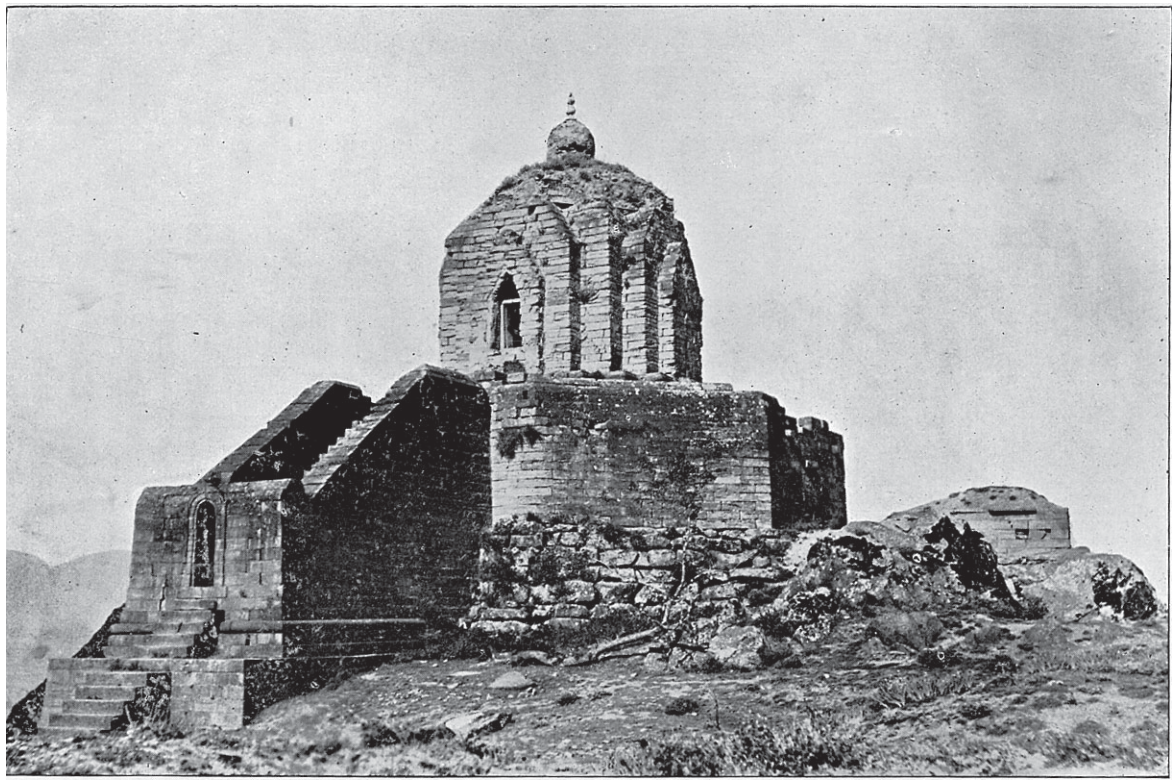
ated all traces of organic remains, at least in the limited area of my examination, for I searched assiduously for fossils in strata apparently thousands of feet in thickness, but found none, unless those I have just mentioned be they. These rocks seem to lie conformably under the carboniferous measures. Running into Srinagar is the end of a mountain range, and upon it, about a thousand feet high, stands the Hindoo Temple, Takht-i-Suliman, plate 16, a celebrated place of pilgrimage, said to be at least a thousand years old. It forms the most picturesque feature of Srinagar. In the centre of the temple is the customary Phallic lingam of stone with a serpent coiled round it. This part of the range consists of an enormous upheaval of amygdaloidal trap, with amygdules of chalcedon, large and small, of which, associated with and forming part of it, is a vast mass of trap rock resembling our Porphyritic greenstone, also slaty measures and large beds of unfossiliferous, argillaceous, and arenaceous softer sandstones, the exact horizon of which I am not able to determine. This immense out-pouring of igneous amygdaloid and greenstone rocks seems to have obliterated the earlier stratified measures. The carboniferous rocks, if I rightly assume them to be such, seem of scant proportions compared with those of the older series, notably those which seemed to me to correlate with our Silurian and Cambrian systems. If there has been no formation or denudation of the coal measures proper, the rest of the carboniferous rocks seem to

PLATE 16.



