantation of *Eucalyptus globulus* aged seven years. I measured one specimen. It was four feet in girth at six feet from the ground and seventy feet high, measuring about twenty-five feet to the first bough. The girth of this specimen was exceptional, but there were several hundreds of trees which would have measured about three feet or three and a quarter feet in girth. They were all well grown, with clean stems, and had never been pruned. They stood at six feet apart, and Major Morgan has this year commenced thinning them out. Grass grows well under the shade of these trees.

7. At Major Morgan's plantations I saw specimens of the *Eucalyptus globosa, Espeperetta, E. citriodora*, several kinds of stringy barks—all *Eucalypti* from Australia. They were growing well. Major Beddome advises the introduction of the following trees as the best known timbers: *Eucalyptus globulus, Eucalyptus sideroxylon, and Eucalyptus marginata*—a valuable timber and said to be obnoxious to white-ants.

The leaves of all the *Eucalypti*, especially when the plants are young, are full of oil glands. The *Eucalyptus globulus* leaf has a strong taste of camphor, and goats even will not touch it.

Large plantations have since been formed by the Forest Department on these hills, and have succeeded admirably. In the plain districts of Madras, however, the attempt to grow the Australian gums has been a complete failure. Repeated notices have from time to time appeared in the public journals on this subject, but the last notice I find is the following quotation from a recent report by the Sanitary Commissioner for Madras:—

I observe in the newspapers that the subject of the cultivation of *Eucalyptus globulus* in marshy places has been under consideration with reference to the drainage of village sites and protection of the health of the people in the Godavery District. As the order of Government on this subject has not been communicated to me, I am not able to submit any remarks on it; but in regard to the general question of the cultivation of the *Eucalypti* in the plains of India, I have the honour to state that the experiment is almost certain to fail. Looking to the importance of introducing malaria destroying trees, I have personally been endeavouring to grow the *Eucalypti* in Madras, but, so far, without any hope of success. The seeds germinate, and the plants grow rapidly under shelter, but they seem unable to bear the great solar heat and die off when planted out. They thrive but indifferently in the elevated plateau of Mysore, and it is only in our hilly ranges, with elevations of 4,000 feet and upwards, that they appear to grow vigorously. Judging from the results of experimental trial of these trees in Madras, I do not think there is any chance of their flourishing in the delta of the Godavery River. But while the cultivation of the *Eucalyptus* in the Godavery District may be impossible, there are plenty of trees which may be substituted for it. The supposed virtues of the *Eucalypti* in neutralising miasmata are probably exaggerated, and whatever power they have in this way is possessed in common with many other resinous-odoured plants, like casuarina, mango, jack, &c., which grow freely in the plains

wherever they are planted and taken care of. I would submit therefore that the spending of money on an exceedingly doubtful experiment is unadvisable, when experience has shown us that trees of similar properties with the *Eucalypti* may be raised with every prospect of success in the eastern coast deltas.

Major Beddome, the Conservator of Forests, is of opinion that the *E. globulus* cannot be grown in the latitude of the Madras Presidency lower than 4,500 feet. Colonel Morgan, Deputy Conservator in the same Presidency, says that *E. globulus* is best grown at an elevation of 6,000 to 7,000 feet; the red gum (*E. rostrata*) at 5,000 to 6,000 feet; the jarrah (*E. robusta*) at 4,500 to 6,000 feet.

Mysore and Coorg.

The experiments made by the Conservator of Forests in Mysore have not been successful. The first sowings in 1870-71 failed, owing, it was said, to a large proportion of the seed having lost its vitality before receipt in India. In 1871-72 plantations of blue gum were commenced in Nagar "with poor success, as out of 6,490 seedlings transplanted, 5,816 died." In 1872-73 the annual report informs us: "The exotics, chiefly Australian, introduced into the plantations have failed in large numbers, and those which have so far succeeded require special care. The attempts to grow the jarrah (*E. rostrata*) in Nandidrung have been successful so far, and the young trees look very healthy."

Bombay and Sindh.

In Bombay, as far as we know officially, no attempts have as yet been made to introduce these trees; but I see it stated in a newspaper that the *Eucalyptus globulus* is thriving in the Victoria Gardens in the town of Bombay. The Commissioner in Sindh has circulated a paper recently written by Dr. Morton, recommending the cultivation of the *Eucalypti* in that province, and he has sent for a large quantity of seed with which to commence experiments wherever possible.

Bengal.

In Bengal all the attempts made to grow the *E. globulus* in the Botanic Gardens have failed. The seed sown has often germinated without difficulty and in quantity. Plants have also attained the height of eight or ten feet, but then they die out. Dr. King says that the chief difficulties of cultivation begin when the roots have become sufficiently long to reach the water-level. He attributes the failure of the tree to the high water-level in the subsoil, the high temperature, and the alluvial nature of the soil of the province. Recently on a suggestion made by a native newspaper for the cultivation of the *Eucalyptus globulus* in the fever-stricken tracts of Burdwan and Hooghly, a letter was written from this Department to the Government of Bengal, No. 489, dated the 7th May 1874, an extract from which is appended:—

Although the alleged anti-miasmatic properties of this tree are problematic, there is no doubt that the introduction of fast-growing aromatic trees, like the gum trees, which moreover produce serviceable timber, can only be advantageous. The species of *Eucalyptus* which grow luxuriantly on the

Nilgiris, and which are cultivated in Provence and Algeria (*E. globulus, obliqua,* and other species), are from the temperate climate of Tasmania and the southern parts of Australia. These do not thrive at Calcutta, and would not thrive in the Burdwan District. But there are numerous species of this genus which inhabit North Australia, Queensland, and other parts of tropical Australia which the Government of India is informed have been cultivated in the Calcutta Botanical Gardens, but hitherto without success; and I am to suggest for His Honour the Lieutenant-Governor's consideration that Dr. King might be encouraged to persevere in his attempts to introduce the gum trees of tropical Australia.

Dr. King says that even these species have never succeeded in Calcutta, but he has sent for seed in order to carry out the experiments suggested, and promises to report the result. There are now, Dr King reports, about sixty or eighty gum trees in the garden, many of them being from fifteen to twenty feet high.

It is understood that the experience of the Calcutta Agricultural and Horticultural Society is much to the same effect as Dr. King's.

Assam.

In Assam the only record of an attempt at the cultivation of these trees that I can find is recorded in a recent report of the Agricultural and Horticultural Society. Dr. Imthurn, stating the result of an attempt to grow the *Eucalyptus globulus* at Tezpur, Upper Assam, writes as follows:—

I found it impossible to get the seeds to germinate in the open, apparently owing to the soil being too moist.

Sown in pots, the seeds germinated pretty freely (from one-third to one-half of the number sown). The time required for the germs to appear above ground was from five to twelve days, generally nearer the former term. The young plants unfortunately look weak and premature, and are very slow in making leaves.

The stalk bearing the cotyledons seems to have grown too fast, and proves too tender. Heaping up fine earth round the stalk does very little good beyond preventing the stalks from bending under the weight of the cotyledons.

I have often noticed the same premature state with cold weather plants, which I wanted to raise during the rains so as to have early seedlings. Its causes are, as far as my experience goes, either—

too rich soil, or
too much humidity, or
too little light (reflected or directed), or
too high temperature.

I have varied my experiments so as to satisfy myself that the premature state of the young *Eucalyptus* plants is not due to any of the first three causes just mentioned, and it seems therefore that the high temperature was the cause of the weekly state of the young plants.

These remarks having been referred to Mr. Kurz, of the Royal Botanic Gardens, he said that in his opinion the failure of *Eucalyptus globulus* in Assam was ascribable both to too great moisture and heat.

It is true that the tree grows best in moist valleys of Victoria and Tasmania, and must there be subjected to a good deal of dry heat during the hot season; but still the distribution, which ranges from 37 degrees to 44 degrees south latitude, indicates its unfitness for the Assam climate, while

it will no doubt prosper in the North-Western Provinces, &c., and still better in the Mediterranean countries.

Dr. F. V. Mueller has sent us another species less temperate than the above, *viz.*, *E. rostrata*, and I enclose a few seeds for Dr. Imthurn for an experiment in Tezpur. Dr. F. V. Mueller thinks that this is the best kind for tropical regions in India, and possibly Dr. Imthurn may be inclined to try it and let us know by and bye with what results.

These seeds were sent with Mr. Kurz's remarks to Dr. Imthurn.

North-Western Provinces.

In the North-Western Provinces, Kumaun is the only locality where experiments have been officially tried. In his report for 1870-71 the Conservator wrote: "The climate and soil of Ranikhet are evidently well suited to the Australian gum trees. We have now gained considerable experience in the cultivation of these very valuable trees, and I am convinced that the best mode is to break up patches of ground and sow the seed broad-cast on the spots the trees are to remain on; for although the young saplings are not killed by transplanting, their growth is very considerably delayed. The seed should be sown in the rainy season, and it will then germinate in about eight or ten days. The blue gum is doubtless the quickest grower, will and do well enough for fuel; but I doubt its being of much use for timber, and I am rather afraid that it will be liable to get broken by the severe gales of wind peculiar to the Himalayas . . . . I have directed Mr. Craw to break up open patches of ground in the forest and sow all the gum seed he has, and next year I mean to go on with this work on an extensive scale, and there are many acres of small open spaces on the Ranikhet hill which I hope to get covered with gum trees in this way."

He was also going to try further experiments at Chakrata.

In 1871-72 Mr. Craw reported from Ranikhet: "7,600 gum trees have been planted in cantonments, and with few exceptions are doing well. * * * In February last about 300 gum seedlings were taken from the Ranikhet nursery and planted at Mohalu (Kumaun). By the end of June these little trees had grown from four inches to six feet in height, but I have since heard that many of them died soon after the heavy rains set in. If this is the case, the gum tree will not do in such a damp climate as the Bhabur. A small quantity of gum seed was sown near Chakrata, but the heavy snow of last winter rotted it, and not one single seedling appeared. However, I fear the gum tree is not suited to that cold and bleak climate."

Mr. Craw's last available report, dated 16th March 1873, shows that he has then between 15,000 and 16,000 gum trees, and was expecting a large increase to his stock from fresh sowings. He considers that they have become acclimatised at Ranikhet, and gives some measurements in support of his opinion. The oldest of the gums planted in August 1869 was 30 feet high when he wrote, and a number of others planted

in August 1870 ranged from 15 to 20 feet, the average being nearly 18 feet. He finds the seeds succeed best when sown in early spring. The young plants thus attain a few inches in height before the rains set in and are not liable to rot off in the seed beds or in transplanting, which they do when from any cause the sowing has been unseasonably deferred.

Colonel Ramsay says that the *Eucalyptus* grows admirably at Naini Tal at an elevation of 6,700 feet and at Doonagiree at an elevation of 6,500 feet; "therefore," he says, "it may be fully admitted that it does not suffer from the frosts to which hills to a height of 7,000 feet are liable." Captain Birney in a small experiment found the *E. globulus* the quickest grower of the seven gums he tried; it attained a height of six feet in one year.

Punjab.

In the Punjab repeated attempts have been made by the Forest Department to raise the various species of this genus. In his *Punjab Plants* (page 93) Dr. Stewart says: "These Australian trees have yet not been found easy to raise in the Punjab, although improvement is taking place in that respect. But several of the trees, which have succeeded at Lahore and Madhopur, where they were first introduced in 1860 by seed obtained from Dr. Chalmers, have grown at least twice as rapidly as the ordinary Punjab trees." Dr. Stewart does not specifically mention the blue gum, and it is not probable that this was one of the kinds which he mentions as having succeeded. Seeds of *E. gigantea* (from Adelaide), *E. sideroxylon* (iron-bark from Victoria), and other species have been obtained from time to time and tried in the Changa Manga plantation without success. The blue gum always failed. Writing in April 1870, Mr. Baden-Powel reported that the experiments had been "so very satisfactory, that a more systematic effort to grow the tree on a large scale is desirable." He said that *E. sideroxylon* had been very successful. Further experience, however, caused Mr. Powell to change his opinion. In February of the present year he wrote: "The only place we grew gums was at Changa Manga, and the plantation officers there have tried all sorts of species. We obtained a large amount of seed, gave it a fair trial, and concluded that our plains do not suit the *Eucalyptus* species, but that the lower hills would be their proper place." Of the *Eucalyptus globulus* he said: "It is *the* most difficult of all the gums to rear in the plains. They have been tried and always failed at Lahore. I had one, I think about the third or fourth in all Lahore, that survived and grew, just as Mr. Hume describes, in a hectic, unhealthy sort of way." These remarks were made on a request from the Government of the Punjab for seeds of the blue gum which Dr. Scriven, attracted by the newspaper reports of the properties of the tree, wished to try in the central jail. He also recommended

its being planted along the banks of canals in those districts where the canals had increased fevers. This Department asked the Government of the Punjab to enquire into the results of the trials made at the Changa Manga plantations, saying that if after considering them it was of opinion that further trials would be useful, the application for seed might be renewed. This was last February, but no further communication on the subject has been received from the Punjab. There is a blue gum at Simla in the grounds of the Simla Bank. It is not a particularly good specimen, but its existence shows that when once established the tree can stand frost fairly well. This tree is some years old. I sowed a quantity of blue gum seed at Simla in the spring of last year. The plants grow rapidly, and I gave away a number of them when they were about a foot high. Those that I kept stood the winter fairly, though it was very severe, and were in good condition when I left at the end of January. But it was evident that if they had not been sheltered, the seedlings would have perished, and it seems certain that the frosts of Simla are too severe for the tree in the early stage of its growth to admit of its satisfactory cultivation on a large scale at that altitude.

Oudh.

In Oudh the *Eucalyptus globulus* has been tried without success by Dr. Bonavia. In his report for 1873-74 on the Lucknow gardens he writes :—

So much has been written lately about the *Eucalyptus* that a few words upon it may not be uninteresting. Several years ago some seed which was ticketed *E. globulus* germinated well, and several of the plants throve and were planted out. Most of them died one rainy season; two escaped and grew to about 30 feet high. The leaves had a bluish bloom on them and were very fragrant. The leaves of the lower part of the tree were totally different in shape from the upper ones. Both these trees died during a subsequent rainy season. I have now in the Horticultural Garden 22 trees of another kind of *Eucalyptus* which Dr. King, the Superintendent of the Royal Botanic Gardens, thinks is the *marginata*. If so he states it is a very valuable timber tree and equal to the mahogany. This kind thrives very well. Some specimens I should say are about forty feet high. They don't mind the hot winds, the rains, or frost. Some have flowered but not seeded yet. This may be a good kind to introduce into the Oudh forests.

We have no record of any other attempts to introduce the blue gum into Oudh.

Central Provinces.

In the Central Provinces the only attempt made, as far as we know, is a recent experiment by Colonel Wood, Deputy Commissioner of Sironcha, who brought out a large quantity of seed with him after his return from furlough, meaning to introduce the tree in the Central Provinces. I can find nothing as to the result of this experiment.

Nicobars.

The only other place where, so far as our knowledge goes, the *E. globulus* has been tried is in the Nicobars. The seedlings appear to have done fairly there yet, but the success of the experiment is problematic.

A report has been called for after a year's experience.

Thus it appears that after repeated experiments the *Eucalyptus globulus* has succeeded only at Ranikhet in the North-Western Provinces and on the Nilgiris in the Madras Presidency. Even in Mysore and Coorg, at an elevation which might have been supposed not unfavorable to the tree, it has failed. Heavy charges have been incurred from time to time on account of the importation of seeds from Australia, and it seems questionable whether it is worth while going to much further expense in the attempt to introduce the tree on the plains of India. It is a native of the cool, temperate zone of the Australian Continent and Tasmania, and its unsuitability to the tropical plains of this country seems now manifest. It might probably succeed well on the lower ranges of Himalayas. In these localities if is hardly wanted as a malaria-destroying agent, but it might be useful in the reboisement of such bare places as the chains between Kussowlie and Simla. The aromatic emanations from the tree are so strong, that it is said cattle will not touch it. In this respect and in its extremely rapid growth (at Ranikhet the growth of a particular tree during the course of a year measured no less than 18 feet) it possesses great advantages.

Certainly, if the trees possessed all or even half the virtues currently attributed to it, Government would be bound to make the most strenuous efforts, without reference to cost, for its universal establishment in India. Here is a list of some of the virtues ascribed to it: when thickly planted in marshy districts the subsoil is speedily relieved of its superabundant moisture as if by pipe drainage, the tree absorbing daily ten times its own weight of water from the soil. Miasma ceases wherever it flourishes, and fever flies before its face. The healthiness of the Australian climate is caused by the emanations from the tree. The bark and leaves possess febrifugal and antiseptic properties. It is valuable as a disinfectant and as an active agent in treatment of diseases of the larynx and of the mucous membrane generally; its leaves make a good lozenge for the throat, and baths in hot water in which the branches and leaves have been infused remove rheumatic pains, neuralgia, and the debility left by malaria. It is praised as a perfume (to which the name *Eucalyptol* has been given) and as a cigar to promote digestion and for bronchial and asthmatic affections. And last, but not least, it has been discovered to be an infallible remedy against the phylloxera vastatrix, thus: inoculate the vine attacked with the pure essence of *E. globulus*, and in three days the phylloxera entirely disappears, while the vine is uninjured. It is not stated that the abbé who made this great discovery has claimed or received the reward of three hundred thousand francs offered by the French Government.

This catalogue of the virtues of the blue gum makes one think of the wonderful powers supposed three hundred years ago to be possessed by that "most holy herb," tobacco. Clearly such statements want confirmation before they can be accepted. They bear indeed on their face the mark of exaggeration. In one of the papers in which an account of the properties of the tree is given it is stated that the British Government has largely grown it in India and on the west coast of Africa with astonishing results in the diminution of fever. Now we know that in India no such results have been obtained, and on the west coast of Africa attempts are only now being made to introduce the tree, and Dr. Hooker is very doubtful of its succeeding there. Mr. Broughton, Government Quinologist at Madras, has examined the bark and leaves of the tree with the result stated in the report to the Government of Madras (appended) dated 29th May 1872:—.

Much has lately appeared in the papers and quasi-scientific journals concerning the valuable qualities of the *Eucalyptus globulus* as a febrifuge. In the *Lancet* for 20th April 1872 a notice is given of the uses of this tree medicinally, in which it is stated that all parts are most valuable as a febrifuge medicine, and also that the leaves when smoked are most efficacious in allaying pain, calming irritation, and procuring sleep. This article furthermore informs us that Professors Vauquelin and Leiciana obtained an alkaloid from the bark which crystallised like quinine as a sulphate, and which yielded the ordinary reaction of quinine with chlorine, water and ammonia. I have examined the bark and leaves of the *Eucalyptus globulus*, and have the honour to state that neither quinine, quinidine, chinchonidine, nor chinchonine is contained in the plant in any proportion.

The only precise instances of the removal of fever by the agency of this tree are those given by M. Gimbert in his paper read before the Académie des Sciences, on which the numerous articles which have appeared in the journals lately have been based. The cases quoted are certainly remarkable if they can be accepted without qualification, but Dr. Hooker, on the other hand, says that he has failed to discover that the reputed virtues of the tree have any certain foundation.

However, without discussing the question of its febrifugal and antimiasmatic qualities, there can be no doubt that *Eucalyptus globulus* is a very valuable tree. Its timber is excellent, very strong and durable. At the Paris and London Exhibitions the wood was mentioned in high terms as very suitable from its hardness and durability for various purposes, and especially for ship-building, as it resists the attacks of insects in the water. At the Paris Exhibition of 1862 the wood was recommended as well adapted for railway sleepers. M. Trottier, who has written a pamphlet on the cultivation of the blue gum in Algeria (where it is now largely grown), calculates that in eight years a tree would be sufficiently large to cut up into sleepers. In Australia the timber of the blue gum is greatly used by colonial ship-

builders and by mill-wrights, carpenters, and makers of implements, as well as by engineers in the construction of works requiring beams of great span. Mr. Broughton reports that the tree produces a gum resin in considerable quantities closely resembling kino in its properties. He found it yields no less than 43 per cent. of tannin, and he thinks it probable that the gum would be found valuable as an astringent medicine. Its growth, as has already been said, is astonishingly rapid.

But if the reputation of *Eucalyptus globulus* as a sanitary agent cannot be confirmed, it will probably be advisable not to waste money in further attempts to naturalise it on the plains. There are many other species of the same family which, as natives of the hotter parts of Australia, will probably succeed perfectly in the plains of India. Their growth, like that of the blue gum, is rapid, and the timber of many (that of the jarrah, for instance) is excellent. The propagation of *Eucalyptus globulus* should be confined to those localities which are known to be suited to it.

Appended is a memorandum on the method of planting the *Eucalypti* by Colonel Morgan, Deputy Conservator of Forests in Madras, with marginal notes by Captain Campbell Walker.

Memorandum on the planting of Eucalyptus, by COLONEL H. R. MORGAN, *Deputy Conservator of Forests in charge of Mudemallai, &c.*

The seed, which should be procured in January or February, should be placed in beds in rows 6 inches apart.

2. When the plants are 6 inches high, they should be taken up and placed 6 inches apart in beds; the roots should be shortened to 4 inches.

3. When 3 feet in height, the plants are taken up with a ball of earth round their roots, moss is bound tightly round the ball, and the plants are left in beds well-earthed up about the roots and watered till the young rootlets show through.

4. They may then be put out. April is the best month for planting, as the plants are then able to make strong roots before the monsoon.

5. When moss is not available, bamboo pots may be used, taking care to keep the large end of the joint for the top of the pot; the hole at the bottom to be plugged with grass. The plants should be placed in the pots when 8 inches in height, and left till they are two feet high, and the root show through; then thrust the roots through, and the plant comes out with a ball of earth attached to the roots. Pits should be 18 inches cube.

6. In the second year it will be necessary to prune the trees heavily to remove all side branches but the three pairs at the top.

NOTE.—I do not like to advance theoretical opinions in opposition to Colonel Morgan's *experience*, but I cannot help thinking this pruning might be dispensed with, and the trees left to nature.—C. W.

7. *Eucalyptus globulus* is best grown from 6,000 to 7,000 feet elevation; the red gum (*Eucalyptus rostrata*) from 5,000 to 6,000 feet: the jarrah (*Eucalyptus robusta*) (*marginata ?*) from 4,500 to 6,000 feet. If the situation is very exposed place your trees four feet apart in trenches 18 inches wide and deep.

8. In rich soils thinning may be necessary in the seventh year; in poor soils the tenth year. Grass land is best broken up by heavy ploughs, and if a crop or two of potatoes or oats are taken off it, the better for the plants. A tree of *Eucalyptus globulus* at twelve years of age in good soil will weigh a ton.

NOTE.—I have seen plantations in which thinning was absolutely necessary in the fifth year. No rule can be laid down, as so much depends on soil and exposure, and the object for which the trees are grown.—C. W.

J. C. O'CONNOR.

Monthly Proceedings of the Society.

Thursday, the 1st of February, 1877.

BABOO PROTAPA CHANDRA GHOSA, *V. P., in the Chair.*

The proceedings of the last (December) meeting were read and confirmed.

The following Report from the Council was submitted and adopted :—

Another year has just closed, and the Council, as usual, are called upon to furnish their annual report on the working of the Society, its progress, its monetary position, and financial prospects.

The Council have much pleasure in stating that His Excellency Lord Lytton has been pleased to signify his acceptance of the office of Patron in succession to the late Viceroy and Governor-General, Lord Northbrook.

The Council regret to observe that the progress of the Society, as regards the election of new Members during the year 1876, as compared with the year 1875, contrasts unfavorably, *viz.*, 91 against 160 in 1875; while the declared resignations in 1876, *viz.*, 52 are equal to the number resigned in 1875. The number of names removed at the end of the year 1876, on account of non-payment of subscriptions for two consecutive years, is 35; on account deaths 18; on account of long absence from India, including the names of a few who have returned, but not responded to calls for subscription, 26; making a total deduction of 131 members; thus reducing the number of 827 members shewn in 1875, to 787 members in 1876, comprised as follows :—Life Members 30, Honorary, Associate, and Corresponding 18, and nominal paying members 739; of the latter, there are 63 members absent in England, and 61 who have failed to contribute to the funds of the Society during the year under review; thus reducing the actual effective number of paying members at conclusion of 1876, to 615. This last contrasts favorably with the number as shewn in 1875, *viz.*, 604, but an unfortunate mistake occurred in the returns of 1875, *viz.*, that in deducting the absentees no allowance was made for Life Members, Honorary, Associate, and Corresponding Members absent, which should not have been deducted; making a difference of 21 in the actual number of paying members for 1875, which ought to have been shewn at 625 and not 604, thereby making the number in 1876 ten less than in 1875. Of the total number of 787 Members of all classes 127 are resident in Calcutta, 576 in the Country, and 84 in Europe, bringing up the total as specified in the subjoined classified statement :—

[It is not considered necessary to introduce this statement].

It may not be out of place to record briefly that out of the three several returns, *viz.*, of members who have not paid subscription for the last two years, those who

did not pay in 1876, and resignations, are included the names of several newly elected members.

The Council also regret to notice the very small proportion of town-members, as compared with the number in the country. The number of the former being less than one-fourth of that of the latter, *viz.*, 127 against 576; and further, that out of the 127, there are about 20 natives, leaving 103 European members resident in town and composed of all classes of the Calcutta community, which may be regarded as a small number for the large and daily increasing wealthy, and influential community of Calcutta, who, it appears, are but meagrely represented in the 103 members of the Society resident in Town.

The monetary position and financial prospects of the Society are in no way different, as regards results, to the previous year. The amount of subscription realized in 1876 is Rs. 2,000 less than in 1875; other sources of income and receipt are about in the same proportion as in 1875. There is a falling off in the sale of fruit grafts; and the expenses of the garden, as hitherto, contrast disproportionately, both as respects its usefulness and the financial means at the command of the Society.

The Council have to acknowledge once more the annual donation of Rs. 2,400 from the Government of Bengal, which has materially assisted the Society in meeting its liabilities, and working its objects; and it is to be noted that such aid will be continued for another twelve months only. In connection with this help, the Council have to record, with much regret, that an application preferred in the early part of the year to the Supreme Government for a renewal of the annual grant of Rs. 5,000 has not been favorably responded to; but it is proposed to make further efforts towards the obtainment of this much desired object; and the Council trust the Supreme Government, may be induced, at no distant period, to acknowledge by a grant the past services rendered by the Society to the State.

The collection of subscription and other dues from members on account of freight, &c., have had the usual care and attention of the Executive, as the arrear list will evidence.

The balance of outstandings for the years 1871, 1872 and 1873, amounting in the aggregate to Rs. 542-11-9, has been written off to the debit of the profit and loss account; the average loss for the three years being about Rs. 180 per annum.

Following is the present state of arrears for the last three years, and the Council rely on the continued exertions of the Executive to bring out a result equally favourable to that accomplished in winding up the working of the Society for the three years previous to 1874.

Balance of arrears for the year 1874 ...	...	Rs.	120	15 1
Ditto ditto ditto 1875 ...	...	„	365	2 5
Arrears for the year 1876 ...	...	„	1,424	11 9
Total, Rs. ...	...		1,910	13 3

The distribution of Plants to Members has been steadily carried on during the year. Two hundred and nine applicants, against two hundred and forty in 1875, received 6139 ornamental shrubs and rose plants against 7835 in 1875, notwithstanding the great reduction in prices in 1876. Had the prices ruled the same as in 1875, the number of plants would have shewn at a still greater reduction as compared with 1875, for instance, plants, which in 1875, were valued and delivered at rates varying from 1 to 5 Rs. each, in 1876 were valued and delivered at considerably lower figures. There were only 440 cuttings of ornamental shrubs and rose plants in 1876, against 1206 in 1875, and 1594 grafts and seedlings of fruit trees sold in 1876 against 1858 in the previous year. The number of ornamental plants sold to non-members was 2019. This might have been larger, but it was found necessary, in the interests of the Society, to suspend, temporarily, in March last, the sale of plants to the public, in consequence of an insufficiency of rarer kinds, which appear to be particularly sought for by that portion of the Calcutta community who are non-members; and the fact that members entitled to free distribution were not sending their requisitions: and the year has since closed without three-fourths of them availing of the privilege.

This clearly indicates that for three successive years the Society's garden with all its introductions of new plants, and offered yearly in free distribution to members, is little availed of or appreciated; nor does the garden with all its advantages offer any inducement or attraction to the general public to become members, for when non-members are desirous of obtaining plants of rarer kinds they resort to the Society's garden to obtain them by purchase, in preference to joining the Society and obtaining them gratuitously. Indeed, it may be observed, that the main inducement to join the Society is the obtainment of the supplies of seeds which are annually distributed.