The Temple Takht-i-Suliman, a place of Hindoo pilgrimage.

imply that a much less time was occupied in representing this formation compared to that of Europe. There seems to be no exact equivalent and sequence to European geology. Even the apparent thickness of the stratified rocks, older than the carboniferous, appears much greater than it really is, for many of the mountain sides run parallel with the strike of the rocks, with complex foldings and complete inversions, and so much have the measures been disturbed, that it is very difficult sometimes to determine where strata do not lie bottom upward. I made for the reading of this paper a rough diagram demonstrating these inversions which although not quite geologically accurate, will indicate what I saw and my inference formed both above and below the mountain section for about three miles in length in one part of my walk along the mountain escarpments. The diagram represents the rocks dipping from south to north from a height of say 8,000 to 15,000 feet above the sea. The granite intrusion shows very plainly the main agent in the mighty effects of the disturbance, contortion and involution of the strata; dotted lines represent the inversions of the strata. A few days of rock observations extended through Achábál Rukh, (plate 32) of about five miles along the mountain side, by Islamabad and Khanabhal, the lower portions of the famed Liddar and Sind Valleys, up a large valley above Avantipura, the ancient capital of Kashmir, the Khrew Rukh,* a very mountainous part, past one

* Rukh is Kashmiri for the Maharaja's big game preserves.

PLATE 32.

Commencement of the Achábál Rukh or Big Game Preserve of H.H. the Maharaja.

of the Maharaja's best big game shooting mountains, the Valley of Arapal and Narastan to Singpura and Pampur, all on the right side of the Jhelum, and in all about thirty-five miles down to Srinagar. The only coal I saw was in Jammu, but it is a Tertiary coal, beginning to be worked in the Himalayan tract north of Jammu. It is not of good quality, but is used at the Jammu Water-works along with Tertiary Bengal coal. It is the intention of the Maharaja of Jammu and Kashmir to develop it, and steps are being taken for that purpose by a projected and much needed railway from Jammu to Srinagar, which is now being surveyed. Glaciation is an important feature at lower levels in and out of the valley. Immense deposits of huge boulders with here and there rochés moutonnés, striation, moraines and rock groovings. Since looking up what has been done by a few able geologists in the Himalayas, I find some very interesting papers by Lieut.-General MacMahon, Mr. Hudleston, Mr. Lyddeker, and especially the work of Mr. Medlicot, Captain Godwin Austen, and others, recorded in the Journals of the Geological Society and Geological Association. Notwithstanding all this recorded work, most of it of great interest, I am still of opinion that a systematic and thorough geological survey of those parts of the Himalayas in which the Valley of Kashmir is placed, is not only necessary but would prove in several ways of great usefulness. In this I am confirmed by the following quotation from MacMahon's able paper on

the Geological History of the Himalayas, referring to the conflicting speculations of their age, one extremist having ventured on the pronouncement that they were first upheaved in the Eocene or even in post Tertiary periods. General MacMahon says:— "Much work in the field, combined with the skilled study of thin sections under the microscope is still needed to elucidate the age and history of the crystalline rocks of the Himalayas." Mr. Griesbach believes that the dark blue limestones of which I have brought specimens are of Devonian age, but I am firmly inclined to the opinion from the fossils they contain that they are of Carboniferous age, although I must admit that several of them appear to be of different species to any yet recorded, especially one of a large species of Polyzoa. Mr. Oldham states that throughout the whole of the Palaezoic and Mesozoic periods the mountains of Simla and of course those of the Kashmir regions were alternately land and sea, and MacMahon thinks that during the Eocene times the sea flowed over this entire region, except over the highest snow-peaks, and it was not until the close of the Eocene epoch that the crumpling up of the strata on both sides of the ancient axis of crystalline rocks took place, and that the steady rise of the *whole* Himalayan area began and which has been going on ever since. When this period of continued elevation set in, the fiords of the Eocene sea began to shrink back from east to west; and the sea gradually retreated from the Himalayan

area, and from the Punjab. He thinks that the contortion, compression and upheaval which marked the earth movements that set in at the close of the Eocene period, were connected with the intrusion of gneissose granite, but that the granite upflow did not, except in one or two instances, protrude through the surface. This granite intrusion which took place as I have said at the close of the Eocene period, greatly contorted the rocks through which it thrust itself, and greatly metamorphosed them, as may be seen in several specimens I brought home, containing fragments of these contorted rocks in the intruded granite. This stupendous action which raised the Himalayas still higher and into their present position was not a sudden outburst of volcanic force or convulsions; but is the result of a very long sustained upward pressure and a long-continued and gradual cooling of the granite. The whole encircling sky-line averaging 10,000 to 20,000 feet above the sea, is clad in the whitest of snow down to a line of about 8,000 to 9,000 feet.

The Valley of Kashmir is a flat plain of pleistocene alluvium, and is composed of loams, clays and sands. It is the ancient bottom of a lake, which formerly occupied the whole area of the valley to a depth of perhaps more than a thousand feet, and is said to have found its outlet by volcanic agency through the narrow gorge at Baramulla. It is interspersed with long flat-topped banks and ridges of detrital wash, called

karewas, which consists of more or less fertile and unfertile alluvium washed down by mountain and lake currents, probably during the existence of the great lake itself. From these deposits the sun-dried brick walls of the houses are built, and coarse porous pottery is made. The whole country is a mass of volcanic disturbance, ancient and modern; much of it contemporaneous with, as well as prior to, the carboniferous epoch, as well as subsequently. Kashmir is situated in a line of seismic weakness. Earthquakes are still frequent; a severe shock occurred in April during my stay. In 1873 an earthquake destroyed 3,000 people and large numbers of cattle, and no year passes without recurrences of greater or less severity.

The rocks surrounding this great lacustrine basin are mostly stratified, except where absolutely igneous.

This collection of Kashmir rock and palæontological specimens, although small, may prove of interest to our North Staffordshire Field Club on some future occasion. I am happy to state that it has been accepted by Professor T. McKenny Hughes, the eminent Geologist and Principal of the new Sedgwick Museum, Cambridge and will find a home in that important geological collection.

Illustrations of some of the principal fossils described will be found in plate 41, the drawings of which have been beautifully executed by my niece Miss Elinor Wardle, and forms one of the

most important and interesting of the illustrations.

List of Specimens of some Kashmir Rocks and Fossils I collected in Kashmir, in May, 1903.

No. 1.—Large block of Limestone with Polyzoa, Producta, Rhynconella spondi, Polypora Rhabdomeson, Glauconoma, etc., from Panduchuck, near Singpura, upper side.

,, 2.—Ditto lower side.

,, 3.—Limestone from Panduchuck, with Avicula, Polypora, Polyzoa, etc.

,, 4.—Ditto Polyzoa (plate 41, fig. 1).

,, 4A.—Ditto ditto magnified (plate 41, fig. 1a).

,, 5.—Ditto Polyzoon, resembling Polypora (plate 41, fig. 2).

,, 6.—Ditto Crinoids.

,, 7.—Ditto Retzia.

,, 8.—Ditto Polypora, Crinoidea, Rhabdomeson.

,, 9.—Ditto Brachiopoda, probably Rhynconella (plate 41, fig. 7).

,, 10.—Ditto Brachiopodas, probably Rhynchonella (plate 41, fig. 8).

,, 11.—Ditto Brachiopodas, Strophomena, Spirifera.

,, 12.—Ditto Spirifera (plate 41, figs. 4, 6 and 9).