The Society has been in correspondence with various gardens and exchanging plants with them, besides purchasing from English and Australian nurserymen.

The Council have to express their obligations to several friends for donations.

Various subjects of interest in connection with tea-blight, cultivation of wheat, Cuzco maize, &c., have been considered during the year. In respect to the first the Council have suggested combined action on the part of Agents of gardens, and others concerned in this important industry. It is at present premature to allude further to this, but the result will be communicated next year.

The election of Officers and Council was next entered on, and the following is the result:—

President.—The Hon'ble Louis L. Jackson.

Vice-Presidents.—The Hon'ble Sir Richard Garth, Dr. George King, Mr. S. H. Robinson, and Baboo Gonendro Nath Tagore.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. R. Blechynden, Baboo Peary Chand Mittra, Mr. E. Broughton, Mr. J. W. O'Keefe, Mr. W. H. Cogswell, Rajah Suttya Nund Ghosal Bahadoor, Dr. S. Lynch, Mr. H. J. Leitch, Mr. G. L. Kemp, Mr J. A. Crawford, Baboo Protapa Chandra Ghosa, and Mr. J. E. Maclachlan.

The Standing Committees need no strengthening, and therefore remain as in 1876.

The following gentlemen were elected members :—

Messrs. Frank Harding, J. J. Allen, and W. G. Parcell.

The names of the following were submitted as candidates for election :—

Manager of the Gellahutting Tea Estate, Assam,—proposed by Mr. P. B. Magor, seconded by Mr. S. H. Robinson.

K. G. Gupta, Esq., C. S., Palnakhate, Barisal,—proposed by Mr. E. J. Barton, seconded by Baboo P. C. Mittra.

W. H. Greenfield, Esq., Manager Mountjoy Tea Estate, Poundanbray, Akyab,—proposed by Mr. S. H. Robinson, seconded by Mr. J. W. O'Keefe.

Mrs. E. Bean, Bankipore,—Proposed by Mr. C. T. Davis, seconded by the Secretary.

Cleland Haxell, Esq., Tea Planter, Kolirbur, Nowgong, Assam,—proposed by Mr. Magor, seconded by Mr. E. Broughton.

Hugh D. Bell, Esq., C. E., Tea Planter, Nurbong, Kursiong,—proposed by Mr. C. F. Inskipp, seconded by the Secretary.

James P. Dallas, Esq., Dooars Tea Company, Julpigoree,—proposed by the Secretary, seconded by Mr G. L. Kemp.

Baboo Prannauth Pundit,—proposed by Baboo P. C. Ghosa, seconded by Baboo P. C. Mittra.

V. Pont, Esq., Engineer, Assensole,—proposed by Mr. W. Stalkartt, seconded by Mr. W. H. Cogswell.

Rejoined.—W. Ter Vepa, Esq.

CONTRIBUTIONS.

1. Proceedings of the Royal Botanic Garden, Petersburgh. From the Director.

2. Eastern Persia, 1870-72 (Vols. 1 and 2) and memoirs of the Geological Survey of India, Vol., XII. Part 1. From the Superintendent.

3. Transactions of the Asiatic Society of Japan, Vol. 4. From the Society.

4. Memoirs of the Manchester Literary and Philosophical Society, Vol. V., and proceedings from 1874 to 1876. From the Society.

5. Records of the Geological Survey of India, Vol. IX., Part 4. Reports on Vaccination in Bengal, 1876, and on the Insane Asylums, 1875. From the Government of Bengal.

6. Proceedings of the Asiatic Society of Bengal for November 1876. From the Society.

7. A packet of seed of *Reana luxurians*. From the Director Royal Botanic Garden, Mauritius.

GARDEN.

The Gardener's monthly report was submitted. The Rosery is in a much better condition this year than in previous years, a larger quantity of manure and abundance of water having been supplied. There is a large stock in hand of seedlings of Arabian coffee, one year old, and ranging in height from 9 to 15 inches. Of the Liberian Coffee there are still some plants for distribution. The first flowers of the standard trees opened last week, and nearly the whole will blossom; the flowers are more than double the size of the Arabian variety. There are some fine Mahogany seedlings (100) on hand. The Gardener sends up a collection of cut roses of 48 kinds, several in good flower: also a collection of vegetables raised from the American and French seeds imported last year, the majority very fair specimens of cauliflower, cabbage, carrot, nole-colo, peas, &c.

A NEW FORAGE PLANT,—REANA LUXURIANS.

The Secretary called attention to a large pot of seedlings of *Reana luxurians*, which he had raised from seed recently received from Mr. Horne, the Director of the Royal Botanic Garden at Mauritius. Seeing this grass very favorably noticed in the proceedings for last year of the Acclimatisation Society of Paris, and that it had been introduced into the Botanic Garden, at Bourbon, he had applied to Mr. Horne on the subject, who had obligingly complied with his request. This grass is a native of Guatemala, where it is known by the name "Teosinté." It is a perennial plant, and reported on most favorably by the Director of the public garden at Guatemala, as possessing most nutritive properties, the stalks containing an abundance of saccharine matter. It forms enormous tufts, a single tuft being sufficient to supply an ox with food for a day. The leaves resemble those of Indian corn, but are much broader. M. Ch. Naudin states, that this "Teosinté" is *Tripsacum monastachyum* (see Journal of the Acclimatisation Society of Paris for September 1876.) The better known "Buffalo grass" is *T. dactyloides*. Teosinté is said to be an Azteque name, signifying "grass of the gods."

Agreed, that the seed of this valuable grass be carefully distributed in small quantities over all parts of the country, with a request that recipients favor the Society with a full report of the result of their trials, and a return of acclimatized seed, with the view, if possible, of its permanent establishment.

In connection with the above, the Secretary referred to the free distribution in August last of some Oregon wheat (in small quantities) which had been favorably reported on by Mr. Duncan, of the Phœnix Mills. No information as to the result of sowings had as yet been received, though such had been particularly requested. It is to be hoped that the distribution of the above named grass seed may be attended with better success.

IMPORTED SEEDS.

The Secretary read extracts from certain letters recently received from Members regarding the vegetable and flower seeds imported last year :—

Major W. S. Young, Commandant, Chunar.—"The seeds, both French and American, have turned out admirably this year; every one of them, both flower and vegetable, germinated freely; with only the following exceptions: flowers—lavender and violet. Vegetables,—carrots, knole-kole and leek. The turnips (American) are magnificent: so are beet root, cress, cauliflowers, cabbage, brussels sprouts, and lettuce. I never saw finer vegetables than the above (both of the French and American seeds, especially the latter) in my whole life, the peas and beans too are splendid. All the above were grown on ground inundated by the Ganges last September to a depth of 3 feet; the soil having thus had much sand and silt deposited on it, which was deeply ploughed in, and 'Kala muttee' added as manure. The flood appears to have thoroughly destroyed grubs and other ground enemies; hence there was no check to the young growing plants."

Mr. D. Keith Murray, Nowgong, Assam.—"The American cauliflower seed which I planted in October came up well, but some Cape seed which I afterwards planted flowered first. The former grew to a great size, and some of them have now flowered, and are the finest flowers which I have ever seen here. I planted them in old stable manure.

"I have several very fine flowers of the 'Stock' which I have been informed, and also see in 'Firminger,' rarely, if ever, gives satisfactory flowers in the plains. Two of the above have several beautiful spikes of fine flowers, and all the rest are about to follow suit. They are planted in fine stable manure well decayed.

"Will the seed from these be of any use? or should I take cuttings and when? A gentleman who takes a great interest in flowers and who has resided in Calcutta, says they are the first he has seen in bloom."

Mr. F. Halsey of Mavhopore, Punjab, writes that Messrs. Vilmorin's seeds of last season, received from the Society have not succeeded with him, nor with many others in the Punjab, and complaints have also been made of the seeds supplied by the same seedsman to the local Society; and adds, "whereas those supplied by Messrs. Vilmorin to me direct are extremely good."

RICE BLIGHT.

Submitted a letter from the Secretary of the Economic Museum, forwarding a communication from Mr. Weeks, Officiating Magistrate of Furreedpore, in which is enclosed a note from Dr. D. D. Cunningham on Rice blight. Mr. Weeks is of opinion that Dr. Cunningham's recommendation to clean the seed should be made wisely known, as no doubt it is not known, that the fungus can be perpetuated from seed."

The following is Dr. Cunningham's report :—

"I herewith return the letter anent the Rice blight [from Furreedpore.] I would have answered you sooner, but have been waiting in the hope that I might

succeed in coaxing the spores to germinate. This however they refuse to do, probably requiring a rest period, such as they naturally get during the interval between two crops.

"The fungus to which they belong is a species of Ustilago, the genus to which the smuts of the home grains are due. It is very likely to spread if dirty seed grain is used, as a few spores adhering to the grain are all that is necessary to start the blight anew. As a means of cleaning the grain Soraner, "Handbuch der Pflan-zer kankreiter 1874," recommends the old plan of passing it rapidly through a flame (shaking it down through the flame of a wisp of straw) which destroys the spores adhering to the surface without injuring the grain itself."

Letters were read—

From under Secretary Government of India, Department of Agriculture, Revenue and Commerce, forwarding copy of a paper by Mr. Wickham on the introduction of the Heavea India Rubber tree into India. (Transferred for Journal.)

From F. Halsey, Esq., Madhopore, Punjab, referring to the excellent quality of the sugar-canes forwarded to him from the Society's Garden:—"the canes you sent me last year are 18 feet high. My cousin [lately a sugar planter in Demerara] says they include all the best and most valued varieties."

From W. T. Dyer, Esq., Assistant Director, Royal Gardens, Kew, returning thanks for certain of the Society's publications on Tea culture in India.

From the Director of the Royal Botanic Gardens, Petersburgh, presenting several copies of their proceedings.

From the Librarian Manchester Literary and Philosophical Society, forwarding certain publications of the Society.

Mr. Geo. Bartlett, exhibited a plant of *Gesnera zebrina* (not previously shown) and a sport from *Iresine aurea reticulata* very prettily marked.

Thursday, the 15th of March, 1877.

S. H. ROBINSON, ESQ., *V. P., in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following were elected Members:—

Mrs. E. Bean; Manager of the Gellakutting Tea Estate, Assam; Messrs. K. G. Gupta, W. H. Greenfield, Cleland Haxell, Hugh D. Bell, James P. Dallas, V. Pont, and Baboo Prannath Pundit.

The names of the following gentlemen were submitted as candidates for election:—

J. Binning, Esq., Custom House, Calcutta,—proposed by Mr. S. U. Phipps, seconded by the Secretary.

Baboo Sri Mohun Thakur, Zemindar, Bhaugulpore,—proposed by Mr. J. DaCosta, seconded by the Secretary.

G. A. Grierson, Esq., C. S., Rungpore,—proposed by Dr. K. D. Ghose, seconded by Mr. W. H. Cogswell.

Secretary Public Garden, Rungpore,—proposed by Dr. K. D. Ghose, seconded by Mr. S. H. Robinson.

T. R. Wyer, Esq., C. S. Moradabad,—proposed by the Secretary, seconded by Mr. R. Blechynden.

Manager of the Mattegurrah Tea Concern, Darjeeling,—proposed by Mr. Henry J. Leitch, seconded by Mr. G. L. Kemp.

F. Linde, Esq., Manager and Co-Proprietor, Seemah Tea Estate, Chota Nagpore,—proposed by the Secretary, seconded by Mr. R. Blechynden.

Syed Ahmed Khan Bahadoor, C. S. I., Aligurh,—proposed by Baboo P. C. Mittra, seconded by Baboo P. C. Ghosa.

Eugene C. Schrottky, Esq., Agricultural Chemist,—proposed by the Secretary, seconded by Baboo P. C. Mittra.

Manager Amluckee Tea Company, Assam,—proposed by Mr. A. B. Inglis, seconded by Mr. S. H. Robinson.

Manager Sonai Tea Company, Cachar,—proposed by Mr. Inglis, seconded by Mr. Robinson.

W. H. Farquharson, Esq., Elambazar,—proposed by the Secretary, seconded by Mr. Cogswell.

R. Rose, Esq., Inspector, Postal Department, Morradabad,—proposed by the Secretary, seconded by Mr. Cogswell.

Baboo Kali Prosunno Ghose, Zemindar,—proposed by Baboo P. C. Mittra, seconded by Baboo P. C. Ghosa.

Rejoined—Manager Halmirah Tea Garden, Assam.

CONTRIBUTIONS.

1. Reports on the Forest Administration in the several provinces under the Government of India, 1874-75. From the Government of India.

2. Report on the Administration of Bengal, 1875-76. From the Government of Bengal.

3. Memoirs of the Geological Survey of India, Vol. XIII., Parts 1 and 2, and Palæontologia Indica, Vol. 1. 2. Ser. X, 2. From the Superintendent.

4. The Principles of Rational Agriculture, applied to India and its staple products. By E. C. Schrottky. (2 copies) From the Author.

5. Select plants readily eligible for Industrial Culture or Naturalisation in Victoria. By Baron Ferd. Von Mueller. From the Author.

6. Manual of Opium Husbandry; by John Scott. From the Author.

7. Journal of the Asiatic Society of Bengal, Part 1 No. 3, 1876, and proceedings for December 1876. From the Society.

8. Reports on the vegetation of the Andaman Islands and on the forest and other vegetation of Pegu. By Sulpiz Kurz. From Dr. G. King.

9. Report of the Committee of the Bengal Chamber of Commerce, From May to October 1876. From the Chamber.

10. The Indian Forester, January 1877. From the Editor.

11. A small collection (28) of plants and a collection (55) of Roses from the public garden at Lucknow. From Dr. Bonavia.

12. A quanity of seed of *Mesua ferrea*, from Assam. From Mr. W. Ter Veen.

13. Seed of *Eucalyptus resinifera*, from Wingfield Park. From Mr. M. Ridley.

A plant of *Anthurium Scherzerianum* in flower from the Society's garden, was placed on the table. Also a spike of flower of *Spathodea campanulata*, from a tree presented by Dr. Tonnerre in November 1873. The tree is now 25 feet high, and has about a dozen heads of flowers.

GARDEN.

The Gardener's monthly report was submitted. The fruit trees (peach and pummelow) from Hong-Kong have arrived in good condition from Messrs. Watson & Co. Of the 55 kinds of Rose plants from Lucknow, 38 are new by name to the Garden. Of the large quantity of seed (6000) of *Corypha Australis*, from Messrs. Shepherd of Sydney, one-half has already germinated, and the residue appears to be germinating freely. The presentation from Dr. Bonavia from the public garden at Lucknow, of 28 plants of sorts is announced in good condition, as also a collection of Rose buddings from Wingfield Park. The whole of the Peaches from Queensland and Hong-Kong, and of Lychees from the latter place, that were planted out some time back, are now starting into growth. The Liberian Coffee appears to have set some fruit, but the flowers do not open freely. Mr. Head adds as follows:—"The season flowers from Lucknow seed have on the whole done very well; the quality is not over good, but the display is moderate. The Asters obtained from Mr. C. Nickels' seeds are flowering very well; the late hot days are however telling on them. The new plantation of roses chiefly on own roots are making fine growths. Some are already three feet high, whereas the grafted plants are not growing nearly so free; it would be well to observe their deportment another year for flower, &c.

"The seeds of *Corypha Australis* from Queensland in November last are now germinating partially, and so are a few of the *Macrozamia Denuisonii* from Sydney."

The name of Mr. Wm. Stalkartt was submitted, on the recommendation of the Council (to be brought up at next meeting), to fill a vacancy consequent on the departure of Mr. J. A. Crawford from India.

POTATOS.

Several communications on the above subject,—with specimens—were submitted.

Mr. Thomas Hindmarsh, sends a small collection of potatos raised at Kanchraparah (E. B. Railway) from the stock received in October last from Mr. Buck, Director of Agriculture and Commerce, N. W. Provinces. Mr. Buck's potatos were raised at Nainee Tal from English seed; and his object in sending them to the Society was to endeavour to raise a spring crop in the plains from such acclimatized stock. The following is Mr. Hindmarsh's plan of raising his crop:—

"Before the seed was planted I had the ground manured with old cow dung and indigo refuse (sotee) mixed together and afterwards ploughed in.

"Two trenches were then made, each 51 feet long, four inches deep, and two feet six inches apart.

"The seed was then planted one foot apart in the drills on the 13th October; but it did not begin to shoot before the 21st November, and then they came up very irregular; when fairly up the stalks grew very strong with abundance of flowers.

"The weight of the seed sown 6 lbs., and the out-turn as follows as per sample sent ... ... 52 lbs.

Small ... ... 28 „

Total 80 lbs.

P. S.—I forgot to mention that the potatos were dug up yesterday, (14th March) having been five months and one day in the ground."

Mr. C. C. Stevens, (Kishnaghur) writing on the 10th March, reports as follows on the same stock:—

"The day before yesterday I took up the potatos which were the produce of the North-West seed sent me by you.

"The seed was planted on the 2nd November. The tubers were a long time in sprouting, and the young plants appeared at very irregular intervals.

"The total weight of the produce was 65½ lbs., of which 41½ lbs. were fit for the table.

"I have put aside for you 25 lbs., of which 10 lbs. are the very largest, 10 lbs. are of the average size, and 5 lbs. in a separate package are very small. I will send them to you when I have an opportunity. I have not yet eaten any.

"*P. S.*—I think that the potatos would probably have been better if they could have been put in a month or six weeks earlier."

Mr. F. Blechynden, writing from Tirhoot, communicates as follows:—

"I send three specimen of potatos, grown at Tirhoot from Nepal seed. These are not the largest, yet one of them weighs over half a seer, being 41 tolas of 82 sicca weight.

"The seeds, 1 md. 15 seers, were sown on the flat in October; ridges, raised as the plants grew, till they stood 15 inches high. Ridges 3½ feet apart top to top. Plants 9 inches apart. Irrigated.

"Had much rain in January which spoilt some young plants.

"Total produce of 4 beds = 16 mds. 1 seer.

"Ridges ran east and west from a slope running north and south."

In connection with the above, the Secretary submitted certain letters referring to the despatch per S. S. *Queen Victoria* of 12 cases of potatos from England for the Government Farm at Allahabad, which, at Mr. Buck's request, he had undertaken to receive and forward to their destination.

Reana Luxubians.

The Secretary intimated, in reference to what was stated at the last meeting about the above, apparently, excellent forage plant, that the demand for seed had so greatly exceeded the supply that he had lost no time in applying for a larger quantity, with specific directions, if obtainable, for raising the plants, as in all the works he had consulted he had failed to obtain such information. From the slow growth of the seedlings he had raised, now six weeks old, and placed on the table for inspection, they would seem to partake of the nature of maize, and would, probably, succeed best in the rainy season.

Rice Blight.

Mr. E. Hughes of Petoragurh, *vid* Almora, Kumaon, applying for seeds of *Reana luxurians*, refers to the question of Rice blight alluded to at the last monthly meeting. "With regard to the Rice blight, I suggest a plan which is in use among the natives of these hills for its prevention. All seed grain after being well dried is thoroughly mixed with ashes of cow-dung, if applied hot from the burning all the better. This is a perfect protection from weevil and other insects, and I believe also from smut."

Letters were read—

1. From the Director of Agriculture and Commerce, N.-W.-Provinces, applying for seeds of *Dipterix odorata*. Registered for compliance as soon as obtained.

2. From the Superintendent of the Agricultural Works of the Maharajah of Cashmere, applying for plants of *Opuntia Cochinilefera*, as he is desirous of introducing the Cochineal into the province. Application placed in hand.

3. From F. R. Wyer, Esq., C. S., Moradabad, applying for sugar-cane cuttings of best kinds to introduce into the district. Complied with.

4. From Secretary Public Garden, Azimghur, to the same effect, and also complied with.

5. From Dr. R. C. Sanders, Azimgurh, reporting favorably of the imported vegetable seeds of last season, but unfavorably of the flower seeds:

"The seeds I received from the Society this last season have germinated very fairly—peas, turnips, and carrots all from America have done singularly well. The peas have gone on bearing and blossoming since the commencement of the season, and are still full of blossom. The beet-root germinated poorly, but the

produce has been singularly fine. The tomatos have done very well indeed and so has the celery. I have some very fine indeed from this season's seed. The American seeds on the whole have been better than the French."

6. From C. Brownlow, Esq., Cachar, forwarding a paper for the Journal, entitled, "Notes on Kookee Jhoom cultivation."

For the above contributions and communications the best thanks of the Society were accorded.

Thursday, the 19th of April, 1877.

THE HON'BLE LOUIS S. JACKSON, *President, in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members :—

Messrs. J. Binning, G. A. Grierson, C. S., F. Linde; Baboo Sri Mohun Thakur; Secretary Public Garden, Rungpore; Manager of the Mattegurrah Tea Concern, Darjeeling; Syed Ahmed Khan Bahadoor, C. S. I.; Manager Amluckee Tea Company, Assam; Manager Sonai Tea Company, Cachar; Messrs. W. H. Farquharson, R. Rose, and Baboo Kali Prosunno Ghose.

The names of the following gentlemen were submitted as candidates for election :—

Lieut. A. Bancu, 39th N. I., Meerut,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

J. Harris, Esq., Sykotta Tea Garden, Jorehât,—proposed by Mr. G. F. Pinney, seconded by Mr. J. E. Maclachlan.

J. R. Sandford, Esq., Proprietor Monsumbul Tea Estate, Palumpore,—proposed by Mr. Duncan MacBean, seconded by the Secretary.

E. F. Langdale, Esq., Poonah Tea Estate, near Palumpore,—proposed by Mr. MacBean, seconded by the Secretary.

Ralph Crisp, Esq., Oating Factory, Golaghat, Assam,—proposed by Mr. Pinney, seconded by Mr. G. L. Kemp.

CONTRIBUTIONS.

1. Records of the Geological Survey of India, Vol. X., Part 1. From the Government of Bengal.

2. Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. IX., Part 1. From the Society.

3. Journal of the Asiatic Society of Bengal, Vol. XLV., Part 2., No. 4, and Proceedings for January and February 1877. From the Society.

4. Several back numbers of the Society's Journal. From the Hon'ble Sir E. C. Bayley.

5. A quantity of seed of a white gram (*Cicer arietinum?*) of very fine quality, raised at Mirzapore. From R. Nicholson, Esq.

6. A few seeds (apparently of the same variety,) of white gram, raised at Assensole from Italian stock. From V. Pont, Esq.

7. A quantity of seeds of *Araucaria Cunninghamii*. From James Bernays, Esq., V. P. Queensland Acclimatisation Society.

8. Seeds of the "Padouk" (*Pterocarpus dalbergiodes*) and of the "Ganggo" (*Mesua ferrea*) and a collection of Calamus plants from the Andamans. From O. H. Brookes, Esq.

9. A quantity of Palm seeds. From the Royal Botanic Garden.

10. A quantity of seed of *Holcus saccharatus*. From H. Deverell, Esq? An excellent grass for cattle.

GARDEN.

A report was brought up from the Garden Committee, announcing completion of certain works sanctioned on their recommendation in a previous report in November last; and suggesting certain additional work, and a few other details. Confirmed.

The Gardener's monthly report was also submitted, acknowledging a few contributions received since last meeting, and referring to certain work now in progress, and other work to be performed shortly.

The Secretary reported that there would probably be some delay in the receipt of the American maize, expected in all this month, in consequence of the accident to the *City of Cambridge*, at Suez, by which steamer a consignment had been forwarded.

COFFEE-LEAF TEA.

The Secretary next submitted the following communication from Mr. Henry Cottam of the Deyandwatte Estate, Badulla District, Central Province, Ceylon, as also the sample of Coffee-leaf tea therein referred to:—

In reply to your favor of the 15th February, 1877, I have the honor to inform you that anything I can do in the way of giving your Society information, will afford me very great pleasure.

I have therefore packed to your address to-day a sample of Coffee-leaf-tea, made in the same manner as that adopted by the Tea Planters of Assam.

The result of my labor has been so far satisfactory, that I have tested the liquor, found it similar in flavour, though not so pungent as Assam made Black Tea.

It seems by your letter that the attention of the Agri-Horticultural Society of India has been drawn to the subject by a description written by me in the *Ceylon Times*, and afterwards copied from that journal by the *Indian Agriculturist*.

Although as stated in that letter I made and used Coffee-leaf-tea as far back as ten years ago, yet my attention was again drawn to the subject by a long correspondence in the Society of Arts Journal of London, to whom I intend forwarding a sample of a pound or two by next mail, with a few remarks regarding its manufacture.

Subsequently to my first attempt at making Coffee-leaf-tea, I have had the advantage of a tour round the Tea Districts of Assam, and gained much valuable information.

Tea cultivation is carried on to some extent in Ceylon, but the plantations are young, and consequently little has been exported.

One great advantage Coffee-leaf-tea would have over ordinary tea is, that instead of having a tendency to create nervousness it contains strengthening properties; this fact was endorsed by a Medical Journal, and quoted by *Public Opinion* as recently as a month ago.

As the question of the practicability of manufacturing and utility as a beverage has been discussed by Societies in England, it will no doubt be of great public value in India and other Coffee-producing countries. Herewith I enclose the necessary instructions for manufacturing, and trust you will be enabled to report favorably on the sample I send you.

Coffee-leaf-tea as manufactured in Ceylon, by Mr. Henry Cottam.

The best time to gather the leaf is after a few days rain, to insure the young tip leaves of the "suckers" on the coffee bushes being sappy and suitable for manipulation.

The leaves most suitable are the first pair at the head, which are usually of a golden copper colour, soft, and require very little withering; this discovery was made through my being enabled to make as good a sample of black tea *the same day* as the leaf was gathered.

However the leaf seemed none the worse for one night of withering.

Coffee-leaf, unlike young tea-leaf, will not roll without breaking into small particles; fortunately we hit upon a plan of panning the leaf for a few minutes: the result was, it became sticky and rolled without breaking. This I considered half the battle, and with the assistance of my bungalow servants succeeded in making about two pounds of good tea out of about four pounds of green leaf.

The sample forwarded being part thereof.

Messrs. Walker and Greig of Badulla, *(Engineers and Pulper Makers)* made me a drum and perforated tray on which we roasted the well-rolled leaf until crisp.

In addition to careful rolling we fermented it in balls for half an hour: this I considered sufficient, as the temperature of the house we used was over 80°.

Both under the process of rolling and fermenting it presented the appearance of good Indian tea, and during roasting gave forth a flavour or odour far more pleasant.

The beverage made in the tea-pot required less sugar to sweeten it, and the addition of milk made it very palatable.

Six branches of work are necessary—

1, Gathering in baskets.

2. Withering in the shade.
3. Panning for a few minutes.
4. Rolling until thoroughly wet in its own brown colored sap.
5. Fermenting according to temperature.
6. Roasting over a slow charcoal fire on perforated tray and turned occasionally until crisp and black. When packing care should be taken not to use boxes or bottles which have previously contained strong smelling articles, for like ordinary tea, Coffee-leaf-tea will imbibe impurities and get damp unless air-light, consequently losing both strength and flavour.

The following is a report from Messrs. J. Thomas & Co. on the above sample:—

"Bold irregular polished black Souchong leaf, full strong, nasty flavour, unsaleable. We doubt if this tea would be saleable, having a very common disagreeable flavour."

Attempts at the introduction of Eucalyptus globulus in the Cuttack tributary mehals.

Read the following communication from Dr. H. C. Bowser on this subject:—

After reading of the repeated failures to cultivate the *Eucalyptus globulus*, I cannot abstain from sending you particulars, of what I consider to be a complete success, in establishing this useful plant, as I am certain the information will be interesting to the members of the Society.

Seeds of the *Eucalyptus globulus* obtained from you were sown in the month of October, 1875, in pots, in the garden of the Maharajah of Mohunbhunge, one of the tributary mehals of Cuttack in Orissa. The seeds germinated freely, and the young seedlings were, when about six weeks old and from three to four inches, pricked out into shallow broad gumlahs. These again when about three months old and about a foot high were ultimately transplanted into the ground on the spots where they were intended to grow. Not much care further than watering freely during the dry hot months of the year was bestowed on them, and the plants, some two dozen or more in number, are at the present date about eighteen months old, vigorous, strong branching trees of from eight to nine feet high.

The country about Mohunbhunge is a rolling one with a laterite soil, and with a temperature varying from excessive dry heat during the summer months to great cold in winter. The rainfall is an average one.

The plants grown on the higher grounds composed almost entirely of laterite, appear to me to have done better than those planted at the foot of hillocks having a large alluvial deposit.