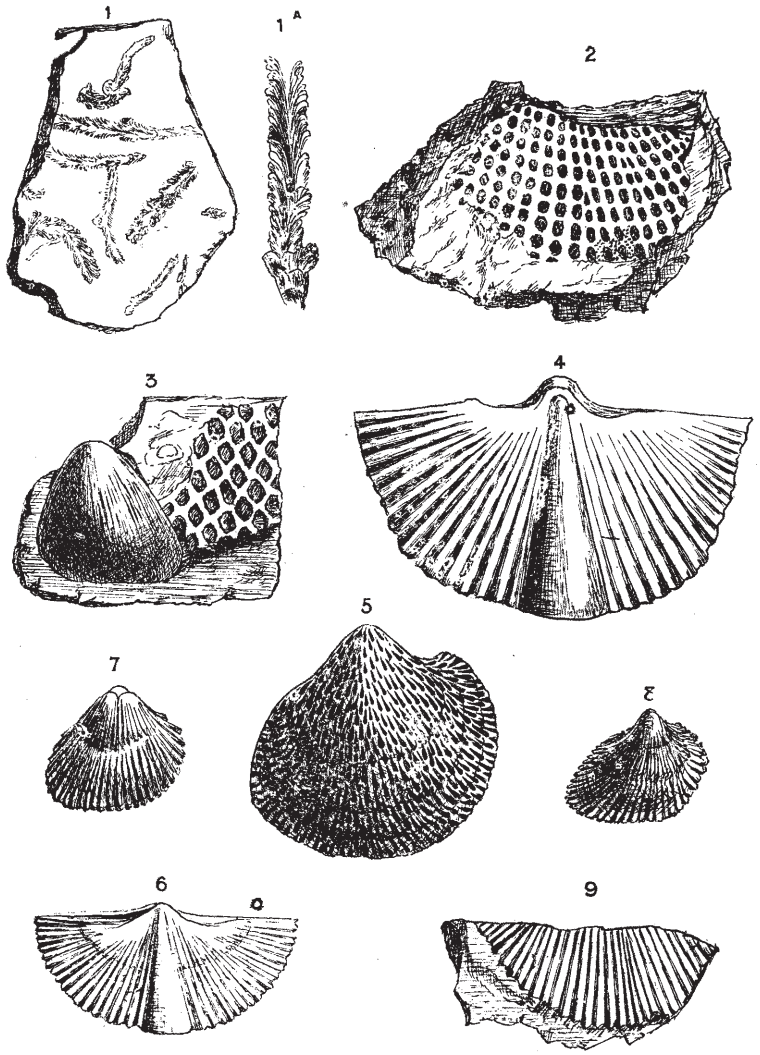
,, 13.—Ditto Polypora, Diastopora, etc.

,, 14.—Ditto Producta, Brachiopoda, etc.

,, 14a.—Ditto Productus, allied to pustulous.

,, 15.—Ditto Productus, Polyzoon (plate 41, fig. 3).

PLATE 41.



A few of the Fossils collected at Singpura, Avantipura, Liddar Valley, Srinagar, etc.

No. 16.—Ditto Streptorynchus and Polyzoa.

,, 17.—Ditto Productus, allied to P. pustulous (plate 41, fig. 5).

,, 18.—Millstone or probably Silurian Grit, resembling Caradoc grit, Liddar Valley, Pseudomorphs of Spirifera, a Conchifera and Polyzoa.

,, 19.—Ditto, ditto, Brachiopoda, Rhynchonella.

,, 20.—Ditto Pseudomorphs, fragment of Brachiopoda.

,, 21.—Ditto fragment of Brachiopoda and Monticulipora.

,, 22.—Ditto Spirifera, etc., Polypora.

,, 23 to 27.—Series of Limestones in succession, near Avantipura, the white looking ones very much contorted, squeezed and compacted with very fine greenish quartz felsite.

,, 28.—Porphoritic Greenstone, from Singpura, close to the carboniferous limestone fossils and limestone series of Nos. 23 to 27.

,, 29.—Carboniferous Limestone, of which the ruined Hindu Temple at Martand, near Islamabad, was built.

,, 30.—Igneous Rock, near Avantipura, of typical quartz-felspar porphyry related to No. 28 and belongs to the same series of intrusions, connected with some granite below or in the area.

,, 31.--Ditto, but with less quartz. These are probably dykes or tills.

No. 32.—Amygdaloid igneous Rock from base of the mountain at Srinagar, possibly a lava and contemporaneous with the sedimentary measures.

,, 33.—Slaty Rock from base of mountain at Srinagar.

,, 34.—Limestone from a stratified cliff at Bawan, Liddar Valley.

,, 35.—Ditto, ditto, ditto.

,, 36.—Green and purple Rocks from Uri, probably calcareous shales; one of these would make a good section to show the effects of the shearing stresses on these rocks.

,, 37.—Road-mending Carboniferous Limestone near Murree, 7,000 feet above sea level.

,, 38.—Amygdaloidal igneous rock from Arapal, probably the fine edge of a rock like No. 32.

During my fifty-one days stay in Kashmir, I had the honour of being entertained as the State guest of the Maharaja of Jammu and Kashmir, of whose kindness and hospitality it is not possible to speak too highly. During the time I was in Jammu he placed one of his splendid elephants and a carriage and pair at my service. The elephant was one that attracted attention at the Delhi Durbar, one of the finest specimens of its kind, with head and front richly and decoratively painted (plate 9).

His Highness the Maharaja and his brother, General Raja Sir Amar Singh, were most courteous,

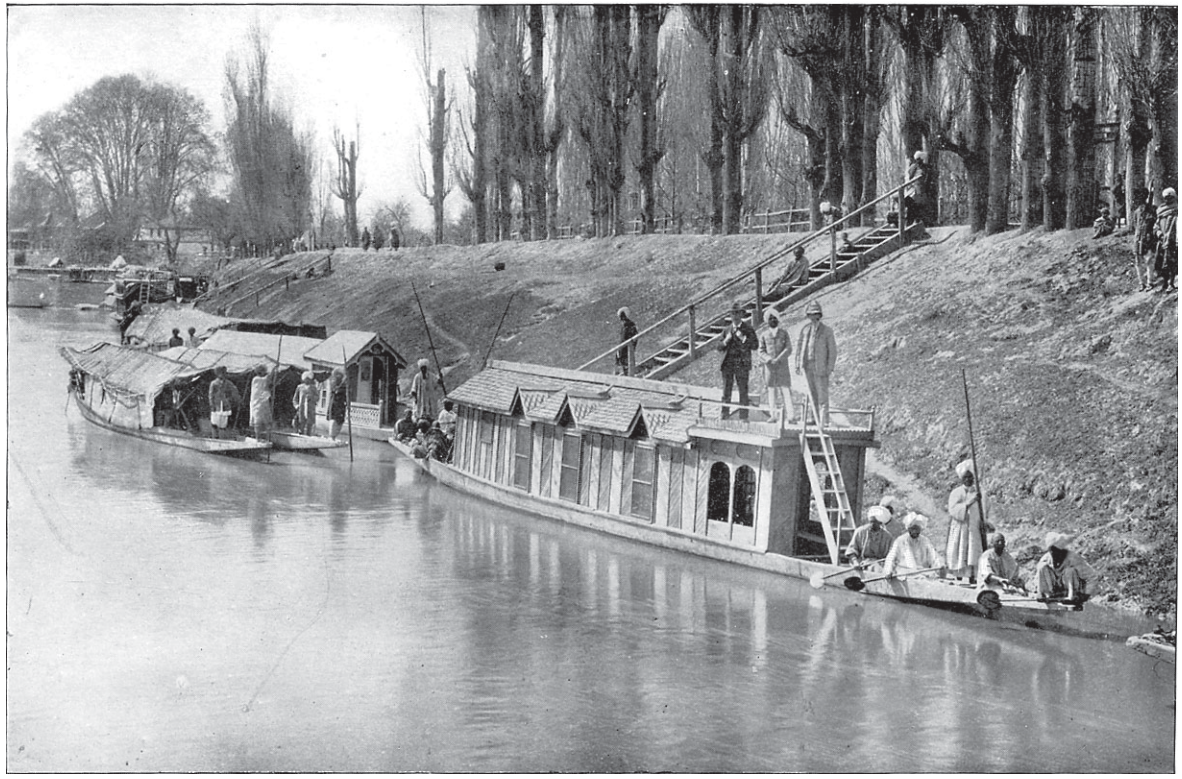
thanking me most warmly in Durbar assembled at the Palace for the interest I had taken in establishing Kashmir Sericiculture, and for my continued attention to it. They invited me to shoot in their special reserves, or Rukhs, as they are termed.

But my time was chiefly occupied with matters connected with the production and reeling of raw-silk, with a view of its improvement, and in reporting on its present state and future developments. I was, however, able to devote nearly a fortnight to natural history work and shooting.