I have given but a hasty sketch, but shall be most happy to furnish any further information that may be required.

In thanking Dr. Bowser for the above particulars, it was *resolved* that he be asked to keep the Society informed of the result of this attempt to raise this useful tree in the locality indicated.

MANGEL WURZEL.

The Secretary next called attention to the monster specimens of Mangel Wurzel on the table. These have been sent to the Economic Museum, by the Chairman of the Local Economic Museum Committee of Mozufferpore. They have been grown by Mr. Abbot of Sikahar Factory, who gives the following particulars on the mode of cultivation :—

"Herewith I send ten samples of Mangel Wurzels grown here by me. I believe the average to be about 42 roots to the daur, and the weights of the ten plants are as follows—Pucca weight of 80 siccas per seer—

1 root	12¾	seers.
	12	
	11	
	9¼	
	9	each.
	8¼	

Total Plants 10 Maunds ... 2-18-4

Average weight of plants—Seers 9-13; weight of plants per Daur of 10 foot luggee, maunds 11-12-2; weight per beegah, maunds 4,521-4. This is a return from heavily manured land which has had decayed indigo manure placed on it as well as *gober*.

"My brother has asked me to send in two cart loads of roots to Mr. Richardson which are going into the station the same time as yours. Each root is on an average of seven seers, and is grown in poor land without scarcely any manure, and there is about sixty roots per daur. The seed is Carter's long red Mangel, it will not grow to seed out here in the plains; cost of seed is nominal, and the way I sow it is by dibbling from eighteen inches to one foot apart and dropping two seeds into each hole, and if both seeds germinate, weed out the smaller plant of the two when three weeks old. It is no good trying to transplant, as although it is possible, yet the plant does not grow to nearly the size of the one raised without transplanting.

"Where Government farms are kept on which there are large quantities of Government cattle, this crop could be easily raised for fodder at 1 Rupee per hundred maunds on any class of lands. The best manure is seet (decayed indigo) for this root, and I fancy myself the strongest country manure we have is this."

The Secretary remarked that the average weight of the above roots was more than double that grown in England. The size most preferred was from five to ten pounds. Over-manuring had a tendency to increase the size at the expense of the quality, causing the formation of a large quantity of water and consequent diminution of nutriment. The largest yield obtained in England was about eighty tons to the acre, whilst the Tirhoot experiment has given nearly double that yield. It seemed to be the general opinion that whilst the soil and climate

where these roots were raised are favourable for such crop, they contained too much water (caused probably by over-manuring) to be so nutritious for cattle feeding as they might have been if differently treated.

Blight of various kinds affecting Tea Plants.

The Secretary called attention to the Proceedings of the Society held in November last, when it was proposed to invite the combined aid of all Tea Gardens in India, subject to "Blights of various kinds affecting tea plants," for the purpose of engaging the services of a practical Entomologist to travel over all tea districts, study the character and habits of the pests, and suggest some remedial measures for entirely eradicating or modifying their ravages. He stated, in continuation, that the project had to the present time scarcely met with any encouragement. Not more than Proprietors of nine Tea Gardens, of but small acreage, having signified their willingness to co-operate.

In connection with the subject, the Secretary read the following extracts from letters recently received from Mr. A. Grote, dated London 28th February and 9th March:—

"Your project in regard to the thorough investigation of the numerous causes of tea blight is a most useful one. It will give great prestige to your Society if it proved successful, but I doubt, with you, whether the Planters will co-operate to find the necessary funds. If they fail to do this, the Society will at least be entitled to credit for having offered to organize such an enquiry, which is one that deserves the support of Government.

"*Apropos* of what I lately wrote to you regarding your Society's claim on the Government for assistance in measures having for their object the destruction of noxious insects in your tea plantations, I commend to your Council's perusal a letter on the subject which I have to-day posted to your address. It is written by my friend and colleague in our Royal Horticultural Scientific Committee, Mr. A. Murray, and will very probably lead to some steps being taken by our Government here, in the direction indicated."

The letter from Mr. Murray, referred to by Mr. Grote, was read with interest. It is entitled "Proposition for stamping out certain insects injurious to Agriculture," and is addressed to the Secretary Science and Art Department. The following is an extract:—

"May I bring under your notice an article which appeared in the *Times* of 16th September, 1876, on the collection of Economic Entomology formed by me for the Department, and now in the Bethnal Green Branch Museum? I ask leave to do so, not only on account of the excellence of the criticism upon that collection and the value of the suggestions for its improvement, but specially because the writer has referred to a plan for the extirpation of our insect pests, that has been already suggested by myself and partially explained to you, *viz.*, that the Department should lend its aid to a combined stamping out of certain pests in particular infested districts.

"As the idea has been thus ventilated, I may perhaps be permitted to explain the course of procedure and machinery, by which I think this important benefit can be conferred on cultivation and the nation at large;—but first allow me by way of preliminary explanation and premise, to quote the passage in which the writer of the article in question states the several grounds for government or other combined interference.

"Our knowledge—that is, the knowledge of our men of science—is in a sufficiently advanced state to know what to do to check insect ravages. The life history of nearly all crop pests has been worked out. The time of egg laying, the places selected for their deposition, the habits of the larva, the condition of the chrysalis, when there is one, the life of the fully-developed insect, are all known. The most effective way of destroying the insects, selecting either the egg, larva, or chrysalis state are also known; and much of this has been known for years. It is to be hoped that this collection will direct attention to this question—'How is it that with so much knowledge we annually suffer such great loses?' The question has been asked in America, where in many States there is a State Entomologist; and the answer has taken this form—'The individual application of the knowledge is of no good; it is useless for property to be cleared of pests, while surrounding properties still breed them. Combination is needed, and the interference of Congress can alone secure this.' Dr. Leconte, in his address before the American Association for the Advancement of Science, at the Detroit meeting, suggested that the importance of combination should be urged upon farmers, and that information as to probable benefits should be supplied to them. Bills have been introduced into Congress on the subject, but the Report for 1867 of Mr. Riley, which has just reached England, does not show more than that earnest attention is being given to the question. That Mr. Murray's hopes do not end with the arrangement of his collection as a means of usefulness, is foreshadowed by a paper on insect damage he read before the Royal Horticultural Society a year ago. He wishes to see some united active steps taken for clearing whole districts at once of pests. If united action could by any means be secured, the work would be simple. A scientific inspection of a district would decide with regard to a particular pest, the condition of development in which it would be on certain days. Instruction would be given as to the course to be adopted, and if this were simultaneously acted on throughout a district, the pest might be checked, if not entirely removed. It is sincerely to be hoped that either some Society or the Department will take so important a matter up.

"The attempt is not new. It has been already tried on a greater or less scale, in various ways, and with more or less success both in this country and on the continent—the degree of success being almost invariably correspondent to the care taken, and the extent of the district subjected to the experiment. Its importance is moreover daily becoming better recognised."

Ordered.—That before abandoning the project, reminders be sent to the several Agents, Proprietors, and others, interested in this important question, to

know whether or not they will collectively and rateably support the proposed scheme.

Letters were read—

1. From A. Christian, Esq., of Putturghat Factory, Bhaugulpore, forwarding a specimen of coffee raised in his garden.

This coffee is of a superior kind, a very pretty berry of excellent flavor, and valued at Rs. 45 per bazar maund.

2. From Captain Protheroe, submitting a specimen of arrow-root grown and prepared at Port Blair. Reported on as "of inferior quality, bad color, dirty, and not so strong as the Bengal arrow-root."

3. From J. H. Bridgman, Esq., Gorruckpore, sending a report from his Manager on the Oregon wheat supplied him in August last:—

I enclose an extract from a letter which I received this morning from the gentleman who manages my indigo factory of Billa Hariya in Lehra, in reply to enquiries I made respecting the prospects of the Oregon wheat. The seed did not appear to be unsound when I received it, but its germinating power may perhaps have been injured, though the injury was not perceptible to the eye. Perhaps its excellence will be restored in a second crop. The 'girwi' spoken of is the red blight, called 'rust' I believe by English farmers. Damp weather in the cold season is very apt to bring it on, but not always. It is sometimes very fatal to wheat and barley; I have seen whole fields of wheat completely destroyed by it; but I do not remember ever to have seen oats affected by it. Looked on through a strong magnifying glass it appears to be a kind of fungus, which sparkles in the sun. A dry westerly wind kills it immediately.

The seed of the Australian wheat was sent to me by Dr. Bonavia. I trust that the magnificent prospect anticipated by this little experimental sowing will be realized in future crops. The extent of the ground sown was less than half a rood.

"In answer to your favor of the 25th instant, received yesterday morning, I am sorry to say the Oregon wheat has turned out a complete failure. In the first place the seeds seem to have been damaged and did not germinate freely; afterwards, owing to the constant rain, the plants got the blight or 'girwi' as it is termed here, and never recovered. The ears are not longer than four or five fingers, and the grain looks withered. If you could procure a further sample for next year's trial, it would be good, for if the ears are so long as nine inches, it is worthy of notice and introduction into these parts.

"As regards the Australian wheat, however, I am happy to say it has thriven remarkably well. The stalks are fully seven feet high, and the ears seven to eight fingers long exclusive of the beard. The grain also is large. The field is the admiration of all who see it. I shall have all the longest ears selected and kept, and the rest threshed out and kept carefully for next year's operations."

4. From Lieut. J. F. Pogson, Simla, promising particulars in respect to the result of trials with Oregon wheat, tobacco and *Reana luxurians*.

5. From W. Smith, Esq., of Dorunda Factory, Ranchee, of which the following is extract :—

"Please note that I have requested you in para. 3 of the instructions to add a pinch of good tobacco seed to the zinnia packet. I once tried a paper of 'James River' stock in my garden, and produced leaf measuring from 22″ × 8″ to 30″ × 11″. The seed was germinated in boxes in September, put out in October, and watered once to give the young plants a start. They were stopped at eight and ten leaves, and suckers carefully kept back. After the crop was gathered, suckers ran up and flowered, and the seed from them became so scattered by the wind as to lay the foundation of a stock of wild stuff which comes up every rains, and dies down in March after scattering more seed. The natural habit of the plant would therefore point to the rains as the best time to cultivate tobacco here."

6. From G. S. Freeman, Esq., Lohoreah, *viâ* Bettiah, noticing an unusual formation in a *Petunia* :—

"The flower seeds have been failures except some *Petunias*, one of which has thrown out a branch all covered with leaves and the top one mass of flowers ; in the space of one-inch-and-a-half there have been 25 flowers, some of them double stamens. If it goes on flowering there will be some 3 or 400 flowers. The flowers are prettily marked with white."

7. From the Vice-President Queensland Acclimatisation Society : "You will be glad to hear," writes Mr. Bernays, "of the arrival of the mango grafts and Cycas revoluta. Of the 24 mangos sent, we have secured 18 plants, and 11 varieties ; a very successful issue, for which we are much obliged. The whole of the Cycads were growing.

"Your requirements are carefully noted ; and as soon as the tubers of the purple arrow-root are at rest, say in July, some shall be sent. The Buffalo grass does not seem to mature its seed here ; but we will pack the arrow-root with sods of this grass, and as it grows readily from cuttings, I have no doubt that there will be vitality enough in the mass to secure you a supply. We may be able to add a variegated species of this grass."

8. From Capt. Protheroe, Port Blair, applying for tea seed and mango stones. (To be complied with.)

9. From the Director Imperial Botanic Garden, St. Petersburgh, returning thanks for publications of the Society.

Thursday, the 17th of May, 1877.

THE HON'BLE LOUIS JACKSON, *President, in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected Members :—

Lieut. A. Banon, Messrs. J. Harris, J. R. Sandford, E. F. Langdale, and Ralph Crisp.

The names of the following gentlemen were submitted as candidates for election :—

The Honorary Secretary, Planters' Club, Mozufferpore,—proposed by Mr. G. Toomy, seconded by Mr. G. L. Kemp.

Maharajah Chaatr Sing Bahadoor, of Samthar,—proposed by Dr. J. P. Stratton, seconded by Mr. H. J. Leitch.

Nawab-Zada Muhammud Hussain Khan Bahadoor, of Baoni,—proposed by Dr. Stratton, seconded by Mr. Leitch.

Dr. F. Sidney Coombe, E. I. Railway, Assensole,—proposed by Mr. W. Stalkartt, seconded by Mr. V. Pont.

R. W. L. Hawkins, Esq., Assistant Engineer, Ganges Canal, Narva *vid* Allygurh,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

Manager of the Kobra Tea Estate, Mungledye, Assam,—proposed by Mr. W. H. Cheetham, seconded by the Secretary.

Rejoined.—Baboo Hemchunder Gossain of Serampore. A. C. Campbell, Esq., Officiating Deputy Commissioner, Goalpara, Assam; and J. Walter Williams, Esq., District Superintendent of Police, N. W. P., Mozuffernagore.

CONTRIBUTIONS.

1. Proceedings of the Fifteenth Session of the American Pomological Society. From the Society.

2. Proceedings of the Boston Society of Natural History, Vol. 17, Parts 3 & 4, and Vol. 18, Parts 1 & 2 and Memoirs of the same, Vol. 2, Part 4, Nos. 2, 3 and 4. From the Society.

3. Memoirs of the Geological Survey of India. Palæontologia Indica, Series 11, 2. From the Superintendent.

4. Journal Asiatic Society of Bengal, Vol. 46, Part 2, No. 1. From the Society.

5. A large quantity of acclimatized Zinnia and Balsam seed. From H. E. Abbott, Esq., of Jaintpore, Tirhoot.

6. A small quantity of acclimatized Maize seed. From Captain W. Barron of Moradabad.

7. Some acclimatized Havanna Tobacco seed and Teak seed. From Dr. George King.

8. A bag of acclimatized English Peas raised at Khaja factory, near Zamaneeah. From A. J. Sturmer, Esq.

GARDEN.

The Gardener's monthly report was submitted, acknowledging receipt of various seeds and plants since last meeting, and referring to certain cultures in the garden, more especially to the Liberian coffee and newly introduced forage grass, *Reana luxurians* The following are extracts from the report :—

"Although the Liberian coffee has flowered freely, but few fruits have set and these are not swelling. The trees continue to grow, and are shewing still a

quantity of blossom buds. This kind appears to stand the sun very well, for there appears to be very little difference, if any, to those exposed entirely and those partially shaded by mats during the bright sunshine.

"The *Reana* is growing well, the two strongest plants being four feet high and have at least from 20 to 25 shoots with leaves from about two inches in width; I have cut over one plant and the bullocks eat it readily. The plants have not all grown equally strong; they would doubtless have been larger had the seeds been sown where they were to remain; whereas the plants are all transplanted and have not been supplied with water since becoming established. A shoot is sent for inspection; the plants are fully exposed to the sun.

"The *Corypha Australis* seeds received in February, and *Macrozamia Denisonii* from Sydney, have grown tolerably well. The planted out *Araucarias* are doing also very well, and with the exception of about six that have been disturbed in cleaning out the weeds, none have died since planting; they are looking healthier than those kept in pots. The *Retinosporas* are also doing very well; but the *Thujopsis dolobrata*, both in pots and planted, appears to suffer from the heat."

TOBACCO.

Messrs Balmer, Lawrie and Co. forwarded for exhibition and report a sample of tobacco raised from Connecticut seed on the south bank of the Ganges, not far from Kooshtea, at an Indigo Factory called Dobracole. The leaves had been cured in accordance with the instructions contained in the Society's Journal, Parts 1 and 2 of Vol. IV. new series. Mr. F. Eisenlohr, a member of the Tobacco Committee, has obligingly reported on the above to the following effect:—

"The sample sent to me for inspection is far superior to any tobacco which has passed through my hands in this country. This is about all I am able to say. I am not able to fix a value. A large sample should be sent home to England for report, if anything like a quantity of this article is likely to be produced."

CULTURE OF MANGEL WURZEL IN TIRHOOT.

The Secretary read the following letter from Mr. H. E. Abbott of Jaintipore, Tirhoot, dated 5th May, in reference to the communications on the same subject submitted at last month's meeting:—

The remarks made by the members of your Committee on the Mangel Wurzel plants forwarded by my brother to the Society, fully carry out my own observations. I found that during the period the bullocks were eating the mangel, they passed an inordinate quantity of water: this however did not appear in any way to injure them. I obtained from Messrs. Carter & Co. an invoice of

20lbs. Warden Prize Mangel,
20lbs. Long Red Mammoth ditto,
20lbs. Imperial Swede Turnip, and
20lbs. Large Horse Carrot.

The Warden Prize Mangel for some reason did not prove a success although the seed germinated. The roots in no instance exceeded the size of the smaller Swedes, they were sown precisely with the long red and in the same fields.

The long red mangel you have already seen, and I need add nothing to my brother's remarks, save to say that I am convinced they could be brought to larger size than even the specimens of this year, as the land in which they were sown is by no means high class and the manuring was but superficial.

The carrots both here and at "Teekalia" were stunted and checked by heavy rain shortly after sowing, and I refrain from any remark on them till another year's experiments justify me.

The Swede out-turn was by far the most satisfactory of all: I sent 10 lbs. to my brother and retained 10 lbs. here. During my absence my jemadar sowed the whole ten pounds broadcast in two beegahs of land, they came up just like grass. I thinned out and transplanted from ths three beegahs more, and here the transplanted roots were far the finer, but my brother who sowed thinner found those sown broadcost the best. The yield in both Factories was simply immense, and I am sorry I did not send you down specimens; several of the roots averaged over five seers in weight and were firm and free from water; most nutritious food for bullocks.

Letters were read—

1. From Messrs. Vilmorin, Andrieux & Co. of Paris, complaining of certain remarks inserted in the Society's proceedings regarding the non-germination of seeds supplied by them last year.

The Secretary observed that the few remarks (which appeared in the proceedings for February last) were contributed by Mr. F. Halsey, to the effect that the seeds supplied to him by this Society had not succeeded, and that complaints were also made by the local Society (Punjab) of seeds supplied to them by Messrs. Vilmorin, Andrieux and Co.

2. From F. Halsey, Esq., Madhopore, Punjab, dated 9th May, explanatory of the above. Mr. Halsey states he was not aware at the time he made his remarks that the Punjab Society were at fault in the mode adopted in importing their supplies which, he believes, was the cause of failure. Mr. Halsey adds—"I have had vegetable seeds from nearly every seedsman of note in Europe and America, and I can safely say that none, either in germinating power or in general results, at all approach those I have received, both directly from Messrs. Vilmorin, Andrieux and Co.' of Paris, or from that firm through the Calcutta or Punjab Societies."

3. From Major Twynam, Executive Engineer, Rangoon, applying on behalf of the Strand Bank Committee for a number of fruit trees to plant on the bank. To be complied with.

4. From the Curator Royal Botanic Gardens, acknowedging with thanks the receipt of a collection of Palms from the garden.

Thursday, the 21st of June, 1877.

THE HON'BLE LOUIS JACKSON, *President, in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members :—

The Honorary Secretary Planters' Club, Mozufferpore, Maharajah Chaatr Sing Bahadoor, Nawab-zada Muhammud Hussain Khan Bahadoor, Dr. F. Sidney Coombe, Mr. R. W. L. Hawkins, and the Manager of the Kobira Tea Estate, Mungledye, Assam.

The names of the following gentlemen were submitted as candidates for election :—

H. V. Hall, Esq., Tea Planter, Hope Town, Darjeeling,—proposed by Mr. H. J. Leitch, seconded by Mr. G. L. Kemp.

J. N. Wallace, Esq., Loojan Tea Concern, Assam,—proposed by Mr. G. F. Pinney, seconded by Mr. R. Blechynden.

R. J. M. Pocock, Esq., District Superintendent of Police, Etawah,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

Baboo Nehal Chand, Zemindar, Mozufferuagore,—proposed by Mr. Walter Williams, seconded by Mr. A. Sells, C. S.

J. Rayson, Esq., Manager Behpara Tea Garden, Debroghur,—proposed by the Hon'ble F. Jennings, seconded by Mr. W. G. Parcell.

Manager Sissobari Garden, Julpigoree,—proposed by the Secretary, seconded by Mr. Cogswell.

Baboo Nogendra Nath Mullick, Zemindar, Audool,—proposed by the Secretary, seconded by Baboo Peary Chand Mittra.

M. A. McConaghey, Esq., C. S., Banda,—proposed by Mr. A. Cadell, seconded by the Secretary.

Rejoined.—W. Foley, Esq., Sylhet.

CONTRIBUTIONS.

1. Records of the Geological Survey of India, Vol. X, Part 2. From the Government of Bengal.

2. Note on Tobacco cultivation and curing, by the Director of Agriculture and Commerce, N. W. Provinces. From the Author.

3. The Indian Forester, Vol. II, No. 4. From the Editor.

4. Journal of the Asiatic Society of Bengal, Part 1, No. 1, 1877, and Proceedings for March, April and May. From the Society.

5. Report on Tussur silk-rearing in the Bombay Presidency, by Captain Coussmaker. From the Author.

6. A collection of seeds of grasses, &c., Cheena, Shama, Kaoni, and Piring. From Dr. S. Lynch.

7. An assortment of seeds of ornamental trees from the Eden Gardens. From Baboo P. C. Banerjee.

8. A quantity of seeds of sorts from the Barrackpore Park Gardens. From the Superintendent.

9. A few seeds of *Amherstia nobilis*, for the garden. From Major Fanshawe, Moulmein.

10. A small quantity of seed of the Bahmia Cotton plant from Alexandria. From J. C. Chapman, Esq., Agent P. & O. Company.

GARDEN.

The Gardener's monthly report was read, of which the following are extracts :—

"There is but little to report this month. The *Amherstia nobilis* seeds are germinating, and the new Egyptian Cotton has produced 15 plants. Nearly the whole of the young plants raised of *Thuja occidentalis* have died during the past very hot weather, and so has a quantity of young plants of fine foliaged *Begonias* and *Hoffmanias*. These plants appear to do well during the early months under partial shade; but after the middle of April they begin to suffer from the heat, and the extra rain we have had this year appears to have made it rather too steamy for them as generally they are not so healthy as last year at this time; fully two-thirds of the stock made this spring have already perished, greatly diminishing the stock expected to be available six weeks ago.

"The Liberian Coffee continues to flower, but I cannot at present say if the flower fertilises. There are a few berries from the first flowers now about the size of Bengal Coffee when full grown.

"The Buffalo Grass [*Reana*] is now over five feet high, this rain has made it grow rapidly, it being now very succulent, it flags greatly on sunny days.

"The mallies have been employed at the usual work of potting plants, and making layers of roses on suitable occasions. The whole stock has been gone over now and from 5 to 10, and more layers in some instances have been made of all kinds that would yield so many. The earliest will be ready for removal as soon as the rains are well set in, when another batch will be made from the same plants. I am not sure if I reported in my last that six plants of all the new Crotons had been planted in the new shed erected this year, as well as six of all the new *Ixoras* and *Dracœnas*, as far as in stock: these will yield a number of cuttings during the rains. The stock entered up in the register is generally the stock in pots over what is retained as stock plants for propagating from."

TOBACCO.

Several communications on this important staple were read, and specimens introduced.

Mr. H. W. Newton submits a sample of sun-dried tobacco leaf grown by him at Chandernagore, from imported Maryland seed obtained from the Society. "I am induced to forward you this sample," observes Mr. Newton, "as the Direc-

tor of Agriculture and Commerce (Mr. Buck), N. W. Provinces, in his recently issued pamphlet on tobacco cultivation in India, states that the sun-curing process is not adapted to this climate. The sample now sent is, I think, a sufficient proof to the contrary."

Mr. Eisenlohr (a member of the Tobacco Committee) reports: "Mr. Newton's tobacco sample shows certainly a beautiful even cure. I have nothing to say whatever against the quality of the leaf."

Mr. Thomas Brae, of Dobracole Factory, forwards seven samples of tobacco raised from seed obtained from the Society of the following kinds :—Connecticut, Havannah, Kentucky, Maryland, Florida, Virginia, and American (particular name unknown.) Mr. Brae sends these for valuation and report. They are considered all well-prepared specimens, superior to general produce, but it is difficult to assign a market value unless a good quantity of each is exported. The following extract from Mr. Buck's pamphlet above referred to bears well on this point :—"Tobacco importers in England declare, that there is no chance for Indian leaf of good quality establishing itself firmly in the market, unless a regular supply of large quantities is annually despatched. It appears, therefore, desirable that as many estates as possible should export properly cured leaf, if there is to be any chance of founding a regular trade between Bengal and Europe in the better class of leaf at a remunerative price."

In connection with this subject, the Secretary called attention to five other samples from the Poosa Model Farm which had been obligingly lent by the Economic Museum Committee, with the following report from Messrs. F. W. Heilgers & Co.

"We have now the honor to report on the samples of Tobacco, forwarded with your communication of the 22nd ultimo, No. 1586:

Sample No. 9577, *Havannah Tobacco.*

"A well-cured strong leaf, but much too thick for the manufacture of cigars.

Sample No. 9576, *Hingly Tobacco.*

"A good long leaf, possessing great strength, suitable for "smoking" (pipe) tobacco, but of coarser flavor than the average produce of this district.

Sample No. 9575, *Kentucky Tobacco.*

"A small thin leaf, adapted for cigar manufacture, with the exception that it does not burn to a *white* ash.

Sample No. 9574, *Kentucky Tobacco.*

"A similar, but somewhat better description than No. 9575.

Sample No. 9573, *Kentucky Tobacco.*

"A large and thin good leaf, but of weak flavor. Nos. 9577-76 are decidedly of better flavor than Nos. 9575-74-73; but the "cure" of all these Tobaccos exhibits a decided improvement on any Indian grown samples we have previously

examined. We entertain the belief, however, that the soil in which they were grown lacks some essential properties for producing Tobacco with high flavor that will burn clean and white.

"We approximately estimate the respective values of the samples as under:

No. 9577	at about Rs.	4-8	per Bazar	Maund.
„ 9576	„	5-4 & 5-8	„	„
„ 9575	„	4-0	„	„
„ 9574	„	4-4	„	„
„ 9573	„	4-12	„	„

but as there is at present no market for these descriptions, too much reliance must not be placed on our valuations. If sufficient quantities are available, we would suggest your sending large samples to London for report and valuation, for which purpose we shall be glad to place the services of our Firm at your disposal."

Oregon Wheat.

The Secretary intimated that the fine Oregon wheat (two kinds) which were presented in August last by Captain Edmonds, of the *Baron Aberdare*, and which were so favorably reported on by Mr. Duncan, of the Phœnix Steam Flour Mills, had been widely distributed. Several unfavorable reports had been received in the early part of the year, and recently three more had come to hand which were now submitted, *viz.*, from the Superintendents Government Farms at Allahabad and Cawnpore, and from Lieutenant Pogson.

From Mr. Phillips, of the Government Farm, Allahabad, to the Director Agriculture and Commerce, N. W. P.—With reference to your letter No. $\frac{T}{49a}$ of 1877, dated 5th May, 1877, I beg to forward the following report on the cultivation of the Oregon Wheat:—

2. "Two small packets of Oregon wheat seed were received here on the 25th August 1876. Some of the seeds were bruised and broken, and some eaten by insects: the samples were carefully cleaned and only two chattacks of sound seed of each kind was left for sowing. A piece of ground was selected in the Khushru Gardens and carefully prepared for the sowing of the seed. Other three varieties of wheat, *viz.*, Pedigree, Jubbulpore, and Doodia, were sown with the Oregon to compare the out-turn, &c. The land was divided off into strips or beds 5 feet × 61, and the seeds sown as far apart as possible (15 feet between each line of beds) to keep the varieties separate.

3. "The seed was sown by hand on the 29th of Octo[illegible] about six inches apart between each seed, the other three varieties germinated freely and well, but only three seeds of the Oregon White Winter variety grew. Great care was taken of them; as the plants increased in growth, they were carefully weeded, and irrigated once only on the 16th of January: no more irrigation was required, as we had occasional showers during the whole season. When the plants were just

beginning to flower we had nasty dull weather with heavy fogs in the mornings: this induced rust to generate on the plants, and as the wind continued from the east, it increased so much that the plants were quite unable to finish the crop. It first attacks the leaves at the bottom of the plants near the ground, where there is a want of circulation of air. It then creeps higher till the plants are denuded of their foliage, and consequently are unable to swell the seed. The three plants of Oregon wheat, when attacked, I had the leaves carefully washed with soap and water which cleaned the plants for a short time, but rust soon broke out again. The washing and cleaning was continued to see if the plants would finish off the seed, but they only produced two chattacks of grain and half seer of straw, while the ears were on an average of about 4½ inches long. The wheat as per sample herewith forwarded, is very thin and light, and not at all like the seed which we received. However, it is even a better sample than the Jubbulpore and Doodia varieties. Thus showing that it is quite as hardy as the native varieties and likely to succeed in a fair season.

4. "The out-turn of each variety was as follows:—

	Varieties.	Area.	When sown.	When reaped.	Out-turn. Grain.			Straw.		
					m.	*s.*	*c.*	*m.*	*s.*	*c.*
		Feet.								
1	Little Club ...	305	29th October.	17th March.	...	...	...	...	...	...
2	White Winter ...	305	„ „	„ „	...	...	2	...	..	8
3	Pedigree ...	305	„ „	„ „	...	3	8	...	19	...
4	Jubbulpore ...	305	„ „	„ „	..	2	8	. .	18	...
5	Doodia ...	305	„ „	„ „	...	2	4	...	18	...

5. "The Pedigree, Jubbulpore, and Doodia varieties germinated evenly, but were spoiled for comparison by the rust: the Little Club did not germinate at all, and only three seeds of the White Winter germinated. The seed of the Oregon wheat, when received, appeared to the eye in excellent condition; but having been opened and despatched during the rains, the germs of the seed had been destroyed by the heat and moisture of the atmosphere. Even the native varieties will not stand to be opened during the rains, but ought to be kept as dry as possible to prevent the seed or germ which is in the seed from becoming soft, otherwise when the seed dries again the vitality of the seed is destroyed. I would, therefore, suggest that any other foreign varieties of seed, which may arrive in small quantities, be packed in tin and not opened till required for sowing at least till the rains are over.

6. "It will be seen from the statement above that the Pedigree wheat has produced the greatest out-turn. It is much the strongest and hardiest variety which we have, and not nearly so liable to the attack of rust as the others: it was grown side by side with the other varieties, and the rust had little or no effect upon it. When all the other varieties were nearly killed by the rust, this one was very little affected and finished off the seed fairly for such a bad season, and although the wheat is not of such fine quality as the others, it is just possible that by crossing the other varieties with the Pedigree, and *vice versâ*, that a good hardy variety of fine quality might be raised from the progeny. In fact, this is only a question of time and opportunity, and will form a series of experiments next season. It had been my intention to have tried them this season, but the plants were not in sufficient health when in flower to do so."

From Mr. Musworth, of the Government Farm at Cawnpore.—As called for by your letter No. $\frac{T}{48a}$ dated 3rd current, I have the honor to submit the following report on the Oregon Wheat, forwarded for propagation on this Farm, as per your letter No. $\frac{701a}{LXXV-19}$ dated 24th August, 1876:

2. "On receipt of the seed, which was under 1 lb. on the 27th August, a piece of garden land plot, No. 10, a good sandy loam (and well manured the previous year) was selected, and thrice ploughed with English plough, harrowed well with English iron harrows, and levelled with country Myrah, and afterwards twice ploughed with country plough and divided into two plots, in one *White Winter*, and the other *Little Club*, was sown.

3. "On the 18th October the land being in good condition as regards moisture, &c. &c., I personally opened the packet and found them so *much* damaged by weevil, that it was more like flour than grain. In hopes, however, that some sound grain might be hidden in the mass, I personally superintended their sowings and had them carefully covered with country harrows, but not a single grain germinated, although other crops sown in the same field did well.

4. "I would suggest that in future grain intended to be distributed for propagation, should be kept in bulk in some secure place till the time for sowing has arrived, as it is almost impossible for small samples, however otherwise securely packed, to be protected from the ravages of the weevil during the rainy season in this country. So strictly is this rule observed amongst the native cultivators; that nothing will induce them to open their seed pits before the sowing season has arrived."

From Lieutenant J. F. Pogson, Simla, 15th June, 1877.—"As regards the American (Oregon) Wheats, I sent all but half an ounce of each to the Lahore A. and H. Society for experimental cultivation. A few days ago I received a letter from the Superintendent of the Gardens, intimating that not a seed of either kind had germinated. The seed sown by me also entirely failed."

Jowar (Holcus Sorghum) as a Food Grain for Export.

In his communication regarding the Oregon wheat, Lieut. Pogson offers the following remarks on the above subject:—

"The wheat exports to Europe have assumed considerable dimensions, but the thing is in its infancy, and I venture to predict, that the Russian trade will pass into our (India's) hands, and a good slice from that of America.

"I have been trying to draw attention to the "Jowar" (*Holcus Sorghum*) as a food grain for export to all Ports in the Mediterranean Sea. This grain is second only to wheat as a bread stuff, and as it will make leavened as well as unleavened bread and biscuits, it would suit all nationalities. But this is not all, for on being malted it would yield good beer, and when distilled, a superior silent spirits. The *grains*, in the former case, and the dregs in the latter would constitute first-class food for pigs and cattle. The British Farmers would not look at Indian Maize, (when American is procurable) though, when its value was known, the Jowar would be preferred to the best Maize. Any how, the Turks and French will purchase it largely. The former as a bread stuff, and the latter for purposes of distillation. In six months the British distillers would follow suit, and in a year or two for every ton of Indian wheat sold in Europe, double that quantity of Jowar would find purchasers.

"The present time is so propitious that Firms (Calcutta ones) sending cargoes of Jowar to Egyptian and Turkish Ports would realize very considerable profits. In like manner, the immense surplus Jowar of the Punjab, and protected Sikh States, if purchased and sent by country boats and steamers to Kurrachee, would soon be on its way direct to the Suez Canal, for steamers and ships in want of cargoes, could proceed from Bombay to Kurrachee, take it in, and proceed to the Mediterranean.

"The Jowar is known as the Dhoorah, or 'Doorah' in the Eastern Ports. "Door" means Pearl in Arabic, and the vulgar name is evidently its corruption. Thus we have 'Pearl Barley' and the grain of the *Holcus Sorghum* being white and representing the pearl in form, has been named accordingly.

"In America, I believe, various kinds of fancy bread are made of Maize meal, and I see no reason why Jowar flour, with or without Soojee, or wheat flour, should not produce wholesome food or bread.

Insect pest of Tea Plants.

Messrs. Balmer, Lawrie & Co. submit the following extract of a letter from Assam, with specimen of the grub therein referred to:—

"A new pest has appeared in this garden. It is a sort of grub which makes a nest of tea leaves, and inside this nest spins for himself a sort of cocoon with an opening at one end. The whole structure he attaches by the open and using some glutinous matter for the purpose to the leaf or *new* stem on which

he intends to feed. The leaves he prefers to feed upon are of a medium age, but the stems on which he feeds are always of new growth. The leaves he eats holes in, but does not wholly devour. The stems he only eats the back off, but both leaves and stems without exception die. His bite seems to be very poisonous, as I have seen a stem about nine inches in length and from which he had only taken a very small piece of bark, rot completely off. The dead stem has something the appearance of a stem eaten by the borer, being perfectly dry and brittle. If not too much trouble could you kindly get some one who knows about these things to report upon the matter? The pest is at present confined to a few bushes, but as they totally destroy a tree, the spread of it would put all other blights and pests into the shade as regards damage and loss." Any advice you can give us will be esteemed a favor.

The Secretary mentioned he had referred this specimen to Mr. Wood-Mason, of the Indian Museum, and that he had lost no time in sending the following copy of that gentleman's note to Messrs. Balmer, Lawrie & Co. :—

"I have to acknowledge receipt of two moribund specimens of a case bearing caterpillar, as to which all I am able to tell you is, that it probably belongs to Westward's genus *Oekelicus*. Please ask your correspondent to send down a good supply (which can easily be done if the beast be really a serious pest) in a perforated wooden box about four inches every way, by banghy post to me direct and with as little delay as possible, for the first burst of the rains is bringing all these beasts to the perfect state. Time enough to ask for remedies when the life-histories of your insect-enemies are as well known as are those of Europe, but especially of U. S. America, where the Government does not think economic Entomology beneath its notice, and almost every State has its paid Entomologist."

Bahmia Cotton.

The next communication had reference to the cotton seed previously alluded to. The Secretary intimated that Mr. Chapman had most promptly met his request for some seed of this supposed new variety or species of cotton, to which a great amount of public interest has recently been drawn in consequence of the published accounts of its great productiveness. Mr. Chapman writes that he has some planted in his garden, and is watching the result with interest. Next season there will be large quantities grown, and Mr. Chapman will report thereon and send some more seed.

A portion of the small quantity of seed now received has been already distributed, and the residue is available to members desirous of giving this cotton a trial.

Letters were also read—

From C. K. Hudson Esq., alluding to the spread of Maize in the Khasia Hills during the last twenty years.—"I see that the Khasias are growing plenty of Maize

in these hills now," observes Mr. Hudson, "and the plants are already, (13th June) a foot high. There was none grown here formerly, and I remember having distributed some in the interior of these hills, when I was in civil charge in 1855, and now the cultivations seems to be spreading rapidly. I think I got the seed from the Society.

The Secretary remarked, that for several consecutive years large quantities of American Maize seed had been sent to General Jenkins, the then Commissioner of Assam, for general distribution throughout the province, and probably a portion thereof had been supplied to Mr. Hudson.

From E. Buck, Esq., Director of Agriculture and Commerce, N. W. Provinces, applying for Carolina Rice seed on behalf of the Collector of Saharunpore. Not complied with in consequence of there not being any in stock.

From C. Nickels, Esq., Jaunpore, a few particulars on the result of high cultivation on peach trees,—"My peaches were splendid this year. In addition to the usual treatment I gave each tree a liberal dose of bone dust to the roots, and rotten fish was added to the liquid manure; and the result surprized me. The fruit on an average weighed between 3½ and 4½ ounces, but a great many weighed five ounces each; and one enormous fellow turned the scale at 5¼ ounces, it measured nine inches round."

Thursday, the 19th July, 1877.

W. H. COGSWELL, ESQ., *in the Chair.*

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members:—

Messrs. H. V. Hall, J. N. Wallace, R. J. M. Pocock, J. Rayson, M. A. McConaghey, Baboos Nehal Chand and Nogendra Nath Mullick, and the Manager of the Sissobari Garden, Jalpigoree.

The names of the following gentlemen were submitted as candidates for election:—

J. E. Welborne, Esq., Tea Planter, Jaipore, Upper Assam,—proposed by the Secretary, seconded by Mr. H. J. Leitch.

Baboo Purmanundoo Barooah, Extra Assistant Commissioner, Goalpara,—proposed by Mr A. C. Campbell, seconded by the Secretary.

Secretary to the Municipal Committee, Goruckpore,—proposed by Dr. A. Wood, seconded by Mr. W. H. Cogswell.

R. Rowett, Esq., Merchant, Rangoon,—proposed by the Secretary, seconded by Mr. Leitch.

Baboo Hurrish Chunder Roy, Supt. of the Bahirbund Estate, Rungpore,—proposed by Mr. M. Stanley Cotton, seconded by Mr. Cogswell.

A. W. Chapman, Esq., Broker, Calcutta,—proposed by Mr. W. H. Cheetham, seconded by the Secretary.

J. Wood-Mason, Esq., Assistant Curator, Indian Museum,—proposed by the Secretary, seconded by Mr. G. L. Kemp.

Rajah Sheoraj Singh, C. S. I., of Khasipur, Naini Tal,—proposed by Capt. W. Barron, seconded by Capt. J. Corse Scott.

Rejoined—Edwin F. Sandys, Esq., Tea Planter, Chittagong.

CONTRIBUTIONS.

1. Transactions of the Royal Society of Arts and Sciences of Mauritius, Vol. IX, new series. From the Society.

2. Journal of the Bombay Branch of the Royal Asiatic Society, No. 34, Vol. 12. From the Society.

3. Note on Sorgho (*Sorghum saccharatum*), by F. G. Wigley. From the Department of Revenue, Agriculture, &c.

4. Several publications on Natural History. From the Royal University of Norway.

5. A quantity of acclimatized Cuzco maize received from Col. Chamberlain of Ranikhet. From the Director of Agriculture and Commerce, N.-W.-P.

6. A small quantity of seed of a variety of Chillie, ornamental for the flower garden. From Baboo Hitlall Missir, Zemindar, Mankoor.

7. Acclimatized seed of Sweet Pea. From Mr. John Lynam.

NEW FORAGE PLANT.

The Secretary announced the receipt from Mr. Horne of the Royal Botanic Garden, Mauritius, of a further quantity of seed of *Tripsacum monostachyum* ("Reana luxurians"), and that he had already distributed a portion to applicants whose names had been previously registered; and stated that there was still some available for those desirous of introducing this fine grass. He read extracts of several letters from those to whom portions of the first supply had been distributed. Mr. H. E. Abbott of Jaintpore Factory, Tirhoot, writes—"*Reana luxurians* is now growing rapidly, and there are several very fine plants which have been once cut." Mr. O. H. Brookes of Port Blair states, "it is thriving luxuriantly, is now over three feet high, and is throwing out numerous shoots from the roots. I have transplanted and manured it, and it will in time form a sort of hedge round the garden." Mr. C. E. Livesay of Dehree observes—"You will be glad to hear that the buffalo grass seed sent me has germinated freely, and I planted out 40 seedlings which are now forming clumps, about 5 feet high and 4 feet in diameter. They were planted 3 feet square and now form a dense bush."

A NEW VARIETY OF COTTON.

Referring to the receipt, as acknowledged in the last monthly proceedings, of a small quantity of cotton seed from Mr. Chapman of Alexandria, the Secretary called attention to the seedlings raised therefrom on the table. He also

read the following extract relative to this supposed new variety from a recent number of the *Gardener's Chronicle*:—

"M. Delchevalerie, the Inspector of Agriculture of Cairo, laid before the recent Congress of Amsterdam some specimens of a new cotton plant found growing in Egypt. In a field of cotton, among which were found some Bahmiehs (Hibiscus esculentus), a certain Cheik-el-celed of the environs of Chibuj-el-kom, in Lower Egypt, noticed some specimens of fastigiate cotton plants, quite different to the others, and similar in habit to the Bahmieh, or Bamia plant. The stems are about 8 to 10 feet high, straight, and with relatively few branches, and those ascending not spreading as in ordinary cotton plants. Hence the Planters of that region did not hesitate to call them 'Kotn Bahmieh.' They collected the seeds carefully, in order to plant them separately. The following year they obtained nearly half a *feddan* (about half an acre) of them, of which the seeds were collected in the same way, and Egypt this year already possesses important plantations of this new variety of cotton. The first samples which arrived in the market of Alexandria were distributed among several merchants, who sent them to Liverpool, where they were classed above fair 'cotton,' and nearly fetched the price of 'good fair.'

"M. Delchevalerie, in a note addressed to the Congress, suggested the idea that this cotton is a hybrid production between *Hibiscus esculentus* and the Egyptian cotton itself, and he proposes this summer to make some experiments at Cairo in order to ascertain if this be so. If this hybridisation has really taken place between the *Hibiscus* (*Abelmoschus*) *esculentus*, and the cotton, the fact will be of great importance from a scientific point of view, for it may give rise to other experiments in artificial fertilisation between other genera of the same family. Similar facts are not unprecedented in the records of horticulture. However this may be, the new cotton plant is taller than the ordinary cotton. It is erect and scarcely branched, with the exception of two or three small branches at the base, which allow of the plants being planted closer. It has not the shrubby form of the ordinary cotton plant, which has numerous branches, themselves branched and producing here and there at the joints a capsule of cotton on a long peduncle. On the contrary, in the new cotton plant, the principal branch is straight and not branched. The capsules grow on the principal stem in clusters in the axils of the leaves, and are likewise borne on long axillary stalks. The roots are more tap-shaped than those of the ordinary cotton, whose root fibres moreover spreads more horizontally, and what is more important is, that the new variety produces much more cotton. The cultivators of this new cotton plant have assured M. Delchelaverie that they have obtained fifteen quintals of it per *feddan*, in the rich soil of the Delta, while the ordinary cotton does not produce half that quantity."

A small quantity of this seed is still available to those desirous of introducing this cotton.

IMPROVEMENT ON AGRICULTURAL MACHINERY FOR HOT COUNTRIES.

The next communication had reference to certain information supplied by Messrs. Ransome Sims and Head of Ipswich respecting agricultural machinery, namely, among others a patent engine for burning vegetable substances, such as cotton and indigo stalks, dry grass, brushwood, &c., whereby the user of steam power is rendered quite independent of any supplies of wood or coal. Messrs. Ransome submit publications and photographs connected with various kinds of machinery which they have introduced into Spain, Italy and South America, and where they are stated to be now very largely used. They close their communication with the following remarks :—

"We need not assure you that we shall be very glad to give any of your Members information upon steam machinery generally and forward them engravings and descriptions of our most improved machinery."

TONQUIN BEAN.

The Director of Agriculture and Commerce, N. W. Provinces, wishes to know, in continuation of former communications on the subject, whether the *Dipterix odorata*, the tree which yields the Tonquin bean, so well known as giving a pleasant scent to snuff, can be grown in any part of India. Mr. Buck considers it may be useful to ascertain this, because he has been informed by the Virginian curer and manufacturer of tobacco at Ghazipur, that this bean is used in the manufacture of tobacco in Virginia, principally in the manufacture of black Cavendish.

The Secretary mentioned he had previously applied to a correspondent in Demerara for seeds of this tree.

Read another letter from the Director of Agriculture and Commerce, N. W. Provinces, stating that he has received a small quantity of best malting barley from England, and enquiring of any of the Society's members, resident in the Hills or north of Allahabad, would like a small quantity for sowing.

Resolved, that Mr. Buck be thanked for this offer, and that the same be notified for information of members and others, who can apply direct for the seed.

Thursday, the 23rd August, 1877.

W. H. COGSWELL, ESQ., *in the Chair*.

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members :—

Messrs. J. E. Welborne, R. Rowett, A. W. Chapman, J. Wood-Mason, Baboos Purmanundoo Baroouh and Hurrish Chunder Roy, Rajah Sheoraj Sing, and Secretary to the Municipal Committee, Gorukpore.

The names of the following gentlemen were submitted as candidates for election :—

The Secretary Public Garden, Nowgong, Bundelkund,—proposed by Dr. J. P. Stratton, seconded by Mr. W. H. Cogswell.

Baboo Janoki Bullub Sen, Zemindar of Dimla, Rungpore,—proposed by Dr. K. D. Ghose, seconded by the Secretary.

Babpo Govind Lall Roy, Zemindar, Tajhat, Rungpore,—proposed by Dr. Ghose, seconded by the Secretary.

Baboo Gonesh Chunder Chunder, Solicitor, High Court,—proposed by Mr. C. T. Davis, seconded by Baboo P. C. Mittra.

Baboo Doyal Chund Doss, Banian, Calcutta,—proposed by the Secretary seconded by Mr. Cogswell.

Baboo Jogendronath Mullick, Calcutta,—proposed by Mr. W. Swinhoe, seconded by Baboo P. C. Mittra.

Alexander Atkinson, Esq., C. E., Bhongaon, Mainpuri,—proposed by the Secretary, seconded by Mr. G. L. Kemp.

J. Bryce, Esq., Kallygunge, Rungpore,—proposed by the Secretary, seconded by Mr. H. J. Leitch.

Captain R. P. Davis, District Superintendent of Police, Beerbhoom,—proposed by Mr. S. H. C. Tayler, C. S., seconded by the Secretary.

J. Macnamara, Esq., C. E., District Engineer, Shahabad,—proposed by Mr. C. W. Odling, seconded by the Secretary.

Rejoined :—A. Scott Campbell, Esq., Tea Planter, Debrooghur; Thomas Greenhill, Esq., Calcutta, and Baboo Poornoo Chunder Mookerjee, Solicitor, High Court.

CONTRIBUTIONS.

1. Reports on the Meteorology of Oudh, &c., for 1876-77 From the Government N. W. Provinces.

2. Report of Committee of the Bengal Chamber of Commerce, 1876-77. From the Chamber.

3. Journal of the Asiatic Society of Bengal, Part 2, No 2, 1877, and Proceedings for June and July. From the Society.

4. Tea cultivation in Assam. By H. Cottam. From the Author.

5. Tubers of purple arrowroot and Buffalo grass, and a small collection of Orchids, &c. From the Queensland Acclimatisation Society.

6. A quantity of Aster seed and seed of the "Solly Qua." From C. Nickels, Esq.

GARDEN.

The Gardener's monthly report was submitted. A few kinds of Palm seeds from Mauritius and seeds from Melbourne are acknowledged—"The most important introduction may be the 'purple arrowoot' from Queensland, which

is not an arrowroot at all, but a Canna with very large and apparently suculent root, greatly resembling the kind No. 2 that we have in the garden. I have no doubt it may produce a substance that would be a substitute for arrowroot. I send a specimen root: the remainder is planted and growing.

"The principal garden operations has been propagating by the various processes, such plants as are in demand and likely to be required, sufficient to keep up the stock. Eight grafts and upwards of all the Queensland Peaches have been made, and a large number of additional roses layered, and rooted cuttings of last season taken up and potted.

"The plants of Bahmié cotton have been planted out and are about a foot high, strong and healthy. The Buffalo grass (Reana) is now upwards of 12 feet high, specimen shoots sent: there are no signs of its flowering yet, but it can easily be increased like Sugar-cane, and might in that way be distributed if required. The kind of Buffalo grass sent from Queensland is quite a different grass, to all appearance like a common coarse grass growing here, the whole of it was dead on arrival. I send also a fruit of *Monstera deliciosa*, it has been broken off by something that had climbed the plant and taken the fruit that was just ripening. This fruit is not so much advanced as the other, it may ripen if laid past; there will not be any more this year, but there are four others on plant for next year."

NEW FORAGE PLANT.

In connection with the Gardener's report on *Reana luxurians*, the Secretary called attention to several more letters he had received since last meeting regarding this fine grass. Dr. R. C. Sanders, of Azimgurh, writes as follows:—

"The 18 seeds of *Reana luxurians* sent me some months ago all germinated and have grown most freely; each seed was put in at intervals of 5 feet, but some two months back each plant had so spread that all touched, some have from 100 to 120 shoots. To give air to those plants which I wished to seed I had some of the plants cut nearly to the ground: cattle eat what was cut most greedily both in its fresh state and ALSO WHEN DRY; and the plants which were cut instantly grew again and are now fit to cut afresh. It is a most excellent grass, and will, I think, be well suited to the country.

"The plants have had the advantage of the Jail Garden which includes a very rich soil and abundance of water, otherwise they could not have made such growth in the hot weather; so far there is no appearance of blossoming, though the plants which have not come out are seven feet high. Should they seed I will send the produce to you.

"I should be glad if you could send me a few more seeds for rain sowing and also some to give away; I have had many applications for seeds and plants. I have at the same time been trying 'Prickly Comfrey,' it is a miserable failure compared to *Reana*."

Mr. Patrick Duff of Senerah, Baugulpore, also reports most favorably. He remarks:—"The *Reana luxurians* has grown 9 feet high, and I have found cattle devour it greedily. When I cut it down I leave a little leaf on the stalks, and this is also springing up very nicely. Is it only an annual, or can I keep it standing without fear of its dying off in the cold weather? I presume it will produce seed, and that this will answer for next year's crop. The natives say they know it grows here, but I think they must be mistaken as they have not produced any thing like it when asked to do so."

In a subsequent letter he adds—that he has tried this grass for feeding elephants and finds that they take to it at once, and it would be very valuable fodder for them during the hot months.

Mr. Blandford of Nurtipore (Malda district,) likewise bears witness to his success with this grass, and promises further and fuller particulars hereafter.

NEW COTTON (BAHMIÉ.)

Read a letter from the Director of Agriculture, N.-W.-P. and Oudh, enclosing copy of a recent number of the *Gardener's Chronicle*, in which an account is given regarding a new variety of Cotton in Egypt.

The Secretary mentioned that this account is the same as that introduced in the last month's proceedings. He drew attention to another notice in a subsequent number of the same periodical (23rd June) from the pen of M. Naudin as follows:—

"The notes in the *Gardener's Chronicle* respecting this pretended hybrid were so interesting to me that I asked M Delchevaleric for some seeds. I received them, and also some of the true cotton (*Gossypium vitifolium*) and of *Hibiscus esculentus*. In the course of five or six days all these seeds had germinated. It is true that at present only the *cotyledons* are visible, but up to this time I do not see one that at all resembles the *Hibiscus* sown by the side of it. Let us wait for the end before judging, but I confess that I shall be much surprised if the *Kota Bahmié* proves to be really a hybrid of the *Hibiscus*. I will return to the subject in a short time."

INSECT PEST OF TEA PLANTS.

The Council reported, in reference to the resolution passed at the meeting in April last, that many of the Agents for Tea Gardens having now agreed to support the proposed scheme, provided the services of a practical Entomologist could be obtained, a communication had been made to Mr. Grote on the subject by a recent mail to endeavour to ascertain if such a person be available, and the cost of remuneration.

In connection with the above, a letter was read from Messrs. J. Mackillican & Co., that one of their Managers in Assam had reported the appearance of a very destructive caterpiller which destroys the leaves of the tea bushes in a most alarming way. This caterpillar had been noticed by several other Planters in

different localities and all agree as to its destructive habits. Enquiries are made as to the best mode of destroying the pest, and specimens promised.

Mr. C. G. D. Betts submits the root of a certain plant received from Sumatra said to be an insect-destroyer. The following is the mode of application:

The root is tied up in bundles. You take half a bundle (equal to a little more than ¼ lb) and this will make a bucketful or about 28 quarts.

Mix it thus;—take the root, cut it into pieces about 4 to 6 inches long as convenient; soak it in enough cold water to cover it for about 12 hours, then smash the pieces and pound them up in the same water and add water to the quantity required, you can use it at once, and it will keep good for 4 to 5 days.

If used for vegetables or plants you merely sprinkle a little over them; it may be required every day or once in three days. With flowers or creepers I have found that once a week was sufficient.

Letters were read—

From L. Wray, Esq., Penang, applying for seeds of *Eucalypti* and cuttings of *Cinchonas*. Mr. Wray wants the "Blue Gum" seed, with a view of planting these trees on and around his estate in Province Wellesley, "to counteract the injury caused by the Government allowing the Chinese to cut (for charcoal burning) the forest trees hitherto covering the low hills in our immediate neighbourhood, and thus causing droughts."

The Secretary stated he had met Mr. Wray's application for *Eucalyptus* seed, and Dr. King had kindly promised his assistance in respect to certain kinds of *Cinchonas*.

Mr. Wray closes his letter with the following remarks:—

"No doubt you have heard of the great success which has attended the introduction of the Assam Tea plant on that estate (the Alma), an experiment which I commenced in 1868-69 contrary to the advice of Mr. de Mornay and every one in any way acquainted with Tea culture. It is now an assured success, and I have the best reasons for believing that Tea will eventually be found far more profitable in the Straits than in Assam or in any part of India."

From N. Belletty, Esq., calling attention to the useful properties of the Carnahaba palm (*Copernicia cerifera*) of Brazil as evidenced in the following extract from notes of a journey in Brazil, by James Well, C. E., published in a recent number of the Journal of the Royal Geographical Society:—

"The Carnahaba palm (*Copernicia cerifera*) is one of the most useful trees in Brazil. In these districts it exists only in small numbers, but in the Provinces of Ceará and Rio Grande do Norte it grows uncultivated in great luxuriance. Perhaps there is no region of the globe where a tree can be found of such varied uses and so serviceable as this palm. It resists the severest droughts, keeping always green and flourishing. The roots possess the same medicinal property as Sarsaparella. From the trunk are extracted strong light fibres capable of receiving a

high polish. The wood is used for props and other building purposes, as also for stakes and fences and for musical instruments, tubes and pumps. The inner rind of the young leaf when fresh, is used as a highly-esteemed and most nutritive food. The tree also affords wine, vinegar, saccharine substance, and great quantity of gum like sago, and possessing the same properties and taste. It has been the daily food of the inhabitants of Ceará and Rio Grande do Norte in times of severe drought.

Agreed to endeavour to obtain seed of this useful Palm.

From F. Halsey, Esq., presenting for the Journal a paper entitled "Notes of a visit to Pangi and Lahoul in the valley of the Upper Chenab."

For the above contributions and communications the thanks of the Society were accorded.

Thursday, the 20th September, 1877.

W. H. COGSWELL, ESQ., *in the Chair*.

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members:—

The Secretary Public Garden, Nowgong, Bundelkund; Babbos Janoki Bullub Sen, Govind Lall Roy, Gonesh Chunder Chunder, Doyal Chund Doss, and Joggendronauth Mullick; Captain R. P. Davis, Messrs. Alex. Atkinson, J. Bryce, and J. Macnamara.