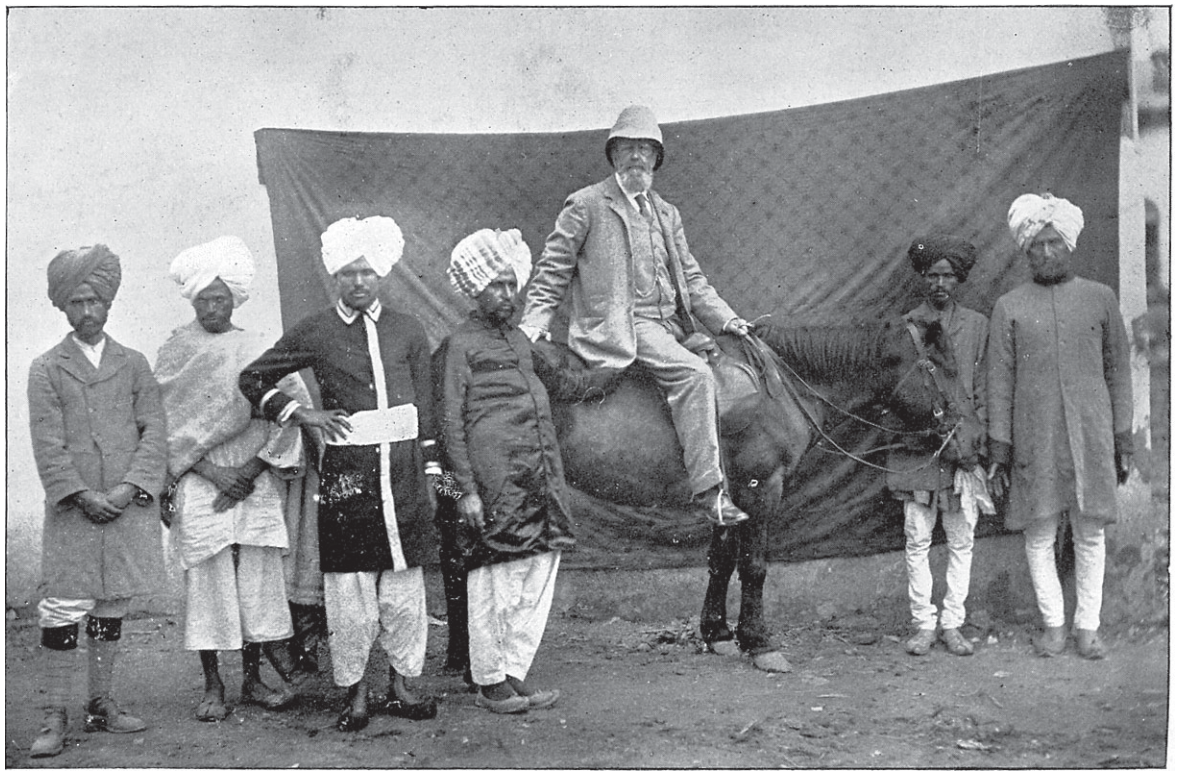
On my arrival at Srinagar from Jammu, I found arranged for me, by instructions to the Governor of Kashmir from His Highness the Maharaja, a house-boat on the Jhelum, a covered Shikara, and two Doongas, one for carrying tent appliances, and the other for cooking. These were for my expedition upon and up the river.

To garrison this expedition I was provided with a pony and Groom (Syce) see plate 40, on the right the Cook (Khansama); my native servant, (Bearer or Boy); Waiter (Karthmagar); Boat Captain (Jamadar); Tent man (Frash); and in additon twelve boatmen.

At the close of the first day's journey up the Jhelum the boats were roped to the river side, and the boatmen applied for money to buy food in the adjoining village. On my being told by my native servant that two annas (2d.) per man would suffice, I replied that I supposed it was



Author's State Shikara or Houseboat, with Cooking and Tent Appliances, Dhungas, lent by the Maharaja for Shooting Expedition. Mr. C. B. Walton, Director of Sericiculture, the State Reception Officer, and the Author on the top.