The names of the following gentlemen were submitted as candidates for election:—

Manager Durrung Tea Company, Limited,—proposed by Baboo Peary Chund Mittra, seconded by the Hon'ble H. F. Brown.

Baboo Mohendro Lall Bose, zemindar, Kaksiali *via* Chinsurah,—proposed by Dr. R. F. Thompson, seconded by the Secretary.

Rejoined.—Secretary Local Fund Committee, Jhansi; and Dr. J. B. Barry.

CONTRIBUTIONS.

1. Memoirs of the Geological Survey of India, *Palæontologia Indica*, Sec. 11, 3. From the Director.
2. The Indian Forester, Vol. 3, Part 1. From the Editor.
3. Report on the progress and condition of the Royal Gardens at Kew for 1876. from the Director.
4. Journal of the Asiatic Society of Bengal, Part 1, No. 2. From the Society.
5. Report of the Sanitary Commissioner for Bengal for 1876. From the Government of Bengal.
6. A glazed case of plants. From Mr. A. R. Wallis of the Department of Agriculture, Melbourne.
7. A basket of Orchids from Sylhet. From Mr. C. K. Hudson.

8. Two bags of bone dust and prepared castor cake. From Mr. Thomas Greenhill. (Transferred to Garden for experiment).

GARDEN.

The Gardener's report was submitted, of which the following are extracts:—

Reana luxuriana.—"Up to the present time there are no signs of flower on the *Reana*; it is not growing so fast, and may perhaps shortly flower, some of it has blown down, and when it has come in contact with the soil it has sent out roots at every joint, and it roots readily by cuttings and could be increased to any extent in that way, or by laying down the long grown shoots, and when rooted cutting it through between the nodes; every joint would then produce shoots, it could then afterwards be transplanted."

Bahmi Cotton.—"The new hybrid cotton is showing signs of flower, but none has opened yet, several of the earliest ones have dropped off. The plant has not nearly so much the appearance of cotton as it had."

Liberian Coffee.—"The berries on Liberian Coffee are now of large size, something like an inch in diameter, and to all appearance about to ripen; there are not many berries of the first crop, and only few of the second.

Purple Arrowroot.—"The purple rooted arrowroot is only, as I reported, a *Canna*, the greater part of the roots have grown and it is about two feet high already, but I don't expect it will be sufficiently advanced to take up next season, but will have to wait till the following. An experiment could be tried with our No. 2 Canna, when the roots are ripe, to see what kind of arrowroot it will produce, it may not be so abundant as the proper arrowroot, but I don't see why not as good, the plants belonging to the same order."

RESULT OF MANURE ON THE SUNN PLANT.

Dr. Lynch presented a sample of Sunn fibre *(Crotalania juncea)* raised in the Alipore Jail Garden on a manured plot, and submitted the following note thereon:—

"I send a small sample of 'Sunn' grown this season in the Jail Garden. The out-turn from two beegahs of land came to four maunds, sixteen seers, or two maunds eight seers per beegah. The plant grew to an average height of 5½ feet. I have sent the specimen not with reference to its quality, but to show what can be got out of land even of an inferior sort, with the help of manure. The field on which this Sunn was grown has now given three crops of this fibre in alternate years and has been incessantly under cultivation in the interval with vegetable and forage crops of different sorts.

"The only manure supplied to the soil, which is of a poor sandy nature, has been vegetable refuse rotted in pits, with urine thrown on it. These pits are exposed to the weather, and much of the strength of the compost must be washed out during the rains.

"What remains is found to be a fairly good manure when applied at the rate of ten or twelve tons per acre, which is the quantity laid on the land from which the Sunn was produced."

The fibre was pronounced to be of good strength and fair quality.

BLIGHTED CHOLUM FROM THE MADRAS PRESIDENCY.

Mr. Locke, Secretary Economic Museum, submitted a specimen of red cholum (*Sorghum vulgare*) with the following note. That on the Rice blight was inserted in the proceedings for February last:—

"I believe the members of your Society felt an interest in some papers which I sent you sometime ago concerning a rice-blight found by Mr. Weekes at Faridpur and reported upon by Dr. D. D. Cunningham, who is, as of course you know a high authority in matters fungal.

"2. I now send you some specimens of blighted millet (red cholum) which Mr. Weekes, who is at present on famine duty in the Madras Presidency, has sent to us from the Cuddapah district.

"3. I annex a copy of Mr. Weeke's letter and of Dr. Cunningham's note upon the fungus."

From A. Weekes, Esq., B. C. S.—"I have the honour to send you by separate packet samples of red cholum grown under wells which are affected with a peculiar kind of blight. In addition to the black sort of dustpods there are many green winged insects in each ear, which probably will be found by you in the packet.

"The blight is unfortunately very prevalent, and has considerably added to the troubles of the richer classes of ryots who have wells for irrigation.

"I sent you some rice blight last year from *Furreedpore, Bengal*; and sent a report on it which Dr. King kindly obtained for me from, I think, Dr. Cunningham who has made the blight fungi a special study. Perhaps he would repeat his kindness."

From Dr. D. D. Cunningham.—Herewith I return the sample of blighted cholum sent with your letter of the 30th August.

"I have examined the specimens of the blight, and although I have not had time thoroughly to work them up, the results are sufficiently definite for all practical purposes, so that I think it better to let you know what they are at once in place of waiting to carry out cultivation experiments, etc., which would necessarily involve considerable delay.

"The cause of the blight is the presence of a fungus belonging to the family *Ustilaginei*, and so far as I have yet determined to the genus *Sorisporium*.

"As the general questions relative to the habits of the family and the best means of preventing the blight were described in my report on the rice blight to which Mr. Weekes refers in his letter, I need not recur to these points here.

"The principal characterstic of the fungus in this case is the manner in which the spores are developed so as to form dense cellular masses. The cases containing the black powder consist of the hypertrophied and stretched outer layers of the grain which normally envelope the starch-producing tissue of the interior.

"The black powder consists of coarse grains mixed with an impalpable black

dust; the former are the cellular bodies previously alluded to, the latter is composed of the few mature sports resulting on the breaking up of these bodies.

"The blighted grains are at first filled by a dense homogeneous tissue consisting of interwoven branching filaments. Certain of these filaments give origin to knots of twigs, and these twigs are ultimately resolved into series of cells, which, when ripe, constitute the spores.

"During the course of development the rows of cells are much pressed upon by one another and by the surrounding tissue, and in consequence become closely packed together and adhere to form dense cellular bodies of irregularly rounded contour. As these approach maturity they acquire a deep brown colour, contrasting strongly with the colourless tissue in which they are imbedded.

"This tissue is now gradually broken up and disappears leaving the brown cellular masses free. Finally the individual cells in the latter enlarge, become covered with projecting points or tubercles and separate from one another. When separate they appear as deep brown spores of roundish oval form and measuring on an average about $\frac{1}{170}'' \times \frac{1}{125}''$

"I did not meet with any peculiar insects in the specimens.

"The tissue of blighted grains and may other fungal elements are favourite articles of diet with many mites and small insects of various species, as any one who has attempted the preservation of fungi in this country must be painfully aware."

Letters were read—

From Messrs. P. Duff & Baugulpore, and A. Blandford of Turtipore, with further particulars regarding the growth of *Reana luxurians*.

From Col. C. L. Showers, offering a paper for the Journal in connection with the late frequent total failures of food crops in India, &c.

From Secretary Government of Bengal, applying for a quantity of American cotton seed for cultivation in Hill Tipperah. (In the absence of American seed some seed of the new Egyptian variety has been forwarded.)

From Mr. F. A. Herbertz of Cologne, enclosing a prospectus of his lawn mower, which is stated to be "light, plain, durable, appropriate for every sort of grass, and easily handled by one person."

Monday, the 12th of November, 1877.

W. H. COGSWELL, ESQ., *in the Chair*.

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members.

The manager of the Durrung Tea Company, and Baboo Mohendro Lall Bose.

The names of the following gentlemen were submitted as candidates for election:

Mess Secretary, 42nd Assam Light Infantry, Gowhatti,—proposed by the Secretary, seconded by Mr. H. J. Leitch.

Captain Henry Lawrence, Deputy Commissioner, Sirsa, Punjab,—proposed by Dr. Geo. King, seconded by the Secretary.

H. R. Maddock, Esq., Tea Planter, Chittagong,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

W. P. Williamson, Esq., Superintendent, Willton Tea Company, Debrooghur, —proposed by Mr. W. E. S. Jefferson, seconded by the Secretary.

Rejoined.—John Ogilvie Hay, Esq., Akyab.

CONTRIBUTIONS.

1. Journal of the Bombay Branch of the Royal Asiatic Society, (extra number) No. 34, vol. 12. From the Society,

2. Journal of the Royal Asiatic Society of Great Britain and Ireland, vol. 9, part 2. From the Society.

3. Report on the Internal Trade of Bengal for 1876-77. From Government of Bengal.

4. Report on Police Administration of British Burma for 1876. From Chief Commissioner.

5. Memoirs of the Boston Society of Natural History, vol. 2, part 4, and Proceedings from January to July 1876. From the Society.

6. Records of the Geological Survey of India, vol. 20, part 3. From the Government of Bengal.

7. Several pamphlets of articles incorporated in the *Imperial Gazetteer.* From E. T. Atkinson, Esq., (The Ganges Canal, Jumna Canal, the Tarai, Kumaon, and Gurhwal districts.)

8. A quantity (20 lbs.) of English malting barley. From E. Buck, Esq.

9. Seed of *Cinchona succirubra.* From Dr. G. King.

10. Capsicum seed of a fine description, from France, and two seedlings of *Eugenia Malaccensis.* From Mr. G. Bartlett. Mr. Bartlett remarks that this tree (Malacca Amrool) has become very scarce since the cyclone of 1864.

11. A graft of Magna Charta rose. From Mr. John Lynam.

12. Twenty plants of Liberian Coffee from the Kew Gardens. From Sir Joseph Hooker.

GARDEN.

The Gardener's report was submitted. Mr. Head states the receipt in excellent condition of the Liberian Coffee plants from Kew, and adds: "We have still on hand a few of our own raising, nice little plants. The fruit on our trees has not made any progress to appearance towards ripening; they continue about the same size; but the second crop is progressing. The plants appear as though next season there will be abundance of flower. There is a fine batch of Zinnia now in flower received from seed, presented by Mr. H. E. Abbott of Tirhoot. There are some fine flowers amongst them. I send a few specimen flowers. It appears to be a very good strain, and the plants are 3½ feet high." [These flowers were much admired. The seed to be carefully gathered for distribution next season.]

"The Bahmié (Egyptian) cotton has been flowering and has produced some pods; the plants are three feet high, and since the rains have ceased have been attacked with 'grub,' eating up the leaves, but not to a great extent except on a few plants. The plant has very little tendency to branch, consequently could be planted rather close together; the out-turn would thereby be great. I send for exhibition a plant in flower of 'Ipomea Horsfalliæ.' I do not know if it has ever been seen in Calcutta before."

BARK CLOTH FROM THE GARO HILLS.

The Secretary submitted specimen of bark called "Sapong" which he had received from Dr. J. C. Shaw of Mymensing, in person, in the early part of the year, and called attention to the following particulars regarding it, and certain specimens of bark cloth from the Garo Hills, with which he had been favored by the Secretary of the Economic Museum :—

Letter from H. H. Locke, dated 13th September, 1877.

"In April last you sent me a piece of bark from the Garo Hills bearing an Assamese name '*Sapong*,' and you asked whether I had any such bark specimens here and whether I could give you their botanical names.

"I told you in reply that we had one or two specimens from the Garo Hills, that they had come to us with vernacular Assamese names only, which up to that time I had been unable to find any mention of in the various botanical works I had referred to, and that the Deputy Commissioner had been asked to give us what information he could as to the botanical names of the trees yielding these barks. or to send specimens of the leaves, flowers, and fruits.

2. "We have lately received from Mr. Damant, the Deputy Commissioner of the Garo Hills, a reply to these enquiries, together with leaves of *five* plants. Although leaves only have been sent Dr. Kurz finds that they belong to genera and species so well known to him that he has no hesitation in naming them. I append hereto an extract from Mr. Damant's letter; and in the margin against the different Assamese names you will find written (in red ink) the botanical names as assigned by Dr. Kurz.

3. "The name '*Sapong*' which your specimen bore does not occur among those given by Mr. Damant, but if you will send the piece of bark to me again with such information as you can give as to the precise locality from which it originally came, I will ask Mr. Damant if he can enlighten us about it."

Extract from a letter from G. H. Damant, Esq., C. S., Officiating Deputy Commissioner of the Garo Hills, to the Secretary to the Central Committee of Management for the Economic Museum, Calcutta, d. el Teera Garo Hills, 14th August, 1877:—

The Mhow (or Mau) tree grows to the height of about 40 feet and is, I am informed, found in the plains as well as in the Hills.

Ficus trifoba. The plainsmen use it, when small, principally for the ridged poles of their houses as it has a long straight trunk which can be easily

curved while green. The trunk is bare of branches three-fourths of its length. The young wood at the tips of the branches covered with brown bristles similar to those on the leaf but rather longer; as the sapling increases in height the small lower branches are said to drop off. Bark is smooth. The tree is said to be deciduous and bears in August flowers and berries (not edible) three on a foot stalk at the tips of the young wood.

The Omak is also said to be deciduous. It is knowu to plainsmen by the name of Odela and Salua, is sturdy in appearance and grows to about 4 feet in girth, height from 30 to 40 feet; bare of boughs up to about 15 feet. The first set of branches, either 2 or 3 are worn out almost horizontally at the same height from the ground round the tree; 5 or 6 feet further up, another similar set. The boughs on these grow irregularly and are crooked. At their tips there are clusters of 10 or 12 leaves. Bears red flowers in April and May. Fruit (not edible) resembles a small crooked or curved plantain, and 4 or 5 of them are borne in a bunch at the tip of the branches.

Sterculia villosa.

4. "The Sram in known to plainsmen by the name of Chama or Chumba; height 60 to 70 feet; bark smooth and ash colored. Trunk somewhat straight and bare of branches to three-fourths of its height. Grows to a large size from 3 to 4 feet in diameter, foliage dense. Bears in the month of May a nearly round fruit, 4 to 5 inches in diameter with rind, resembling that of jack fruit, and contains seed somewhat similar; said to be deciduous.

Artocarpus lacoocha.

5. "Phakram called by plainsmen the Jigini height 22 to 30 feet. Trunk straight or nearly so, about 10 or 12 inches in diameter. Bare of boughs about half way up, Above that rather slender and long boughs grew out nearly horizontally about 1 or 2 feet above one another from different sides of the tree. On the smaller branches there are twigs growing out right and left in a horizontal direction, about 6 or 8 inches apart, on which small flowers and berries are borne close to the base of each leaf stem in the month of March. The berries are about the size of small 'dhal,' and 3 of them are attached to each stalk.

Trema orientalis.

6. "I send a specimen leaf from a Chenung or Chengrung sapling. This tree does not appear to be obtainable in great numbers near this station, and I have not come across a large tree. The largest is said to be about 5 inches in diameter at thickest part. The boughs are thrown out in pairs one on each side of the tree. The lower ones drop off as the tree increases in size, leaving the stem bare about half way up.

Morinda angustifolia.

7. "At this time of the year neither flowers nor fruit are obtainable of any of the trees above referred to, except the flowers of the Mhow which will be sent to you shortly. The product called 'Amphak' is obtained from the bark of the Sram and Hakram trees, and is not the name of a tree."

In a subsequent letter, dated 6th November, Mr. Locke adds as follows :—

"In continuation of my letter to you of the 13th September last I have much pleasure in sending you such further information as I have been able to get regarding the specimen of bark cloth from the Garo Hills called '*Sapong*' presented to your Society by Dr. J. C. Shaw.

2. "I sent the specimen to Mr. Damant (Deputy Commissioner of the Garo Hills) for inspection, and he writes concerning it as follows :—

'The bark cloth sent by you for identification is undoubtedly the product of the 'Phakram' tree referred to in my letter No. 740 of 15th August, 1877.

"The bark is known to plainsmen on the Mymensingh side (who purchase it from the Garos) by the name of Opang. In the South Eastern portion of this district the bark is called 'Simpak.' In other parts it goes by the name of 'Amphak' or 'Hamphak,' but the name of '*Sapong*' is apparently unknown here.

'The bark is removed from the trees by the Garos in the early part of the cold weather.'

3. "I return your piece of '*Sapong*' herewith. If your Society is not forming a regular collection of such things, would they have any objection to placing this specimen in this museum where it can be put beside other similar bark cloths."

Ordered—That the piece of "Sapong" be transferred to the Economic Museum, with the best thanks of the Society for the information afforded.

REANA LUXURIANS.

Letters were read from Messrs. Duff of Baugulpore, W. F. Gibbon of Chumparun, A. Sturmer of Ghazeepore, A Nicholson of Mirzapore, and W. B. Carshore, of Shapore, Oondy, announcing the general flowering of their plants of the above grass.

The seed is not formed on the flower spikes at the top of the stalk, as some of the Society's correspondents suppose, but on the axil of the plant, somewhat after the fashion of Indian corn; the cob is at first so deeply set as to escape general observation; but on approaching maturity, it swells out and then becomes more conspicuous. The plants in the Society's Garden are now seedling freely, and will be shortly ready for gathering.

Letters were read—

From A. E. Abbott, Esq., Tickahar Factory Tirhoot, dated 5th October, regarding the Bahmié (Egyptian) cotton :

"In answer to your enquiries about the cotton," observes Mr. Abbott—"I have compared the leaf with the ordinary Daharttee cotton but find the leaf of the hybrid plants to be nearly three times as large and ... shape not quite alike. I am afraid the plants I have will be very stunted this year in consequence of having only had a fall of 12 inches of rain within the last three months; the plants were doing splendid up to within three weeks ago, when they stopped growing. I will send you all the pods collected off your plants as soon as ripe."

From Captain Protheroe, Deputy Superintendent Andamans, applying for

seeds of the Liberian coffee for trial in the Government Plantation at Port Blair. Seeds not available—plants offered.

From the Magistrate and Collector, Basti, applying for seeds of Mahogany and *Eucalyptus globulus*. Mahogany plants offered.

From the Director Department of Agriculture and Commerce, N.-W.P., applying for seed of Zazania or Canada Rice.

From the Secretary Boston Society of Natural History, returning thanks for publications of this Society.

Thursday, the 13th of December, 1877,

W. H. COGSWELL, ESQ., *in the Chair*.

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected members:—

Mess Secretary, 42nd Assam L. I., Gowhatti,—Captain Henry Lawrence, Messrs. H. R. Maddock, and W. P. Williamson.

CONTRIBUTIONS.

1. Transactions of the Asiatic Society of Japan, Vol. V, Parts 1 & 2. From the Society.

2. Notes on the Economic Mineralogy of the Hill Districts of the N.-W.-P. of India, by E. T. Atkinson. B. C. S. From the Author.

3. Hand-book to Cinchona planting for Ceylon Planters, by Harold A White. From the Author.

4. A supply of violet plants raised in his garden at Mozufferpore. From T. M. Francis, Esq.

5. Acclimatized seed of Carters "Greengage tomato" and of the "Golden butter bean." From Capt. J. F. Pogson.

Capt. Pogson states that this tomato is the produce of imported seed raised last year and resown this year. "The fruit is fully equal to original stock, and as regards size many of the tomatos produced this year were larger than the photographed engraving printed on the London seed parcel." In respect to the beans, Capt. Pogson adds—"of all the beans I have as yet grown, this is out and out the best. The cooked pods are eaten whole without any peeling or slicing in the cook-room. They are ready for the table in six weeks after sowing. I allow one teaspoonful of pounded calcined bone to each dibble, and put two seeds in each distance between dibbles, centre to centre nine inches. One chittack of saltpetre was mixed with 16 chittacks of bone powder, and water poured over to moisten all and dissolve the nitre. When dry the manure is ready."

6. A parcel of Tonquin beans (*Dipterix odorata*) from Demerara. From Messrs. Hobson and Ede.

The Secretary intimated that the majority of this supply had been transferred to the Director of Agriculture, N.-W.-P, at whose requisition it was obtained; a few sent to the Royal Botanic Garden and to the Society's Garden.

7. A small quantity of Arnotto seed (*Bixa orellana*) from Monsr. L. Voisson, Engineer to the King of Burmah, Mandalay. M. Voisson states that the colouring property of the Arnotto raised at Mandalay is superior to that raised elsewhere.

8. A quantity of freshly gathered teak seed from Soorool. From C. E. Bleshynden, Esq.

9. A few kinds of Palm seeds, from Mauritius. From Mr. C. Horne, Director of the Royal Botanic Garden.

The Secretary placed on the table several pods, recently gathered, from the few plants of Bahmié (Egyptian) cotton raised in his garden from the seed kindly presented in June last, by Mr. Chapman, Agent to the P. and O. Company at Alexandria. This cotton possesses a long and strong fibre. Full particulars will be furnished in due course.

Garden.

The Gardener's report was submitted. The stock of violet plants, received in excellent condition from Mr. Francis, have been divided into 50 or more. A good quantity of Zinnia seed has been gathered from the stock, presented by Mr. H. E. Abbott of Tirhoot, fine flowers of which were submitted last month. A large quantity of seed of *Reana luxurians* has also been obtained, and a further quantity is ripening; the plant, which is an annual, is now dying down. Garden operations in connection with Rose pruning, &c., are nearly completed. The Peach plantation commenced last year, has been continued. Four of all the Queensland peaches are now planted, and a dozen of Mr. Nickel's kind. A specimen in flower is sent of the "Queensland Purple Arrowroot" which proves to be a *Canna*.

In connection with the above a report was submitted from the Garden Committee, partly in respect to next year's operations and the amount to be allowed for the same. The Committee recommend, in conclusion, that from the commencement of next year, Members be allowed to purchase ordinary ornamental plants at half price over and above their authorized annual allowance of Rs. 20 per annum. The report was adopted.

Provision of Vegetable and Flower seed for 1878.

The Special Committee appointed by the Council, to arrange for the supply of seeds for next year submitted their report. The Committee regret to remark that several complaints have been received in respect to the consignments of seeds in 1877, more particularly those from Messrs. D. Landreth and Sons of Philadelphia. The seeds from Messrs Vilmorin, Andrieux and Co. of Paris

especially the flower seeds, have not been reported to be so good as usual. Messrs. Haage and Schmidt, of Erfurt, have behaved in a most unaccountable manner, as already intimated by circular to members, in having violated their promise of despatching, in due course, the annual consignments of flower seeds.

The Committee propose that an order be given to Messrs. Sutton & Co. of Reading, in place of Messrs. Landreth, and to Messrs, Platz Brothers of Erfurt, in place of Messrs. Haage and Schmidt. Consignments to be again ordered from Mr. Buist of Philadelphia and Messrs. Vilmorin, Andrieux & Co. of Paris. A consignment of acclimatized flower seeds from Lucknow, and field seeds from Melbourne. The report was adopted.

In connection with the above, the Secretary read the following note regarding certain kinds of flower seeds raised in his garden :—

Several members, having complained of the flower seeds imported this year from Messrs. Vilmorin, Andrieux & Co. of Paris I think it as well to give the result of my sowings. On the 25th October (but too early in the season), I sowed in pots the following 8 kinds :—Petunia, Phlox, Heartsease, Portulaca, Daisy, Geranium, Mignonette (large flowered variety) and Violet. With the exception of Violet, all these germinated fairly, the Petunia and Portulaca freely.

On the 16th November, I sowed the following 5 kinds :—Lupins, Nigella, Carnation, Nasturtium, and Dianthus. These germinated still more freely.

On the 26th November, I sowed 5 other sorts, namely :—Tagetes, Phacelia, Antirrhinum, Cineraira, and Browallea. These have germinated most freely, as the pots now placed on the table will shew. We have had an unusually warm November or, probably, those sown in the middle of the month might have given still better results. As a general rule, founded on many years' experience, I am of opinion that the majority of our imported annual seeds, Mignonette, Aster, Sweet peas, and one or two others excepted, should not be committed to the soil before the 10th or 15th of November under ordinary seasons; but still later this year, November having been, as already remarked, so unusually warm.

Thus, it will be seen that, out of 18 kinds 17 have germinated, some partially, others freely, violets the sole exception, being difficult to raise from seed except in a hot bed.

I may add in conclusion that my mode of raising these seeds has been simply as follows :—

First, to make the soil fine, moistening it previously;—after sowing the seeds, cover them with still finer soil through a sieve. Place the pots in a shady place during the day, but remove them into the open at night for the benefit of dew. Shortly after germination remove the pots, first to a part of the garden, where they can get the benefit of the morning sun, and afterwards to a more exposed place, to strengthen the seedlings preparatory to pricking out in

open beds or in larger pots according to kinds. The majority of annuals, with exception of Mignonette, Pink, Linum, and Larkspur, should, in the first instance be sown in pots, and afterwards transplanted.

Floral Notes.

The letters next read had reference to the violet plants, presented by Mr. Francis, and to a cheap and efficacious mode of transporting plants from one part of the country to another. Mr Francis writes as follows, on the 13th November last:—

"I brought a quantity of plants with me from Naini Tal. As the boxes full of earth which I brought down last year cost a great deal, I made up my mind to economize, and shook off all the earth this time, leaving the roots quite bare, and simply wrapping them in damp moss. The result was that I brought down a goodly number of plants in a basket two feet broad, and the heat of the train made the damp moss act like a hot-bed, so that each plant emitted several fresh roots. I potted them out two days after arrival, and every plant is well and thriving. The Fuchsias, in particular look, wonderfully well.

"I am *simply overburthened* with violets, and am giving them away right and left It is wonderful how they increase and multiply here.

"Last year, I brought down two plants of the light purple primrose. They were put in a shady place to the north of my house, and flowered beautifully at the commencement of the year In spite of the extreme heat this year they have survived till now; and by dividing the roots, I have now got sixteen healthy plants. Would you like a plant or two for the Society? If so, I shall be glad to send them down next month, by which time they will be fully established. If you want any violets, I can let you have fifty plants at once."

In a subsequent letter, Mr. Francis adds—"I have sent a basket of violet plants. These are enough to form the nucleus of a good stock, but I can easily send you more if required.

"Each clump of plants represents the increase from five plants. These were all that I put into each pot about a year ago, and you can judge for yourself how they have increased and multiplied. Each rooted plant should be separated from the clump and planted out either in the open ground, (with a northern aspect and shaded from the midday and afternoon sun) or in pots. The roots should be cut to a length of not more than 2½ inches, and the plants should be put down about three inches apart. This treatment should be repeated each year, as soon as the cold weather sets in; and the plants will flower profusely. If (as is too often the case) violets are left to themselves year after year, they become pot-bound, and yield a few miserable looking flowers; whereas if they are treated in the mode which I have described, they thrive wonderfully. I have given away hundreds of plants, and have still a very large stock, though many plants perished from the extreme heat this year. All these plants have sprung from about twenty, which were given to me three years ago. They

were then at the point of death, as the pot containing them had been left untouched for some three years.

"I can let you have a pot of primroses in a month or so. They came down from Naini Tal last year, and I have multiplied two pots into ten, in spite of the hot weather."

Proposed extended utilization of the Singhara Nut.

The following remarks, dated 10th November, by Capt. Pogson, on the above subject were next submitted:—

"The publication of agricultural suggestions, in the Proceedings of the Agricultural and Horticultural Society, are productive of so much good that I am induced to ask you to utilise the subject matter of the enclosed letter published last October in the *Delhi Gazette*.

"With the example of Cashmere before us, it does seem very singular that the vauntéd tanks, large lakes, and inland fresh water sea of the Madras Presidency, as well as the immense jheels of the North-Western Provinces and Oudh are not, as a rule, turned to most profitable account, by being placed under *singhara* cultivation. The dried nuts will I believe keep for years, and as arrowroot or rather singhara starch will always sell in England, either as food or for manufacturing purposes, all old singhara stock could be so converted and sold.

"It would, I think, be advisable to publish in the Society's Proceedings, how to plant the water-nuts, and as annual extension of the cultivation spontaneous and artificial, is a very simple affair, the Madras Government would, in a few years, find themselves to be the proprietors of very valuable singhara nut plantations. In the N. W. Provinces and Oudh the systematic deepening of jheels by dredging machinery, worked by manual labour, would very soon give a general depth of three feet of water, and the excavated soil being systematically deposited on the sides of the jheel, a regular 'bund' or embankment would be formed which, if strong enough, would keep in all rain water, to be utilised on their cessation for purposes of artificial irrigation. The Government is by law sole proprietor of all, flowing and non-flowing water; hence the suggestions made cannot and may not be undertaken by 'private enterprise,' and if neglected, every year of drought or famine will run the State heavily into debt: whereas by taking a leaf out of Cashmeer's book, a very large supply of wholesome food may be annually produced for a song, and, if not immediately wanted, may be dried and stored and sold at discretion to the European or Parsee starch manufacturer."

In a subsequent communication of the 3rd December, Capt. Pogson continues the subject:—

"As my communication on the subject of 'singhara' cultivation was too late for your Society's meeting, held on the 12th November, I have thought it advisable to supply some further information.

To begin, I have sent to your address by this day's bangy post a small quantity of uncooked sun-dried singhara nut kernels. In the parcel you will find four kernels nearly black on one side, and not so dark coloured on the other.

"This result has been attained, by soaking the kernels for a few minutes, in an aqueous solution of sulphate of iron. The object in view being to prove that the skin covering the kernels is rich in pleasant flavoured tannin, and as iron must be present in the tough leathery shell of the green nut and also in the kernel, it is more than probable that the latter contains all the 'food phosphates' duly associated with starch and gluten. Hence it follows that like the grain of wheat, the kernel of the singhara is capable of sustaining life for an indefinite period, and is palatable whether seasoned with salt and pepper, and when made into porridge with sugar, goor or jaggry. If the kernels are broken into small bits, they may then be ground into meal in a hand-mill, and the produce may be kneaded up into dough, and made into small chuppatees. If the kernels be soaked overnight in cold water, next morning a single boil converts them into cooked food. Steaming would do as well, perhaps better, but I have as yet only tried the soaked kernels in the boiled state. I have years ago eaten hulwa, made of 'singhara' meal, and it was more palatable than that made from fine wheat flour.

"The price of the dried nuts, *this year*, is four annas a seer in the Simla bazar and two annas in Umballa. The consumers and purchasers are natives exclusively.

"I presume, when cheap, the price would be that of wheat, or over 20 seers for a Rupee.

"I find that as an average, a full grown nut kernel weighs 65 grains, which, gives 14 of them to the *chittack* of 900 grains, and 224 to the seer of 14,400 grains Troy.

"In the last *Indian Agriculturist* at page 354, is a paragraph on singhara culture as carried on at Indore. In it is stated that:—'The rent paid for an ordinary tank by the cultivator is about Rs. 100 a year.'

"If the dimensions of the tank had been given, a rough calculation might have been made of the produce per acre of water's surface.

"The shells of the ripe singhara when removed would, I think, yield a good manure for most crops, and when the cultivation of this valuable water-nut is once fairly established Government will always have a reserve of food and money in hand. At present the Bunneahs, by acting in concert, can easily charge famine prices on food grain. But with large stores of dried singharas in hand and the crop growing on the water's surface, the Bunneah may be most effectually kept under control, and check-mated if needs be.

"The Ganges, Jumna, and Punjab River Canals have produced water-logged lands, and fertile-lands sterilized by sulphate and muriate of soda called 'khar and kullur.' Genuine 'reh' lands are fertile, for 'reh' proper being a crude

carbonate of soda is of value as a mineral manure, and doubly so when it is associated with saltpetre.

"The fact of genuine 'reh' being quite another thing, and distinct from 'khar' and 'kullur' is practically demonstrated by old women and village dhoobees, washing dirty, oily clothes in soil, impregnated with 'reh' and called 'reh mittee.' The saponification proves the presence of carbonate of soda in ample quantity, and a simple but certain test is provided for distinguishing 'reh' from 'khur' and 'kullur.'

"It appears to me that if water-logged lands were embanked, so that four feet in depth of water could always be retained on their surface, that these, at present hopelessly unproductive lands, could be made to yield very paying crops of singhara.

"The 'khar' and 'kullur' lands, if similarly embanked and kept under water for say two or three months before the singhara sowing season set in, might become sufficiently sweetened to grow the singhara, and as it is these soils which produce malaria and fevers, by keeping them permanently under water, future salubrity might be secured and a paying food crop as well.

"The common Indian name for fevers is 'Bookhar,' a compound word meaning smell of effluvia from sulphate of soda, *i. e.*, 'Boo' a bad smell, 'Khar,' alkaline, or saline matter, and it is not a little strange that the Medical Officers who have investigated the source whence fevers are produced on the Coast of Africa, have affirmed that such fevers are due to the inhalations of a gas evolved from the decomposition of vegetable and saline matters.

"As regards the Canal water-logged lands, the embankments once properly and strongly constructed, they would be permanently available for singhara cultivation, and as fish of good size and quality may be reared in less than three feet depth of fresh water, the suggestion, if carried out, would bring grist to the State mill, and wholesome food and fish to the *zemindars'* and *ryots'* doors.

The following are the particulars inserted in the *Delhi Gazette* :—

"In your impression of the 12th of October you have reproduced from the *World* (newspaper) an article headed, 'Why are not Indian Famines Prevented,' and from its perusal I learn that the Madras Presidency possesses some magnificent ancient water works which are described as follows, *viz* :—'The Viranum tank, with its area of thirty-five square miles, and its embankment of twelve miles; Cauverpauk tank with its embankment of four miles, riveted along its entire length with stone; the Chembrumbankum tank, looking like a picturesque inland sea, are of unknown antiquity.'

"The first of these artificial lakes equals 22,400 acres of surface; and the third, being compared to an 'Inland sea,' may be ten times that size.

"I have in a former paper drawn attention to the remarkable and very important officially authenticated fact, that in Cashmere THIRTY-THOUSAND human beings are for five months out of the twelve fed and sustained on the

'singara,' or water-nut (*Trapa bispinosa*) of India, and if the *picturesque inland sea* under notice is at all deserving of the name, its bed and water surface might be most profitably utilized by being put under 'singara' cultivation.

"This 'singara,' harvest will soon commence in the plains, and if a sufficient quantity of the nuts be secured and sent by rail to Madras, the tank of 35 square miles might become a first-class nursery for supplying seed nuts to all Madras. The productiveness of the water-nut per acre is at present unknown; but supposing the yield to be four quarters (480 lbs. each.) of nut kernels per acre, then the 22,400 acres will give 43,008,000 pounds of food, and at sixty pounds per adult per month, the above quantity will suffice to feed 7,16,800 human beings for one month, and 1,43,360 adults for five months.

"The cost of this large and perennial supply of food would be a mere trifle. There are 4000 square land yards in one acre, and allowing one seed nut to each, the price of the nuts and railway freight may be easily calculated. The first year's harvest will more than cover all cost, and thereafter, in perpetuity, a harvest will result which would only have to bear the cost of watch, ward, and collection. The entire crop being State property, a very considerable revenue would be derived from the sale of the nuts, even if the kernels were sold at half the price of rice or other grain.

"In good seasons the agricultural population would freely use this cheap and nourishing food, and sell and export rice crops, &c.; and in bad seasons or famine the growing crop of water-nuts would be a stand-by. In fact, their presence would go far to prevent the artificial production of local famines.

"The nuts once sown re-sow themselves, and in this way the square land yard might soon be growing nine water-nut plants or more per square land yard.

The *Inland Sea*, when covered with these nuts, would be a source of wealth to the State, and the people would be greatly benefited. Immediate action, and judicious liberality is all that is needed to carry out the measure."

Reana luxurians.

Several communications were submitted in respect to the above grass.

Mr. W. B. Carshore, of Shahpore, Oondee, Tirhoot.—"I am glad to inform you that my *Reana luxurians* has perfected its seed; I have cut one plant, and have got 1½ lbs. of good seed from same. The seed on the other plants has not ripened yet. The time for the Reana to flower seems to be the same as when the Tirhoot *Jenera* flowers. Natives will readily cultivate it as a fodder plant, as I have been applied to for seed by those who have seen my cattle eating the grass. The cattle themselves seem to be very fond of it, as I had great difficulty in keeping away a braminee bull who came at night to feed."

Mr. James Carey, of Indore.—"Last year I think you very kindly sent me a packet of the *Reana luxurians* grass seeds.

"It has grown splendidly in my garden, is now in seed, height over seven feet. The drawback is it requires irrigation; the tufts commenced to dry up very

soon after the rain ceased, and since I commenced to give them water, they are springing up with fresh vigour.

"My cows eat it readily, and I have no doubt when I mix it (chopped up) with the leaf of the 'Prickly Comfrey,' which also grows well in my garden (and which cattle will not all eat) I shall get a very nutritious food."

Mr. Francis Halsey, of Madhopore, Punjab.—"I saw in a late Garden Report that your *Reana luxurians* had shewed no signs of flower; mine is now in full flower. It is evidently a species of Indian Corn. The male flower at the top of the stalk, and a cob forming at every joint of the stalk; but I much fear it will not have time to ripen its seeds up here before the cold sets in. It is a very open season, however, and I hope for the best. Lower down India it should succeed admirably, and should turn out a very valuable introduction."

Capt. J. F. Pogson, Simla.—"I have now the pleasure to inform you that out of 12 plants of *Reana luxurians* raised from seed sent me by you, ten are coming into flour. The two plants not in flour were transplanted to fill up two vacancies caused by my having given away one plant, three feet in height, and having cut the other up into eight parts with roots attached for propogation. All these, as well as two suckers removed from a vigorous plant, have struck, and I have accordingly 22 plants. Of those coming into flower, one has thirteen spikes, another seven, and none less than two. If the present weather continues, I think the flowers will mature and ripen seed. But a sudden frost may knock all my trouble and anticipations on the head."

The Secretary placed on the table a quantity of seed—about three pints—gathered from a few plants in his garden,—thus showing the abundance of yield. There will now shortly be sufficient in hand for general distribution next year. He had just sent a supply to the Revenue Commissioner, Southern Division, Poonah, on the requisition of the Department of Agriculture and Commerce.

A. H. BLECHYNDEN,
Secretary.

REPORT

OF THE

Agricultural and Horticultural Society

OF

INDIA.

Report from the Council, at the Annual General Meeting held on the 30th January, 1878.

THE Council, render, as usual, at the close of the year, an account of the working of the Society, its monetary position and progress.

And first in respect to Members, they have to state, that the number elected, is less than in 1876, *viz.*, 80 against 91, and the declared resignation 54 against 32. The number of names removed in 1877 for non-payment of subscriptions for 1876-77 is 32; for * deaths 13, and on account of long absence from India 13, making a total deduction of 112, thus reducing the number of the 787 Members in 1876 to 755 classed as follows:—Life Members 31, Honorary, Associate, and Corresponding 18, and nominal-paying Members 706; of the latter there are 74 absent from India and 82 who have failed to contribute to the funds of the Society in 1877, thus reducing the actual effective number of paying Members to 550. Of the total number of all classes 130 are resident in Calcutta, 530

* A. E. Abbott, T. W. Armstrong, Capt. A. C. Dando, Coomar Grees Chunder Singh, Maharajah Jungh Bahadoor, R. McAlpine, Nobin Chunder Nag, Maharajah Ramanath Tagore, Col. A. O. Rooke, J. T. Rowett, A. E. Sharpley, B. J. Yate, and J. P. Langlois.

in other parts of the country, and 96 in Europe, bringing up the total as specified in the following classified statement:—

Classification.	In 50 previous years.	In 1871.	In 1872.	In 1873.	In 1874.	In 1875.	In 1876.	In 1877.	Gross Total.	Total real number at the close of 1876 after deducting lapses.
Honorary Members	20	2	0	0	0	1	1	0	24	9
Associate Members ...	6	0	0	0	0	0	0	0	6	2
Corresponding Members.	14	0	0	0	1	0	0	0	15	7
Civilians, Covenanted and Uncovenanted ...	693	24	14	10	14	16	14	5	790	88
Merchants and Traders.	606	14	10	10	18	15	9	2	684	89
Agriculturists	596	22	27	19	41	90	30	31	856	269
Military Officers ...	639	34	12	15	4	4	6	4	718	76
Medical Officers ...	229	8	8	7	6	7	5	2	272	36
Asiatics...	267	16	8	8	25	10	15	19	368	99
Clergy...	39	0	1	1	0	0	0	0	41	4
Law Officers	121	4	4	2	6	6	1	0	144	22
Miscellaneous, Police, Civil Engr., &c. ...	137	9	3	17	8	12	10	17	213	54
Total ...	3367	133	87	89	123	161	91	80	4131	755

From the financial statement appended it will be observed that the position is much the same as last year. The annual donation of Rs. 2,400 from the Government of Bengal has now ceased, as it was granted only for three years. A further application to the Government for the renewal of the allowance, or for State assistance in some other form, is under consideration. The amount of subscription realized in 1877 is Rs. 1,500 less than in 1876. There is very little difference in other sources of income, except in the proceeds for ornamental plants and fruit grafts, which are about Rs. 650 less than in the previous year.

The following is the amount of arrears for the last four years:—

Balance of arrears for the year 1874	Rs.	113 5 7
Ditto ditto ditto 1875	„	265 3 5
Ditto ditto ditto 1876	„	284 13 6
Arrears for the year 1877	„	1,450 15 6
Total Rupees		2,114 6 0

It is satisfactory to note that the sum of Rs. 1,248-6-9 has been collected during 1877 of the arrears (1,910-13-3) of the three previous years.

In regard to the Garden it may be mentioned that the distribution of plants to members has somewhat increased, though the number of applicants is still smaller than might be expected. In addition to the privilege of the indenting on the Garden annually to the value of twenty Rupees, it has been recently determined to allow members to purchase ordinary ornamental plants, in excess of the free allowance, at half price, Two hundred and forty-four applicants against 209 in 1876 received 7,972 ornamental rooted shrubs against 6,139 in the previous year; besides 429 bundles of rose cuttings and 50 bundles of cuttings of other plants, which is also an increase on 1876. There were 2,052 ornamental plants sold to members and others, and 1,612 fruits, grafts and seedlings, consisting principally of mangoes, peaches, and lyches, against 1,594 in 1876. Five hundred and eighty sugar-cane cuttings were also distributed. The stock in the Garden of all kinds (ornamental plants and fruit-grafts) has been steadily augmented, though a large part of the former consists of ordinary sorts, such as the Society is not often called upon to furnish, and these plants will consequently have to be otherwise disposed of. The orchard, which may be considered the most valuable portion of the garden has, during the past year, received additions in stock plants, principally of peaches, lychees, and pummelows imported from China and Queensland.

The Council have again to tender their best acknowledgments to members and others for contributions of plants and seeds, including the Directors of the Royal Botanic Gardens of Kew, Calcutta, and Mauritius, the Queensland Acclimatisation Society, the Department of Agriculture, Melbourne, the Director of Agriculture and Commerce, North-West Provinces; Messrs. C. K. Hudson, C. Nickels, H. E. Abbott, and T. M. Francis. An interchange of plants has also been continued throughout the year.

Various subjects have come before the Society during the year, of which full particulars have been introduced in the monthly proceedings. Among these may be cited in this place the endeavours at improvement in the culture and manufacture of tobacco: the introduction of new kinds of potatos; the attempts towards the introduction of Oregon and other descriptions of wheat; the satisfactory result of culture of Mangel Wurzel, and other field crops in Tirhoot; reports on blights affecting certain kinds of Rice and Jowar (*Sorghum Vulgare:*) the introduction of a new fodder grass, (*Reana luxurians*, syn, *Euchlæna luxurians*) and a new variety of cotton from Egypt, termed Bahmia. The Reana grass, it may be remarked, has taken kindly to the country, as evidenced by many letters from

members who have been supplied with seeds, and is likely to prove a valuable addition to our list of forage plants. It is an annual, but seeds most freely, and therefore the continuance of a crop annually may be confidently anticipated. The stalks contain saccharine matter and possess nutritious properties. It forms large tufts, where ample space is allowed for its development; a single tuft is said to be sufficient to supply an ox with food for a day. A quantity of seeds has been recently gathered from plants raised in the Society's Garden which will be fully distributed in due time, the commencement of the rainy season. Seeds of the new variety of cotton (for which the Society is indebted to Mr. Chapman, agent to the P. & O. Company at Alexandria) have been freely distributed in small quantities, throughout the country, but the time has not yet arrived to report fully on the result. It may merely be remarked at present, that the report of its being a hybrid production between our "Dheros" (*Hibiscus esculentus*) and the Egyptian cotton would appear to be questionable, though the mode of growth certainly differs in various ways from the ordinary native and foreign varieties. The produce recently gathered partakes much of the character of *Gossypium Barbadense*. If, however, it fulfils the expectations formed of it in respect to yield, &c., it will probably prove an important addition to our present stock of cultivated varieties.

Another and most important subject which has engaged attention during the year has been that of blights of various kinds affecting tea plants. The Council are endeavouring to organize a full enquiry in respect to a thorough investigation of the several causes of blight, and have requested the co-operation of Agents of gardens towards the proposed scheme. They have also obtained the kind assistance of Mr. Arthur Grote, (a former President of the Society and one of its firmest supporters) to endeavour to ascertain if the service of a thoroughly practical Entomologist can be secured for the purpose, and on what terms.

From paucity of papers of sufficient length the Council have been unable to issue a number of the Journal during the year, but they hope to be able to do so early in 1878. The monthly proceedings which are widely circulated contain a variety of useful and interesting notices.

Statement of Receipts and Disbursements of the AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA, *from 1st January to 31st December*, 1877.

RECEIPTS.

From	Members—Subscriptions collected during the year				19,514	2	9
„	Accruings of Interest on Government Securities				99	12	0
„	Proceeds of country vegetable—acclimated flower and other seeds	350	0	0			
„	Proceeds of surplus stock of American vegetable—French vegetable, and flower seeds, and Melbourne field seeds ...	2,266	4	0			
„	Government,—proceeds of American vegetable and French flower seeds especially imported for Government	1,624	6	9			
„	proceeds of fruit grafts	883	9	0			
„	proceeds of copies of Journals of the Society	4	0	0			
„	proceeds of copies of other publications of the Society	105	8	0			
„	proceeds of seed cabinets sold ...	41	0	0			
„	proceeds of copies of Hand-book for Indian Vegetable Garden	77	0	0			
„	amount of freight repaid	627	12	1			
„	amount of suspense account in deposit for appropriation on various accounts ...	222	1	0			
„	proceeds of sale of ornamental plants, grass, &c., &c., and cooly hire at the garden ..	1,510	3	0			
					7,741	11	10
„	Agency Seed Department—Amount from Members in repayment of packing and forwarding charges, pots, boxes, &c.				3,475	14	0
	Total, Ordinary Receipts, Rs.... ...				30,834	8	7
	EXTRAORDINARY RECEIPTS.						
From	Government of Bengal—Donation from December 1876 to November 1877				2,400	0	0
	Total, Rupees				33,234	8	7
Balance in the Bank of Bengal on 31st December 1876					6,021	7	2
	GRAND TOTAL, Rupees				39,255	15	9

DISBURSEMENTS.

PURCHASE OF SEED ACCOUNT.

By	Messrs. D. Landreth and Sons, on account of consignment of seeds received in 1876, and in part for 1877	3,449	1	6			
„	Messrs. Vilmorin, Andrieux & Co., on account ditto ditto ditto ...	3,449	1	6			
„	Robt. Buist, Jr., on account ditto ditto ditto ...	1,954	8	0			
	Carried over ...	8,852	11	0			

	Brought forward ...	8,852	11	0		
By Messrs. Law, Somner & Co., on account of consignment of seeds received in 1877 in full		172	2	0		
„ Remittances made for consignment of seeds imported for Government ...		1,252	12	0		
„ A. & H. Society, Lucknow, on account acclimatised flower seeds in full ...		311	3	6		
„ Sundry parties for country vegetable seeds, potatos, &c &c., ...		154	15	0		
					10,743	11 6

LIBRARY ACCOUNT.

By Messrs. H. S. King and Co. for sundry publications		126	0	3		
„ Sundry parties for books purchased ...		17	5	0		
„ Duftry for binding books		17	0	0		
					160	5 3

PRINTING ACCOUNT.

By Messrs. T. Black Co., for printing letters of calls, money receipts, annual reports, &c. &c.					134	8 0

FURNITURE ACCOUNT.

By sundry parties for reparing furniture					16	0 0

ESTABLISHMENT ACCOUNT.

By Office Establishment from December 1876, to November, 1877		8,645	8	0		
„ Agency Seed Department do do ...		3,000	0	0		
					11,645	8 0

ADVERTISEMENT ACCOUNT.

By advertising notices of meetings, seeds for distribution, and surplus seeds for sale, &c					65	12 0

FREIGHT ACCOUNT.

By freight paid on Australian field seeds, and Mr. Buists American vegetable seeds ...		128	9	6		
„ freight paid on packages of seeds, plants, &c., sent to Members		694	3	6		
					822	13 0

METCALFE HALL ACCOUNT.

By proportion of House rates from July, 1876, to September, 1877, and Police, Lighting and Water rates from October, 1876 to December, 1877		711	0	0		
„ Sundry petty repairs to the building ...		64	10	0		
					775	10 0

STATIONERY ACCOUNT.

„ Sundry parties for stationery purchased ...					57	14 0
	Carried forward ...				24,422	1 9

				Brought forward ..		24,423	1 9
				Re-fund Account.			
By amount refunded balances of accounts due to Members					246 15 6		
„ Ditto do for seed cabinets sold ...					31 0 0		
„ Ditto do for Hand-book for Indian Vegetable Gardens ...					68 0 0		
						345 15 6	
				Petty Charges Accounts.			
By postage on letters, circulars, &c. &c., sent and received					134 9 6		
„ Punkawallahs, hackery, boat and cooly hire, extra packerman, landing and forwarding charges, cost of wax-cloth, sealing-wax, twine, &c. &c.					524 2 3		
						658 11 9	
				Purchase of Plants.			
By Messrs. Shepherd and Co., balance in full for new and rare plants supplied in 1876 ..					83 1 6		
„ Sundry parties for fruit grafts, flowering shrubs purchased					207 15 3	291 0 9	
				Live Stock Account.			
By cost of a pair of bullocks purchased ...					...	64 0 0	
				Garden Account.			
By cost of sundry materials and for propagation of roses, fruit grafts, orchids, &c., ...	429 4 6						
„ cost of tools, implements, boxes, pots and contingencies, &c. ...	1,093 7 0				1,522 11 6		
„ Salary of Head Gardener from December, 1876, to November, 1877	2,270 0 0						
„ Wages of Native Establishment, Mallies, Coolies, &c. ...	2,426 6 9				4,696 6 9		
						6,219 2 3	
Total Expenditure, Rupees ...					...	32,001 0 0	
By balance in the Bank of Bengal on 31st December, 1877					...	7,254 15 9	
				Grand Total, Rupees	...	39,255 15 9	

MEMORANDUM.

DISBURSEMENTS.

To amount of ordinary disbursements during the year 1877, as per statement ..			25,781	13	9
,, Amount of Garden expenditure during the year 1877, as per statement ..			6,219	2	3
Total Rupees ..			32,001	0	0
,, Balance in the Bank of Bengal on 31st December, 1877			7,254	15	9
GRAND TOTAL, Rupees ..			39,255	15	9

LIABILITIES.

Messrs. D. Landreth and Son, for balance of vegetable seeds supplied in 1877	£	70	19	0
Vilmorin, Andrieux & Co., Do. ,,		18	19	0
Robt. Buist, Jr., for ditto ditto .. ,,		25	5	9
		115	3	0 @ 1s. 9d.
Rupees ..		1,316	6	9

RECEIPTS.

By balance in the Bank of Bengal on 31st December 1876			6,021	7	2
,, amount of ordinary receipts during the year 1877 as follows:—					
Subscription, &c., ...	27,378	10	7		
Agency Seed Department ..	3,475	14	0		
	30,854	8	7		
Government of Bengal Donation	2,400	0	0		
Total Receipts, Rupees ..			33,234	8	7
GRAND TOTAL, Rupees ..			39,255	15	9

ASSETS.

Amount of Cash Balance			7,254	15	9
Balance of subscription, &c., due from Members from 1874 to 1876	663	6	6		
Ditto ditto for 1877, as follows:—					
Balance of subscription, Rs. 894 10 6					
Balance of seeds, grafts, and freight, &c. .. 556 5 0	1,450	15	6	2,114	6	0
Total Rs. ..			9,369	5	9

Memo:

Society's proportion cost of erecting the Metcalfe Hall	23,557	15	9	
In landed property including building at Alipore	20,646	6	0	
			44,204	5	9

LIST OF MEMBERS

OF THE

Agricultural and Horticultural Society

OF

INDIA.

DECEMBER 31st, 1877.

ALPHABETICALLY ARRANGED,

CLASSIFIED,

AND

DISTINGUISHING THE YEAR OF ADMISSION.

Office Bearers.

President.

THE HON'BLE LOUIS JACKSON, C. I. E.

Vice-Presidents:

S. H. ROBINSON, Esq.
BABOO GONENDRONATH TAGORE.
THE HON'BLE SIR RD. GARTH.
DR. GEO. KING.

Secretary and Treasurer.

A. H. BLECHYNDEN, Esq.

Members of Council:

R. BLECHYNDEN, Esq.
BABOO PEARY CHAND MITTRA.
E. BROUGHTON, Esq.
J. W. O'KEEFE, Esq.
W. H. COGSWELL, Esq.
RAJAH SUTTYANUND GHOSAL.
DR. S. LYNCH.
H. J. LEITCH, Esq.
G. L. KEMP, Esq.
BABOO PROTAPA CHANDRA GHOSA.
J. E. MACLACHLAN, Esq.
W. STALKARTT, Esq.

Patron.

HIS EXCELLENCY THE RIGHT HON'BLE
EDWARD ROBERT LYTTON, BULWER-LYTTON, BARON
LYTTON OF KNEBWORTH, G. M. S. I.,
Viceroy and Governor-General of India

List of Members.

* This mark denotes Members who are absent from India, and therefore non-contributors.

† This mark denotes Members who, though absent, are desirous of continuing their subscriptions.

HONORARY MEMBERS.

	Don Ramon de la Sagra, Island of Cuba ...		
	The Right Hon'ble Sir Lawrence Peel, London	1842	1856
	R. Fortune, Esq., London ...		1856
	A. Grote, Esq., London ...	1837	1868
5	The Revd. T. A. C. Firminger, London	1851	1868
	Baboo Peary Chand Mittra, Calcutta	1847	1871
	John Scott, Esq., Patna ...		1871
	J. A. Crawford, Esq., London ...	1857	1874
	F. L. Beaufort, Esq., England ...	1838	1876

CORRESPONDING MEMBERS.

10	D. J. MacGowan, Esq., M. D., Ningpo	1851
	Mons. Natalis Rondot, Paris	1858
	Lieut.-Col. W. H. Lowther, Benares	1864
	Dr. H. Cleghorn, Stravithee, St. Andrews, N. B.	1867
	Vause Fretwell, Esq., Supdt. of Model Farms at Bhurgaums, Kandeish	1869
15	C. Brownlow, Esq., Cachar	1870
	Samuel Jennings, Esq., London	1874

ASSOCIATE MEMBERS.

	Capt. E. P. Nisbet, London ...	1842
	Geo. Bartlett, Esq., Calcutta ...	1870

LIFE MEMBERS.

		Admitted.
	Anund Rao Puar, His Highness, the Rajah of Dhar, Dhar, *viâ* Indore, C. I.	1872
	Bentall,* Edward, Esq.	1837
	Bhopal, H. H. the Begum of	1870
	Bhowany Sing, Maharajah, Duttea	1864
5	Bishop,* Major H. P. (Artillery)	1853

LIFE MEMBERS.—(*Continued.*)

		Admitted.
	Bishuath Sing, Rajah Bahadoor, Chief of Chutterpore, Bundlekund	1875
	Brodie, * Major T.	1836
	Buller, * Frederic Pole, Esq.	1837
	Carew, † R. R., Esq.	1846
10	Chhat Sing Bahadoor, Maharajah of Samthar ...	1877
	Chatter Patti Rao. Jagirdar of Alipoorah ...	1876
	Colvile, * Sir J. W	1849
	Gopaul Sing, Rajah of Jabooah, *viâ* Indore ...	1874
	Hawkins, * John Abraham Francis, Esq. ...	1837
15	Joy Sing, Deo Bahadoor, Maharajah of Chikari ...	1868
	Lowther, * Robert, Esq.	1836
	Maharaj, Dhiraj Matabchunder Bahadoor, Rajah of Burdwan	1836
	Maharajah of Johore	1868
	Manikjee Rustomjee, Esq, Merchant, Calcutta ...	1837
20	Mohender Pertab Singh, Maharajah, Bahadoor of Orcha, Tehri	1876
	Muhammud Hussin Khan Bahadoor, Nawab-zada of Baonie	1877
	Munsier Ali, H. H., The Nawab Nazim of Bengal ...	1874
	Palmer, * T. A. G., Esq.	1861
	Rajkissen Mookerjee, Baboo, Landholder, Oterparah	1836
25	Richards, * J., Esq., Merchant	1834
	Roodurpurshaud, Chowdry, Nanpore, Tirhoot ...	1867
	Roop Deo, Rajah of Ali-Rajpore, *viâ* Sirdarpore, C. I.	1874
	Roordur Purtab Sing, Rajah Bahadoor, Dewan of Panna	1868
	Suttyanundo Ghosal, Rajah Bahadoor, Bhookoylas...	1869
30	Thompson, Dr. R. E., Hooghly	1865
	Wigram, Percy, Esq., C. S., Muttra	1871

ORDINARY MEMBERS.

A.

		Admitted.
	Abbott, Horace, Esq., Rajapore, *viâ* Koosteah ...	1858
	Abbott, H. E., Esq., Manager, Jaintpore Factory, Tirhoot	1874
	Abdool Gunny, Kajee, Nawab, Zemindar, Dacca ...	1860
	Ady, Charles, Esq., Merchant, Moulmein ...	1864
5	Agabeg, Thadeus, Indigo Planter, Baraset ...	1875
	Ahmed, Dr. Z A., Civil Surgeon, S. P. Doomka ...	1875
	Ahmed Khan, Bahadoor, Syed, C. S. I., Alygurh ...	1877

A.—(*Continued.*)

		Admitted.
	Aitchison, W., Esq., Manager, Dooloo Tea Garden, Cachar	1869
	Ainslie, W. D., Esq., Kimidi, Ganjam	1875
10	Alexander, N. Stuart, Esq., C. S., Tipperah ...	1864
	Allen, W. S., Esq., Asst. Conservator of Forests, Madhopore, Punjaub ...	1876
	Allen, J. J., Esq., Furka-ting, Assam	1877
	Ameer Allee Khan, Nawab, Bahadoor, Calcutta ...	1869
	Amos, W. G., Esq., Calcutta	1876
15	Anderson, Col. F. C., Depy. Supdt., Revenue Survey, Banda	1876
	Andrews, S. J., Esq., Gadee Zillah, Moorshŏdabad...	1876
	Angelo, E., Esq., Cossipore	1873
	Anthony, Adam, Esq., 1st Assistant Accountant-General, Allahabad	1870
	Arbuthnot, The Hon'ble Sir A. J., K.C.S.I., Calcutta	1876
20	Armstrong, Joseph Samuel, Esq., C. S., Pooree ...	1865
	Assistant Manager, Ting Ling Tea Co., Darjeeling...	1875
	Assistant Manager, Singbulli and Nurmah Tea Co., Limited, Darjeeling	1875
	Assistant Commissioner, Jhansi	1877
	Atkinson, Alex., Esq., C. E., Bongaon, Mainpuri ...	1877

B.

25	Banon, Lieut. A., 39th N. I., Meerut ...	1877
	Banee Madhub Roy Chowdry, Zemindar, Allahabad	1873
	Banee Madhub Sen, Baboo, Calcutta	1875
	Bannerman, Major P. W., Pol. Agent, Bhagelkund (Rewah)	1876
	Bean, Mrs. E., Bankipore	1877
30	Barber, H. W., Esq., Deputy Magistrate, Chittagong	1875
	Barker,* Dr. R. A., Civil Surgeon, Bogra ...	1870
	Barlow, G. N., Esq., Civil Service, Patna ...	1864
	Barron, Capt. W., Dy. Supdt., Revenue Survey, 4th or Moradabad District, Nynee Tal	1871
	Barry, Dr. J. B., Calcutta	1877
35	Barstow, H. C., Esq., Civil Service, Ghazipore ...	1868
	Barton, E. J., Esq., C. S., Burisal	1874
	Bayley, The Hon'ble Sir E. C., Civil Service, Calcutta	1863
	Bean, Mrs. E., Bankipore	1877
	Beaumont, Dr. Thomas, Residency Surgeon, Indore	1870

B.—(*Continued.*)

		Admitted.
40	Beckett, W. O. A., Esq., Dy. Commr., Sylhet ...	1871
	Beckett,* H. B., Esq., Depy. Commissioner. ...	1876
	Beeby, G. O., Esq., Solicitor, Calcutta... ...	1866
	Behari Lall Pyne, Baboo, Calcutta	1876
	Bell, H. C., Esq., Nurbong, Kurseong ...	1877
45	Bennett, Walter H., Esq., Supt., New Tea Concern, Assam	1873
	Benson, George, Esq., Pleader, High Court, N.-W.-P., Bareilly	1868
	Benwell, W. M., Esq., Calcutta	1876
	Beveridge, H., Esq., c. s., Rungpore	1865
	Bhugwan Chunder Bose, Baboo, Deputy Magistrate, Cutwa	1875
50	Bignell, R. A. D'O., Esq., Assistant Superintendent of Police, Nya Doomka	1867
	Bimala Churn Bhuttacharjea, Deputy Collector and Magistrate, Nowada, *viâ* Behar	1870
	Binning, J., Esq., Calcutta	1877
	Blandford, A., Turtipore Indigo Concern, Malda ...	1875
	Blathwayt,* Capt. L., Assistant Commissioner ...	1871
55	Blechynden, R., Esq., Merchant, Calcutta ...	1858
	Blechynden, A. H., Esq., Secretary, Agri-Hort. Society of India, Calcutta	1851
	Blissett, T., Esq, Govt. Tel. Department ...	1874
	Blyth, W. D., Esq., c. s., 24-Pergunnahs ...	1876
	Boddam, Col. Hungerford, Hazarecbaugh ...	1871
60	Boileau, G. W. K., Esq., Surdah Silk Concern, Rajshahye	1874
	Bond,* T. T., Govt. Engineer	1873
	Bonnaud, Arthur, Esq., Merchant, Calcutta ...	1873
	Bowers, Mrs., Bhuptani, Protaubgunge, Bhaugulpore	1872
	Bowser, Dr. H C., Calcutta	1876
65	Boxwell, J., Esq., c. s., Nya Doomka	1874
	Brac, T., Esq., Debracole, Commercolly, E. B. Railway	1854
	Brander, James, Esq., E. B. Railway, Sealdah ...	1865
	Brandis, Dr. D., Inspector-General of Forests ...	1874
	Branson, J. H. Esq., *Barrister-at-Law*, Calcutta ...	1874
70	Bridgman, J. H., Esq., Goruckpore	1868
	Brodhurst, M., Esq., Civil Service, Benares ...	1859
	Broucke, W. J., Esq., Indigo Planter, Bhugha Factory, *viâ* Chumparun	1859
	Broughton, E., Esq., Merchant, Calcutta ...	1865
	Brown, Forbes Scott, Esq., Merchant, Penang ...	1840
75	Brown, Hon'ble H. F., Merchant, Calcutta ...	1875

B.—(*Continued.*)

		Admitted.
	Brown, Lord Ulick, Civil Service, Rajshahye ...	1876
	Bruce, H. W., Esq., Tea Planter, Tezpore, Assam...	1876
	Bryce, J., Esq., Kallygunge, Rungpore... ...	1877
	Buck, E. C., Esq., C. S., Allahabad	1870
80	Bull, Alexis, Esq., Bambarria Tea Estate, Seebsagar, Assam	1875
	Burkinyoung, H. H., Oating Factory, Golaghat, Assam	1875
	Buskin, E. G., Esq., Calcutta	1864
	Buskin, M., Esq, Serepore Factory	1870
	Butler, Walter, Naga Doolia Factory, Jorehaut, Assam	1858
85	Butt, Geo., Esq., Civil Service, Allahabad ...	1866
	Byrne, William A., Esq.	1870

C.

	Calder, G. L., Esq., E. B. Railway, Kanchraparah ..	1871
	Campbell, D. W., Esq., Locomotive Supdt., E. I. Railway, Jamalpore	1870
	Campbell, A., Esq., Tea Planter, Manager, Michi Tea Estate, Kurseong	1872
90	Campbell, W. A., Esq., Manager, Sungoo River Tea Plantation, Chittagong	1874
	Campbell, A. C., Esq., Offg. Depy. Commr., Goalpara	1877
	Campbell, A. S., Esq., Tea Planter, Debrooghur ...	1877
	Cantonment Magistrate, Cawnpore	1873
	Cantonment Magistrate, Lucknow	1876
95	Carew, R. H., Esq., Tea Planter, Cachar ...	1874
	Carleton, C. F., Esq., Indigo Planter, Meerpore, Motecharry, Chumparun...	1868
	Carnac, H. Rivett, Esq., C. S., Ghazepore ...	1869
	Carey, J., Esq., C. E., Indore	1875
	Carter, F. McL., Esq., Chandpore Tea Estate, Chittagong	1875
100	Carshore, Walter B., Nundinee Fy., Shapore, Oondse	1875
	Carnegy, P. T., Esq., Asst. Comr., Gowhatty, Assam	1872
	Carritt, Alfred, Esq., Merchant	1873
	Castle, * C. T., Esq., Supdt. of Police	1865
	Chamarett, A., Esq., Surveyor Genl.'s Dept., Calcutta	1874
105	Chapman, A. W., Esq., Broker, Calcutta ...	1877
	Chardon, W. B., Esq., Seepah Factory, *viâ* Arrah ...	1864
	Charriol, F., Esq., Merchant, Calcutta	1875
	Chairman, Kishnaghur Municipality, Kishnaghur ...	1875
	Cheetham, W. H., Esq., Merchant, Calcutta ...	1870
110	Chester, Major, H. D. E. W., Officiating S. A. C. G., Allahabad	1869

C.—(Continued)

		Admitted.
	Christian, A., Esq., Putterghat Factory, Mudheepooral, Bhaugulpore	1872
	Christian, E., Esq., Bugha, Champarun ...	1875
	Chunder Caunt Mookerjee, Baboo, Calcutta ...	1866
	Chunder Coomar Roy, Baboo, Norail	1876
115	Chunder Kirtee Singh, Maharajah of Munnipore ...	1874
	Clark, Col. E. G., Settlement Officer, Kheree (Oude)	1872
	Clarke, The Hon'ble Sir A., K. C. M., G. C. B. ...	1876
	Claxton, E., Esq., Dy. Controller of Accts., P. W. D., Allahabad	1875
	Cogswell, W. H., Esq., Calcutta	1866
120	Cole, Conductor Thos., Secundrabad, Deccan ...	1873
	Cole, Revd. J., Supdt. Lawrence Asylum, Sanawur	1865
	Collins, Capt. W. B.	1873
	Collis,* F. S., Esq., *Barrister-at-Law*	1871
	Collier, F. R. S., Esq., C. S., Kungram, Rungpore ...	1875
125	Cooke, F. C., Esq., Taleah Factory, *vid* Burhuj, Goruckpore	1866
	Coombe, Dr. F. S., Khagoul, Dinapore ...	1877
	Cooper, Dr. A. D., Civil Medical Officer, Naga Hills	1876
	Cornell, W., Esq., Civil Service, Bankura ...	1861
	Corse-Scott, Capt. J., 37th N. I., Bareilly ...	1876
130	Cossemt,* Lewis, Esq., Indigo Planter ...	1859
	Courneuve, F. E. T. dela, Esq., Raneegunge ...	1876
	Cowie,* E. H., Esq., Merchant ...	1874
	Cowley,* F. W. R., Esq., Civil Service, Bhaugulpore	1867
	Coxhead, T., E. Esq., C. S., Moorshedabad ...	1875
135	Creaton, W. E., Esq., Merchant, Calcutta ...	1875
	Cresswell, W. S., Esq., Merchant, Calcutta ...	1874
	Cresswell, H. T., Esq., Shahpore Oondy Factory, Barrh, Tirhoot	1874
	Crisp, Ralph, Esq., Oating Factory, Golaghat, Assam	1877
	Crowdy, Charles, Esq., Adrukt Factory, Beguserai, Monghyr	1875
140	Crowdy, L. J., Esq., Manghot Factory, Beguserai, Monghyr	1875
	Crosthwaite,* R. J., Esq., B. A. C. S.	1869
	Cumming, W., Esq., Indigo Planter, Muniharee Factory, Sahebgunge	1851
	Currie, G. M., Esq., Civil Service, Dacca ...	1868
	Curtis, * J. F., Esq., Indigo Planter	1860

D.

145	DaCosta, Joseph, Esq., Pleader, Civil Court, Bhaugulpore	1865

D.—(*Continued.*)

		Admitted.
	Dalbusset, E., Esq., Merchant, Calcutta ...	1871
	Dalgliesh, E. W., Esq., Tea Planter, Dulsing Serai, Tirhoot	1873
	Dallas, J. P., Esq., Dooars Tea Coy., Julpigoree ...	1877
	Daly, F. D., Esq., Manager, Simla Bank, Umballa ...	1867
150	Daly, R. M., Esq., H. M., Bengal Marine, Calcutta ...	1869
	Dashwood, * H. W., Esq., Civil Service ...	1869
	Davies, * Lieut.-Col F. J.	1869
	Davies, A., Esq., Calcutta	1874
	Davis, C. T. Esq., Solicitor, Calcutta	1874
155	Davis, W. P., Esq., Bengal Police, Hooghly ...	1870
	Davis, Capt. R. P., Dist. Supdt. Police, Beerbhoom	1877
	Davison, * Capt., 15th King's Hussars	1872
	Davidson, James, Esq., Debrooghur, Assam ...	1870
	Dear, Herschel, Esq., Monghyr	1860
160	Deas, C., Esq., N. B. State Ry., Luckunhatty ...	1874
	Denham, * C. H., Esq., C. E.	1874
	Dennison, W. T. M., Esq., Kurian Estate, Baitenzerg, Java	1873
	Deputy Commissioner of Sumbulpore	1866
	Deputy Commissioner of Ellichpore	1869
165	Deputy Commissioner of Woon	1869
	Deputy Commissioner of Bassim, West Berar ...	1871
	Deputy Commissioner of Akola, Berar	1875
	Desaran, Edwd. Dubois, Esq., Aurungabad Factory, *viâ* Pakour	1874
	Determes, T., Esq., Merchant, Chittagong ...	1873
170	Deverell, H., Esq., Indigo Planter, Ackriguinge Factory, *viâ* Berhampore	1854
	Dickens, * Col. C. H., Artillery	1856
	Dignam, S., Esq., Solicitor, Calcutta	1876
	D'Oyly, W. H., Esq., Civil Service, Rampore Beauleah	1872
	Dodgson, W., Esq., Kallygunge Factory, Rungpore...	1864
175	Dombal, M. E. Durup-de, Esq., Mymensing ...	1876
	Dombal, Rchd. De, Esq., Katchee Katta, *viâ* Chooadanga	1872
	Donaldson, Peter, Esq., Supdt. Jail Manufactures, Alipore	1876
	Doyal Chund Dass, Baboo, Banian, Calcutta ...	1877
	D'Silva, E. A., Esq., Asst. Dispensing Chemist, Calcutta	1873
180	Duff, P., Esq., Sirrcoah, Narodnuggur, North Bhaugulpore	1875
	Dunn, * Lt. T. D. W., 62nd Regt.	1873
	Dunne, M. P., Esq., Zemindar, Sumshabad, Azimgurh	1872
	Dwarka Nath Dutt, Baboo, Calcutta	1874

E.

		Admitted.
	Eden, Hon'ble A., Lieut.-Govr., Bengal, Alipore ...	1873
185	Edgar, E. L., Esq., Cachar	1872
	Egerton, Hon'ble R. E., Lieutenant-Govr., Punjab, Lahore	1864
	Eisenlohr, F., Esq., Merchant, Calcutta ...	1870

F.

	Farquharson, J. G., Esq., Nunmati Garden, Gowhatty	1874
	Feltwell, J. W., Esq., Manager, Kookeecherra Garden, Cachar	1875
190	Finch, W. R., Esq., Shahpore, Oondee, Tirhoot ...	1875
	Firth, H. A., Esq., Emigration Agent, Calcutta ...	1873
	Fisher, Lieut-Col. G. R., Commandant, Fort Shabkodar, Peshawur	1865
	Fisher, J. H., Esq., C. S., Jubbulpore	1871
	Foley, E. G., Esq., Cullecherra Garden. Sylhet ...	1873
195	Foley, W., Esq., Tea Planter, Sylhet	1877
	Forbes, Capt. W. E., Settlement Officer, Gonda, Oudh	1873
	Foster, G., Esq., Asst. Conservator of Forests, Saugor	1876
	Francis, T. M., Esq., Solicitor, Muzufferpore, Tirhoot	1871
	Fraser, Ronald, Manager, Margaret's Hope Tea Estate, Hope Town, Darjeeling	1875
200	Freeman, G. S., Esq., Lohoria Factory, Champarun	1876
	Freeman, H., Esq., Lall Serriah Factory, Seegowly, Champarun	1866
	Fuller, Daniel, Esq., Tea Planter, Chittagong ...	1874
	Fyz Alee Khan, Nawab, Bahadoor, Jeypore ...	1871

G.

	Gale, M. H. L., Pundoul Concern, Tirhoot ...	1873
205	Galiffe, J. F., Esq., Chandernagore	1856
	Garbett, Capt C. H., Asst. Commr, Lohardugga. ...	1868
	Gardner, D. M., Esq., Civil Service, Azimghur ...	1872
	Gardner, E. B., Dr., Civil Surgeon, Shajehanpore ...	1876
	Garrett, C. B., Esq., C. S., Dacca	1875
210	Garth, Hon'ble Sir Richard, Chief Justice, High Court, Calcutta, *Vice-President*	1875
	Gibbon,† T. M., Esq., Indigo Planter	1874
	Gibbon, W. F., Esq., Senr. Doolha Factory, Goruckpore	1870
	Gibbon, W. F., Esq., Turcoleah, Chumparun ...	1874
	Gilman, J. H. S., Esq., Sonapore Tea Factory, Gowhatty	1874
215	Glass, J., Esq., Ex-Engineer, D. P. W., Jubbulpore	1866
	Gocool Nath Chatterjee, Baboo, Calcutta ...	1874
	Gokul Chunder Dutt, Baboo, Calcutta	1874

(G.—*Continued.*)

		Admitted.
	Gonesh Chunder Chunder, Baboo, Solicitor, Calcutta	1877
	Goonendra Nath Tagore, Baboo, Zemindar, Calcutta, *Vice-President*	1872
220	Gopal Chunder Bose, Baboo, Kuranpal, *vid* Cuttack	1876
	Gopeenath Roy, Baboo, Calcutta	1871
	Gordon, D. T., Esq., Surdah	1859
	Gordon, John, Esq., Bank of Bengal, Calcutta ...	1865
	Govind Loll Roy, Baboo, Zemindar, Tajhat, Rungpore	1877
225	Graham, Wm. Francis, Esq., M. C. S., Chicacole ...	1871
	Grant,* Thomas, Esq., Indigo Planter	1848
	Grant, G. H., Esq., Indigo Planter, Bhaugulpore ...	1859
	Grant, C., Esq., Lebong, Darjeeling	1864
	Gray, Dr. E., Jorehaut, Assam	1875
230	Gray, W., Esq., Merchant, Calcutta	1875
	Grey,* E., Esq., Civil Service	1868
	Grihill, T., Esq., Calcutta	1877
	Greenfield, W. H., Esq Mountjoy Tea Estate, Poundaubra, Akyab	1877
	Grierson, G. A., Esq., c. s., Durbhangah ...	1877
235	Griffiths, Ralph, Esq., Principal Queen's College, Benares	1870
	Grimley, J. E., Esq., Supt. Nizam's Garden, Hydrabad	1875
	Groundwater, R., Esq., Tea Planter, Gowhatty, Assam	1875
	Guise,* J. J., Esq., Merchant	1867
	Gupta, K. G., Esq., c. s., Perozepore, Backergunge ...	1877

H.

240	Hadenfeldt,* R., Esq., Merchant	1874
	Halford,* Charles, Esq., Bill Broker	1872
	Hall, H. V., Esq., Tea Planter, Hope Town, Darjeeling	1877
	Halsey, F., Esq., Sujanpore, *vid* Pathankote, Punjab	1863
	Hamilton, T. F., Esq., Merchant, Calcutta ...	1870
245	Harding, F., Esq., c.s., Tajpore Divsn., Durbhangah Dist.	1877
	Harlow, Wm., Esq., Manager, Eastern Cachar Tea Company, Cachar	1871
	Harman, A. L., Esq., Jatapore Factory, Sarun ...	1876
	Harris, J., Esq, Sykotta Tea Garden, Jorehat, Assam,	1877
	Harrison, Augustus S., Esq., Principal of the Muir College, Allahabad	1873
250	Harrison, H. A., Esq., Civil Service, Mirzapore ...	1863
	Harrison, Revd. H. J., Tollygunge	1872
	Harish Chunder Roy, Baboo, Supdt., Bahirbund Estate, Rungpore	1877
	Hartnell,* M., Esq.	1876

H.—*(Continued.)*

		Admitted.
	Hawkins, Major E. L., R. A., Mean Meer ...	1871
255	Hawkins, R. W. L., Esq., Narva, *viâ* Allygurh ...	1877
	Haxell, Cleland, Esq., Koliabar, Nowgong, Assam ...	1877
	Hay, A. O., Esq., Akyab	1877
	Hay, John, Esq., Merchant, Calcutta	1876
	Hayes, G., Esq., Zemindar, Purneah	1876
260	Head Gardner of the Ram Nawas, Jeypore ...	1876
	Health Officer, Calcutta	1865
	Helps, W., Esq., Manager, Fallodhi Tea Co., Darjeeling	1875
	Hem Chunder Goossami, Baboo, Serampore ...	1877
	Henderson, Dr. Geo., Rawul Pindee	1876
265	Henderson, W., Esq., Pathicharra, Cachar ...	1876
	Hill, Edgar, Esq., Indigo Planter, Allahabad ...	1874
	Hill, Dr. J. H. G., Turcooleah Factory, Motecharee, Chumparun	1865
	Hill, R. H., Esq., Seraba, Tirhoot	1865
	Hindmarsh, Thomas, Esq., Eastern Bengal Railway, Kancharapara	1866
270	*Hittoll Messer, Baboo, Zemindar, Mauncoor ...	1864
	Hobhouse,* Hon'ble Arthur	1872
	Hobson,* E. A., Esq., Merchant	1875
	Hogg, Capt. T. W., Asst. Commissioner, Jubbulpore	1868
	Holl,† F. W., Esq., Nundeekotee, Hope Town ...	1874
275	Hollingberry, R. H., Esq., Asst. Secy., Financial Dept., Calcutta	1874
	Holmes, R. A. K., Dr., Supdt. Central Prison, Meerut	1876
	Holroyd,* Col. Charles	1866
	Home, Major R., Lahore	1873
	Hudson, C. K., Esq., Dacca	1874
280	Hunter, J. K., Esq., Kopili Tea Estate, Assam ...	1876
	Hutchison, J. H., Esq., Merchant, Calcutta ...	1870
	Hutchison,* John, Esq., Merchant ...	1876
	Ingels, Lionel, Esq., Chogdah	1872
	Inglis, A. B., Esq., Merchant, Calcutta... ...	1873
285	Inskip, C. T., Esq., Merchant, Calcutta... ...	1870
	Imthurn,* Dr. A., M. D., ...	1873
	Irving, Dr. James, Civil Surgeon, Dinapore ...	1867
	Irwin,* Lieut.-Col. W., Stud. Dept.	1864
	Ishore Pershaud Narain Singh, Bahadoor, Maharajah of Benares	1854

J.

		Admitted.
290	JACK, E. A., Esq., Merchant, Calcutta	1863
	Jackson, Hon'ble L. S., C. S., C. I. E., Calcutta, *President*	1852
	Jackson, W. G., Esq., C. S., Rangoon	1876
	Janoki Bullub Sen, Baboo, Zemindar of Dimla, Rungpore	1877
	Jefferson, W. E. S., Esq., Debrooghur, Assam ...	1875
295	Jenkinson,* E. G., Esq., C. S.	1874
	Jennings, F., Esq., Calcutta	1874
	Jerdon,* C. M., Esq., Sub-Deputy Opium Agent ...	1872
	Jogendra Nath Roy, Baboo, Norail	1876
	Jogendro Nath Mullick, Baboo, Calcutta	1877
300	Johari Mull, Baboo, Zemindar, Mahomedpore, Bijnore	1876
	Johnson,* H. Luttman, Esq., Civil Service ...	1873
	Johnstone, Lieut.-Col. J., Political-Agent, Munneepore	1871
	Jones, W. H., Esq., Calcutta	1863
	Joykissen Mookerjee, Baboo, Zemindar, Ooterpara...	1852
305	Juggut Singh Koer, Tajpore, *viâ* Bijnour ...	1874

K.

	KALEE Kissen Tagore, Baboo, Calcutta... ...	1869
	Kali Narain Roy Chowdry, Raja, Bahadoor, Bhowal, Dacca	1876
	Kali Prosunno Ghose, Baboo, Calcutta	1877
	Kally Prosunno Roy, Baboo, Zemindar, Cossipore ...	1867
310	Kalberer, J., Esq., Kotahi Factory, Goruckpore ...	1875
	Kemp, Geo. Lucas, Esq., F. R. G. S., Calcutta ...	1871
	Kemble, W., Esq, Civil Service, Purneah ...	1872
	Kidd, Dr. H. A., Civil Surgeon, Mundla ...	1871
	Kilby, W., Esq., District Supdt. of Police, Jessore	1875
315	Kincaid, Lieut.-Col. W., Pol. Agent, Bhopal, Sehore	1867
	King, Dr. Geo., Supdt. Royal Botanical Garden, Calcutta, *Vice-President*	1872
	Kirkpatrick, Clarance, Esq., Delhi	1874
	Kisch, H. M., Esq., C. S., Bellary	1876
	Kisnen Chunder Bhunge, Rajah of Kiloh, Mohurbhunge, Cuttack	1874
320	Knox, G. E., Esq., C. S., Kirwee	1875
	Knyvett, Major, W. L. N., District Supdt. of Police, Purneah	1864
	Komul Krishna Deb Bahadoor, Rajah, Calcutta ...	1874
	Krishnadhun Ghose, Dr., Civil Surgeon, Rungpore	1874

L.

Admitted.

	LANDALE,* Geo. A., Esq., Indigo Planter ...	1868
325	Langdale, E. F., Esq., Poonah Tea Estate, Palumpore	1877
	Langlois, P. L. F. C., Esq., *Barrister-at-Law*, Vizagapatam	1873
	Larminie, W. R., Esq., Civil Service, Bancoorah ...	1862
	Laruleta, J., Esq., Rampoorah Factory, *viâ* Jeagunge	1875
	Lawford, H. B., Esq., C. S,.	1865
330	Lawrence, Capt. H., Depy, Commr., Sirsa, Punjab...	1877
	Lazarus, F. A., Esq., Calcutta	1874
	Lees, Col. W. M., Under-Secretary, Govt. of India, Military Dept.	1871
	Leibert, M , Esq., Tea Planter, Hazareebaugh ...	1868
	Leitch, Henry Joseph, Esq., Broker, Calcutta ...	1872
335	Leslie, S. J., Esq., Solicitor, Calcutta	1873
	Levinge, * H. C., Esq., C. E.	1863
	Llewhellin, Stanley, Esq., Chitwarrah Factory, Mozufferpore	1876
	Llewhellin, W., Esq., Regai Factory, Mozufferpore ...	1871
	Linde F., Esq., Seemah Tea Estate, Chota Nagpore	1877
340	Lindesay, H. G., Esq.	1873
	Livesay, C. E., Esq., Asst.-Engineer, Irrigation Dept., Baroon, *viâ* Dehree	1868
	Lloyd, M.. Esq., Indigo Planter, Shapore Oondee, Tirhoot	1863
	Lloyd, Trevor, Esq., Narath Factory, Madhobani, Tirhoot	1857
	Lockhart, Major, W. S. A., Allahabad	1871
345	Lovell, Thos., Esq., Deputy Chief Engineer, Lucknow	1869
	Lowis, Capt. N., Manager, Chota Nagpore Estate, Ranchi	1875
	Luchmeeput Sing, Roy, Bahadoor, Banker, Calcutta	1864
	Luchmessur Sing Bahadoor, Zemindar, Durbungah, Tirhoot	1861
	Lukin, Major F., 3rd Hussars, Mhow, Central India	1860
350	Lushington, H., Esq., C. S , Allahabad	1865
	Lyall, D. R., Esq., Civil Service, Dacca ...	1869
	Lyall, R. A., Esq., Merchant, Calcutta	1875
	Lynam, John, Esq., Supdt., Reserved Police Force, Calcutta	1866
	Lynch, Dr. Sydney, Supdt. of Jail, Alipore ...	1872
355	Lyon, W., Esq., Asst. Commr., Sambhurlake, Rajpootana	1875
	Lyons, A., Dr., Civil Surgeon, Fureedpore ...	1874

M.

		Admitted.
	MACALLISTER, R., Esq., Merchant, Calcutta ...	1872
	MacBean, Duncan, Esq., Paror Tea Estate, Kangra Valley	1876
	MacDonald, M. N., Esq., Pertipore Factory, Sarun	1869
360	Macdonald, * Æneas J., Esq., Lohurreah Factory ...	1872
	Macdonald, James, Esq., C. E., Allyghur ...	1874
	Mackenzie, W. S., Esq., Belsund, Tirhoot ...	1873
	Mackillican, J., Esq., Merchant, Calcutta	1865
	Mackinnon, D., Esq., Merchant, Calcutta ...	1874
365	Mackinnon, John, Esq., Merchant, Calcutta ...	1875
	Maclachlan, J. E., Esq., Merchant, Calcutta ...	1861
	Maclean, * A. T., Esq., Civil Service	1858
	Macmillan, J., Esq., C. E., Cuttack	1865
	Macnaghten, * Chester, Esq., Principal, Rajkumar College, Rajkote, Kattywur	1860
370	Macnamara, J. A., Esq., C. E., Dist. Engineer, Shahabad	1877
	Maconochie, G. B., Esq., Sultanpore, Oude	1873
	Macpherson, W., Esq., Civil Service, Cuttack	1861
	Maddock, H. R., Esq. Tea Planter, Chittagong	1877
	Magor, R. B., Esq., Merchant	1875
375	Maharajah of Betteah, Tirhoot	1870
	Maharajah of Cooch Behar	1864
	Manager, Balasun Tea Co., Darjeeling...	1875
	Manager, Amluckee Tea Company, Assam	1877
	Manager of Awah Estate, Agra	1877
380	Manager, Bengal Tea Company, Cachar	1864
	Manager, Bisnath Tea Co., Assam	1875
	Manager, Borsillah Tea Co., Assam	1875
	Manager, Brahmapootra Tea Co., Assam ...	1875
	Manager, Burrumsal Garden, Sylhet	1876
385	Manager, Boroomcherra Tea Garden, Cachar ...	1876
	Manager, Central Cachar Tea Co.	1875
	Manager, Central Terai Tea Co., Darjeeling ...	1875
	Manager, Chenga Tea Association, Darjeeling ...	1875
	Manager, Chincoorie Tea Co., Cachar	1875
390	Manager, Chumta Tea Association, Darjeeling ...	1875
	Manager, Chunderpore Tea Garden, Assam ...	1875
	Manager, Chundypore Tea Company, Cachar ...	1862
	Manager, Cutlee Cherra Garden, Cachar ...	1865
	Manager, Dahingeapore Factory, Assam ...	1865
395	Manager, Dessai and Purbuttea Tea Company, Jorehaut, Assam	1874
	Manager, Durrung Tea Company, Assam ...	1877
	Manager of Dewkonall Estate, Cuttack ...	1871
	Manager, East India Tea Company, Assam ...	1865

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		Admitted.
	Manager, East India Tea Company, Cachar ...	1866
400	Manager, Elambazar Indigo Concern, Bhulpore ...	1877
	Manager, Gellhutting Tea Estate, Assam ...	1877
	Manager, Giell Tea Co., Darjeeling	1875
	Manager, Goomrah Factory, Tirhoot	1865
	Manager, Government Garden, Fyzabad, Oudh ...	1871
405	Manager, Government Garden, Gondah, Oudh ...	1875
	Manager, Greenwood Tea Garden, Assam ...	1875
	Manager, Halmara Tea Estate, Assam ...	1870
	Manager, Hoolmaree Tea Co., Assam	1875
	Manager, Hunwall Tea Estate, Jorehaut, Assam ...	1874
410	Manager, Jokie (Assam) Tea Co., Assam ...	1875
	Manager, Julvacherra Tea Garden, Cachar ...	1875
	Manager, Joypore Garden, Cachar	1865
	Manager, Kaliabar Tea Estate, Assam	1876
	Manager, Kallacherra Tea Company, Cachar ...	1862
415	Manager, Kallian Tea Garden, Cachar ..	1874
	Manager, Kamptee Gwallie Tea Estate, Debrooghur	1875
	Manager, Kanchunpore Tea Company, Cachar ...	1862
	Manager, Kassomaree Tea Garden, Assam ...	1875
	Manager, Kobra Tea Estate, Mungledye, Assam ...	1877
420	Manager, Koeyah Factory, Cachar	1865
	Manager, Koomber Tea Garden, Cachar ...	1875
	Manager, Koomtar Tea Garden, Assam ...	1869
	Manager, Lalla Mookh Tea Garden, Cachar ...	1875
	Manager, Luckimpore Tea Co., Assam ...	1875
425	Manager, Luckwah Tea Garden, Assam ...	1875
	Manager, Majagram Tea Co., Cachar	1875
	Manager, Majuligbur Tea Estate, Assam ...	1875
	Manager, Mandarkatta Tea Estate, Assam ...	1875
	Manager, Monacherra Tea Garden, Cachar ...	1875
430	Manager, Moran Tea Co., Seebsangor, Assam ...	1875
	Manager, Margaret Hope Tea Plantation, Darjeeling	1876
	Manager, Massempore Tea Garden, Cachar ...	1875
	Manager, Mattegurrah Tea Concern, Darjeeling ...	1877
	Manager, Mesia Jan Tea Estate, Debrooghur ...	1875
43	Manager, Munguldye Tea Co., Assam	1875
	Manager, Naga Dhoolie Tea Garden, Assam ...	1876
	Manager, Narainpore Garden, Cachar	1865
	Manager, New Golaghat Assam Tea Company, Assam	1874
	Manager, Noakacharee Tea Company, Assam ...	1865
440	Manager, Nuddea Ward's Estate, Kishnaghur ...	1875
	Manager, Pattareah Tea Co., Sylhet	1875
	Manager, Public Garden, Etawah	1874

M. *(Continued.)*

		Admitted.
	Manager, Roopacherra Tea Garden, Cachar ...	1875
	Manager, Scottish Assam Tea Co., Assam ...	1875
445	Manager, Selong Tea Estate, Shillong... ...	1867
	Manager, Silcoorie Tea Garden, Cachar ...	1875
	Manager, Singbulli and Nurmah Tea Co., Ld., Darjeeling	1875
	Manager, Singell Tea Company, Darjeeling ...	1874
	Manager, Sissobari Garden, Julpigoree ...	1877
450	Manager, Sonai Tea Co., Cachar	1877
	Manager, Springside Tea Garden, Kurseong ...	1875
	Manager, Tarrapore Tea Garden, Cachar ...	1871
	Manager, Teendarea Tea Company, Darjeeling ...	1874
	Manager, Teesta Valley Tea Association, Darjeeling	1875
455	Manager, Terihannah Tea Plantation, Darjeeling ...	1876
	Manager, Tingri Tea Estate, Assam	1875
	Mandelli, L., Esq., Tea Planter, Darjeeling ...	1868
	Manook, Dr. S. J., Civil Surgeon, Chyebassa ...	1866
	Manuel, R. A., Esq., Rangoon	1876
460	Markby, Hon'ble W., Judge of High Court, Calcutta	1866
	Martin,* John, Esq.	1874
	Martin, W. R., Esq., Tea Planter, Punkabaree, Darjeeling	1868
	Maseyk, C. H., Esq., Jungypore	1876
	McFarlane, A. C., Esq., Merchant, Calcutta ...	1870
465	McIntosh, A. R., Esq., Merchant, Calcutta ...	1872
	McConaghey, M. A., Esq., C. S., Banda... ...	1877
	Meiselbach, J. F. R., Esq., Dhurropia Hesont, North Bhagulpore	1875
	Melvile, S. S., Esq., C. S., Meerut	1875
	Mess Secretary, 42nd Assam Light Infantry, Gowhatti	1877
470	Meugens, J. G., Esq., Merchant, Calcutta ...	1865
	Mewburn,* G. F., Esq., Merchant	1874
	Michea, P., Esq., Daodchurn Factory, Benares ...	1875
	Middleton,* C. J., Esq., P. W. D.	1875
	Miller, Lieut-Col. F. J., Goordaspore ...	1869
475	Minchin, F. J. V., Esq., Aska, Ganjam ...	1862
	Mitchell, R. W. S., Esq., Emigration Agent for Trinidad, 9, Garden Reach	1875
	Mohendro Lall Bose, Baboo, Zemindar Kaksiali, *viâ* Chinsurah	1877
	Moir,* Dr. W., Civil Surgeon	1872
	Mohima Rungan Roy Chowdry, Zemindar, Kakinia, Rungpore	1865
804	Mohendrolall, Khan, Koomar, Narajole, Midnapore...	1871

M.—(*Continued.*)

		Admitted.
	Moore, A. H., Esq., Dekai Jalue Factory, Jorehaut, Assam	1875
	Moore, C. W., Esq., C. S., Bareilly	1865
	Moran, F. C., Esq., Woodbine Factory, Debroghur, Assam	1870
	Morris, E., Esq., Manager, Hong-Kong and Shanghai Banking Corporation, Calcutta	1874
485	Morris, G. G., The Honorable, Civil Service, Judge, High Court, Calcutta	1872
	Mosely, T. H., Esq., Merchant, Calcutta ...	1862
	Mullen, Dr. T. Ffrench, Residency Asst. Surgeon, Ulwar, Rajpootana	1871
	Murdoch, A. W., Esq., C. E., Serajgunge ...	1870
	Murray, D. K., Esq., Amluckie, Nowgong, Assam ...	1876
490	Murray, J. L. K., Esq., Higli Mari Garden, Nowgong	1876

N.

	Narayan Rao, Maharajah of Dewass, Indore ...	1874
	Nassiruddeen Ahmed Moulvi, Behar ...	1876
	Nehalchand, Baboo, Zemindar, Mozuffernagore ...	1877
	Newson, W. H., Esq., Merchant, Calcutta ...	1876
495	Newton, W. H., Esq., Merchant, Calcutta ...	1875
	Nickels, C., Esq., Indigo Planter, Pesewa Factory, Jaimpore	1866
	Nilladhur Sing Deo Bahadoor, Feudatory Chief of Killa, Sonepore	1874
	Nobin Chand Bural, Baboo, Solicitor, Calcutta ...	1874
	Nogendra Nath Mullick, Baboo, Zemindar, Andool	1877
500	Nolan, Phillip, Esq., Civil Service, Dinapore ...	1873
	Notobur Singh, Rajah, Murdraj Bromobur Roy of Killo-Khand Padda, Cuttack	1873
	Noor Khan, Huzruf, Minister of Jowrah ...	1871
	Nundlall Bose, Baboo, Zemindar, Calcutta ...	1875

O.

	Obhoychurn Goho, Baboo, Merchant, Calcutta ...	1856
505	Odling, C. W., Esq., C. E., Arrah ...	1871
	O' Keefe † J. W., Esq., Merchant, Calcutta ..	1871
	Oldfield, R. C., Hon'ble, C. S., Allahabad ...	1875
	Oldham, * Wilton, Esq., L. L. D., Civil Service ...	1867
	Omesh Chunder Dutt, Esq., Calcutta ...	1874
510	Orchard, Coll. M. A. D., B. S. C., Meerut ..	1871
	Orr, Maior Alexander P., Roy Bareilly, Oudh ...	1868

O.—(*Continued.*)

		Admitted.
	Osborne, * Col. Willoughby, F. R. G. S., F. G. S. ...	1862.
	Osborne, Lt.-Col. J. H. Willoughby, Cawnpore ...	1870
	Ouseley, Gore, Esq.	1872
515	Owen,* Brigdr. Genl. W. G., (12th Madras N. I.) ...	1846

P.

	Paddy, Major A. C., Royal Engineers, Dugshai ...	1871
	Parcell, W. G., Esq., Dehing Tea Co., Assam ...	1877
	Peal, S. E., Esq., Tea Planter, Sapakatee, Seebsaugor, Assam	1867
	Peel,* Fredk., Esq., Merchant, Calcutta ...	1871
520	Peppè, * G. T., Esq., Manager, Dunwar Estate, ...	1872
	Peppè, T. F., Esq., Chota Nagpôre	1868
	Peppè, W., Esq., Birdpore, Gorruckpore ...	1875
	Perrin, Monsr. J., Silk Filatures, Berhampore ...	1859
	Peter, James, Esq., Lydiacherra Garden, Cachar ...	1872
525	Phear,* the Hon'ble J. B.	1867
	Phillips, J., Esq., Manager, Government Farm, Allahabad	1875
	Phipps, * S. U., Esq.	1874
	Pickance, Capt. W. John, Madras Staff Corps, Chutterpore, Ganjam District	1867
	Pigott,* William, Esq., Broker	1864
530	Pinney, G. F., Esq., Cinnamara Factory, Jorehaut, Assam	1871
	Plowden, W. C., Esq., c. s., Allahabad	1876
	Pocock, R. J. M., Esq., District Superintendent of Police, Etawah	1877
	Political Agent for Supdt., Rajkumar College, Bundelkund	1876
	Political Agent of Morar, Gwalior	1873
535	Pont, V., Esq., Engineer, Assensole	1877
	Pope, C. H., Esq., Planter, Singhia Factory, Haddjapore, Tirhoot	1872
	Poorno Chunder Roy, Rajah, Zemindar, Sarapooly	1870
	Poorno Chunder Mookerjee, Baboo, Solicitor, Calcutta	1877
	Powell, G. F., Esq., Saharunpore ...	1873
540	Prannath Pundit, Baboo, Bhowanipore.. ...	1877
	Pratapa Chandra Ghosa, Baboo, Calcutta ...	1869
	Prendergast, Lt.-Col. G. A., 15th B. C., Cawnpore...	1876
	Preo Nath Sett, Baboo, Calcutta	1876
	Pringle, R. B., Esq., Badalipur Tea Garden, Assam	1870
545	Proprietors, Jugdispore Estate, Beeheea, Shahabad...	1869

(P.—*Continued.*)

Admitted.

Protheroe, Major Montague, Dy. Supdt., Port Blair 1869
Prosono Coomar Banerjee, Baboo, Calcutta ... 1871
Pryce, W A., Esq., Station Master, E. I. R., Assensole 1876
Purna Nundo Barooah, Baboo, Extra Assistant Commissioner, Debrooghur, Assam 1877
550 Pyne, R., Esq., Neelgunge, Purneah 1867

Q.

QUINTON, J. W., Esq., Civil Service, Allahabad 1865

R.

RAHAN, H., Esq., Assam 1858
Radcliffe,* John, Esq., Merchant 1871
Radha Persad Sing, Maharaj Koomar, Doomrah, Shahabad 1875
55 Rajah of Kuntil, Mirzapore ... 1871
Ramanymohun Chowdry, Rai Bahadoor, Zemindar, Rungpore 1861
Rammell, Col. H. S., 29th M. I., Secunderabad ... 1876
Rampini,* R. F., Esq., C. S. 1875
Rattray, Haldane, Esq., Arraria, Purneah ... 1871
560 Ravenshaw, T. E., Esq., Civil Service, Calcutta ... 1865
Rayson, J., Esq., Manager, Behpara Tea Garden, Debrooghur 1877
Reid, J. R., Esq., C. S., Azimgurh 1866
Reilly, Herbert, Esq., Depy. Magistrate, Maldah ... 1872
Remfry, H., Esq., Solicitor, Calcutta 1874
565 Riach, F. S. M., Esq., Rungagora, Debrooghur, Assam 1870
Ridge, W., Esq., Soorsah Factory, *viâ* Rajshahye ... 1866
Ritchie, D. W., Esq., Offg. District Supdt. of Police, Chyebassa 1871
Robinson,* S. H., Esq., Merchant, Calcutta, *Vice-President* 1854
Robinson, W. A., Esq. 1876
570 Romesh Chunder Mittra, the Hon'ble, Calcutta .. 1874
Rose, R., Esq., Inspector Postal Department, Moradabad 1877
Rowett, R., Esq., Merchant, Rangoon 1877
Ruddock, E. H., Esq, B. C. S., Rajshahye ... 1868
Runglall Sing, Baboo, Bhaugulpore 1876
575 Russell, T. M., Esq., Merchant, Calcutta ... 1868

S.

		Admitted.
	Sagore Dutt, Baboo, Merchant, Calcutta ...	1855
	Samachurn Law, Baboo, Merchant, Calcutta	1850
	Samanand De, Bahadoor Rai, Balasore ...	1875
	Samuells,* W. L., Capt., Political Agent ...	1875
580	Sanders, Dr. R. C., Azamghur, N.-W.-P. ...	1875
	Sandys, Edwin F., Chittagong	1877
	Sandys, Mrs. Annie, Bhaugulpore	1870
	Sandford, J. R., Esq., Monsumbud Tea Estate, Palumpore	1877
	Savi, Thomas, Esq., Indigo Planter, Moisgunge, *viâ* Kishnaghur	1851
585	Sceales, Jaffray O'Brien, Esq., Bancoorah ...	1869
	Schwendler,* Louis, Esq.	1875
	Scott,* T. W., Esq., Assistant Engineer, Baree Doab Canal, Umritsur	1875
	Secretary, Assam Company, Calcutta	1865
	Secretary, Agricultural Society, Satkhira ...	1871
590	Secretary, Cantonment Public Garden, Agra ...	1865
	Secretary, Government Botanical Garden, Monghyr	1873
	Secretary, Local Funds, Raepore	1874
	Secretary, Local Fund Committee, Ferozepore ...	1861
	Secretary, Local Fund, Nimar, Khundwa ...	1873
595	Secretary, Local Committee, Betul	1874
	Secretary, Local Committee, Jhansi	1877
	Secretary, Municipal Committee, Mirzapore ...	1869
	Secretary, Municipal Committee, Prome ...	1876
	Secretary, Municipal Committee, Gurruckpore ...	1877
600	Secretary, Public Garden, Azimghur	1871
	Secretary, Public Garden, Banda	1855
	Secretary, Public Garden, Jaloun, Ooorai	1866
	Secretary, Public Garden, Benares	1875
	Secretary, (Hony.) Planter's Club, Mozufferpore ...	1877
605	Secretary, Public Garden, Rungpore	1877
	Secretary, Public Garden, Nowgong, Bundlekhund..	1877
	Secretary, Queen's Garden, Delhi	1873
	Secretary, Road Fund Committee, Jaunpore ...	1867
	Sells, A., Esq., c. s., Mozufferpuggur ...	1874
610	Shaw, Dr. John Cardy, Civil Surgeon, Arrah ...	1873
	Shearin,* E., Esq., Merchant	1856
	Sherer,* J. W., Esq., Civil Service	1869
	Sheoraj Sing, Rajah, c. s. i., Kasipore, Naincetal ...	1877
	Sherriff, W., Esq., Jorroda, Jessore ...	1859
615	Shillingford, J. L., Esq., Kolassy Factory, Purneah ...	1865
	Shillingford, G. W., Esq., Kolassy Factory, Purneah	1867

S.—(*Continued*)

		Admitted.
	Showers, St. Geo. G., Esq., Goria Habu Factory, Jorehaut, Assam	1875
	Shuttleworth, E. J., Esq., Dist. Supt. of Police, 24-Pergunnahs	1876
	Simons, C. J., Esq., Tea Planter, Borsella Factory, Morar Bazaar, Post Office, Upper Assam ...	1863
620	Simson,* James, Esq., Civil Service	1856
	Skinner, A., Esq., Mussoorie	1854
	Slater, E. M., Esq., Bank of Bengal, Calcutta ...	1870
	Sladen, J., Esq., c. s., Saharunpore	1876
	Smallwood, A. E., Esq., Broker, Calcutta ...	1875
625	Smith, G. M., Esq., Joyhinga Tea Estate, Luckimpore, Assam	1871
	Smith, Dr. H. S., Civil Surgeon, Allahabad ...	1875
	Smith, Maxwell, Esq., Hursingpore, Tirhoot ...	1869
	Smith, W. E., Esq., Hyah Factory, Nowgong, Assam	1875
	Smith, W., Esq., Dorunda Factory, Chota Nagpore...	1872
630	Smith, A. Hume, Esq., Manager, Genl. Norail Estate, Jessore	1875
	Sparks, H. J., Esq., c. s. Lucknow	1876
	Spencer, Harrison, Esq., Tea Planter, Darjeeling ...	1874
	Speid, James, Esq., Hobeegunge, *viâ* Dacca ...	1875
	Spicer, A., Esq., Tea Planter, Cachar ...	1869
635	Sri Mohun Thakur, Baboo, Beraric, Bhaugulpore ...	1877
	Stalkartt, William, Esq., Merchant, Calcutta ...	1845
	Stalkartt, J., Esq., Hope Town, Darjeeling ...	1863
	Steel, Octavius, Esq., Merchant, Calcutta ...	1874
	Steel, Donald, Esq., Eastern Cachar Tea Company, Cachar	1861
640	Stevens, C. C., Esq., Civil Service, Kishnagur ...	1875
	Stevens, H. W., Esq., Supdg. Engr., Durbhangah ...	1867
	Stevenson, Geo., Esq., Civil Service, Mymensing ...	1873
	Stewart, A. N., Esq., Collector of Tolls, Calcutta ...	1862
	Stewart,* James, Esq., Civil Engineer ...	1873
645	Stokes,* Allen, Esq., E. I. Railway	1867
	Stone, C. G., Esq., Bokahala Factory, Jorehaut Assam	1875
	Stoney, R. V., Esq., Civil Engineer, Kendrapara, Orissa	1866
	Stratton, J. P., Esq., Political Agent, Nowgong, Bundelkhund	1873
	Supdt., Govt. Model Farm, Cawnpore ...	1875
650	Studd, E. J. C., Esq., Dhoolea Factory, Tirhoot ...	1875
	Sturmer, A. J., Esq., Talooka Kojah, *viâ* Gazeepore ...	1866
	Sukharam Martund, Esq., Indore	1872

S.—(Continued.)

		Admitted.
	Sumbhoo Narayana, Rajah Bahadoor, Benares ...	1872
	Superintendent, Ramtagh, Umritsur	1859
655	Superintendent, Taj Garden, Agra	1874
	Superintendent of the Patna Lunatic Asylum, Patna	1872
	Superintendent, Central Prison, Benares ...	1871
	Superintendent of Jorehaut Tea Company, Assam ...	1865
	Superintendent, Serajgung Jute Compy., Serajgung	1868
660	Surdharee Lall, Baboo, Zemindar, Bhaugulpore ...	1874
	Sutcliffe,* James, Esq., Principal of the Presidency College	1871
	Sutherland, Charles J., Esq., Merchant, Calcutta ...	1838
	Sutherland,* H. H., Esq., Merchant	1870
	Sutherland, A. B., Esq., Merchant, Calcutta ...	1870
665	Swaine, G., Esq., Ottur Factory, Tirhoot ...	1875
	Swinhoe, William, Esq., Attorney, Calcutta ...	1859
	Syed Wilayat Ali Khan, Patna	1876

T.

	Takur Sedenath Sing, Zemindar of Kerabally	1874
	Tayloe, J. E., Esq., Merchant, Barrackpore	1875
670	Taylor, V. T., Esq., Civil Service, Ranchee	1860
	Taylor, W. C., Esq., Khoordah, Orissa	1858
	Taylor,* Frank, Esq., Executive Engineer	1868
	Taylor, S. H. C., Esq., C. S., Beerbhoom	1873
	Taylor, Geo., Esq., *Barrister-at-law*, Bombay ...	1874
675	Tennant, Col. J. E., Mint Master, Calcutta ...	1874
	Terveen, W., Esq., Calcutta	1877
	Thomas, G., Esq., Zemindar, Monghyr	1875
	Thomas, J., Esq., Merchant, Calcutta	1867
	Thompson, H., Esq., Seebsaugor, Assam ...	1871
680	Thomson, J. A., Esq.	1871
	Thornhill, E. B., Esq., Civil Service, Banda ...	1875
	Tonnerre,* Dr. C. Fabre	1862
	Toomey, Geo., Esq., Indigo Planter, Contai, Tirhoot	1870
	Tottenham,* L. R., Esq., Civil Service	1873
685	Tucker, Robert, Esq., Tea Planter, Seebsaugor ...	1867
	Turner, H. B. H., Esq., Merchant, Calcutta ...	1868
	Twyford, C., Esq., Tea Planter, Addlabannie Garden, Assam	1874
	Twynam, Lt.-Col. E. J. L., Executive Officer, Rangoon	1856

U.

	Unwin,* Howard, Esq., C. E.	1869
690	Unwhart, E., Esq., Indigo Planter, Rajpore Concern, Tirhoot	1875

V.

		Admitted.
	VANCUTSEM, E. C., Esq., Calcutta	1876
	Venayk-Rao Gunput Kibia Sahaib, Indore ...	1872
	Vernon, John, Esq., Executive Engineer, Debrooghur	1871
	Vizianagram, His Highness the Rajah of ...	1847
	Voss, C. W., Esq., Merchant, Parla-Kimidi, Ganjam	1874

W.

	WAGENTRIEBER, W. J. H., Esq., Jorehat, Upper Assam	1868
	Walker, William, Esq., Tea Planter, Seebsaugor, Upper Assam	1870
	Wallace, Adolphus, Esq., Rungajaun Factory, Golaghaut, Assam	1866
	Wallace, G., Esq., Doria Factory, Golaghaut, Assam	1875
700	Wallace, J. N., Esq., Loojan Tea Concern, Assam ...	1877
	Ward, W. E., Esq., Civil Service, Gowhattee, Assam	1873
	Waterfield, William, Esq., Civil Service, Calcutta ...	1870
	Watt, George, Dr., Educational Service, Hooghly ...	1875
	Webster, Alex. L., Esq., Tea Planter, Chittagong ...	1867
705	Welborne, J. E., Esq., Tea Planter, Jeypore, Assam	1877
	Wemyss, Sir John, Bart., Mirzapore	1876
	West, R. Barton, Esq., Calcutta	1876
	Westfield, W. F., Esq., Julpigoree	1876
	White, C. P., Esq., Bullis Goorie Tea Garden, Assam	1876
710	White, H. F., Esq., Ex-Engineer, Nagode ...	1875
	White,* Dr. J. B.	1872
	Whitney, F., Esq., Merchant, Calcutta	1875
	Whitty, Irwin, Jr., Esq., Civil Engineer, E. I. Railway, Chord Line, Giridhi	1867
	Whitwell, Dr. Henry, Benares	1874
715	Wilcox, Frederick, Esq., Bengal Police, Dinagepore	1876
	Wilkinson,* Major A. E.	1862
	Wilkinson,* C. J., Esq., *Barrister-at-law* ...	1870
	Williams, J., Walter, Esq., Dist. Supt. Police, N.-W.-P., Mozuffernagore	1877
	Williamson, Capt. W. J., Deputy Commr., Garrow Hills, Assam	1867
720	Williamson, W. P., Esq., Supt., Wilton Tea Co., Debrooghur, Assam	1877
	Wilmot, C. W., Esq., Asstt. Commr., Sonthal Pergunnahs, Deoghur	1876
	Wilson, Major-Genl., H. M., Sutah, *viâ* Palampore, Punjab	1860
	Wilson, H. F., Esq., Serajgunge	1870
	Wingrove, Clement, Esq., Gowhatty, Assam ...	1871

Admitted.

W.—*Continued.*

725 Wollen, H. W., Esq., Indigo Planter, Dasuah, near Gazeeabad 1873
Wood, James M., Esq., Talup Factory, Debrughur, Assam 1865
Wood, Dr. A., Goruckpore 1875
Wood-Mason,* J., Esq., Asst. Curator, India Museum, Calcutta 1877
Woodman, J. V., Esq., *Barrister-at-law*, Calcutta ... 1875
730 Wright,* A. C., Esq. 1865
Wright, W., Esq., Judge, Small Cause Court, Cuttack 1866

Y.

Young, W., Esq., C. S., Mynpooree 1868
Young,* Major Siddons 1874

Z.

Zander Leo, Esq., Merchant, Calcutta 1872
735 Zalim Singh Chowdry, Zemindar of Seohara, Bijnore 1876