Author's State Shikara or Houseboat, with Cooking and Tent Appliances, Dhungas, lent by the Maharaja for Shooting Expedition. Mr. C. B. Walton, Director of Sericiculture, the State Reception Officer, and the Author on the top.

for the evening meal; he said, "No, it is enough for the whole day, and they will be well satisfied," and during my week's stay on the shooting tour it only cost me two shillings per day for the twelve boatmen. It is customary for the State guest to provide the commissariat of such expeditions.

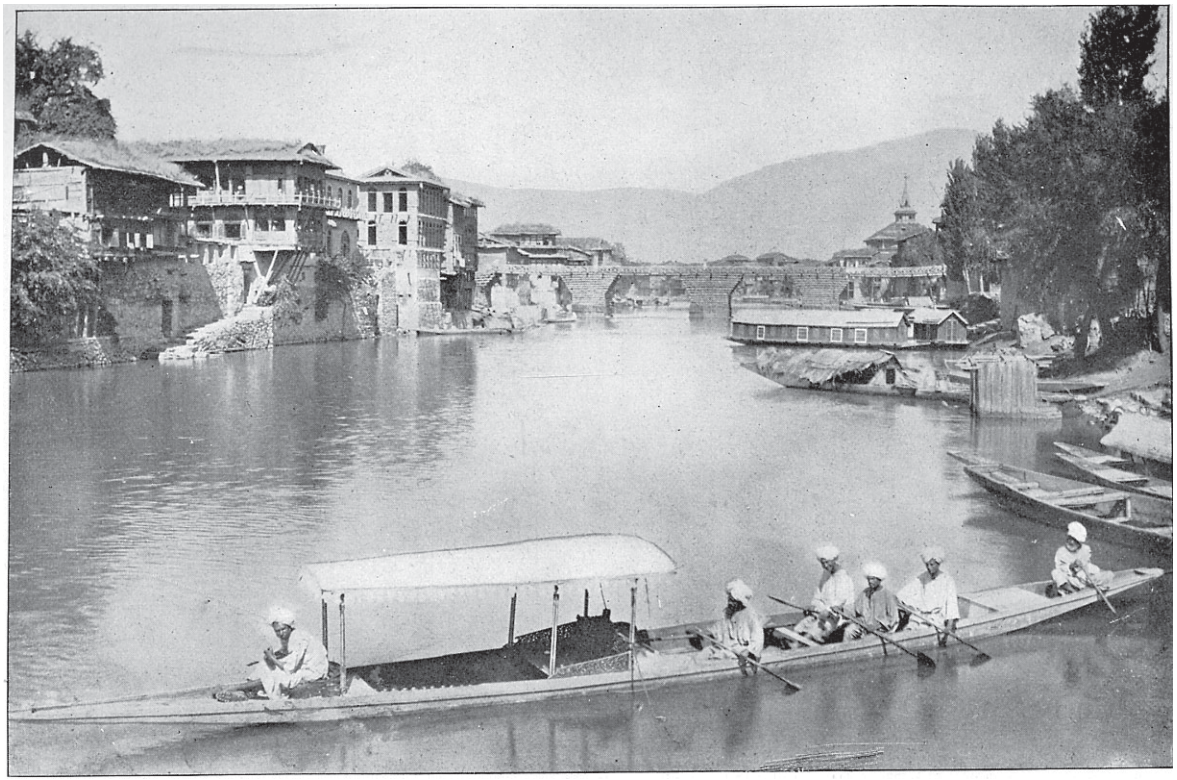
Srinagar and the Jhelum constitute a veritable second Venice, with its house-boat life and charming river scenery.

I had the good fortune to shoot two fine stags, Bárásinghás, (Cervus Kashmeriensis) a wild boar, (Sus Cristatus) in the Achábál Rukh, and a black bear (Bomba Hapat) in the Khrewe Rukh (plate 42). This was skinned in the evening, and by seven o'clock the next morning I counted thirteen immense vultures devouring the carcase.

Three days spent in the Achábál reserve, driving and stalking for Bárásinghás and bears, gave ample opportunities for geological observation from the base of the mountain to a height of about 9,000 to 10,000 feet, parts of which ascents were on pony-back nearly half-way up, and after that on foot, the ascents being too steep for pony climbing, so steep in some parts that it was difficult to hold on except by the rock stratification ledges. I got to consider an angle of forty-five degrees a gentle slope.

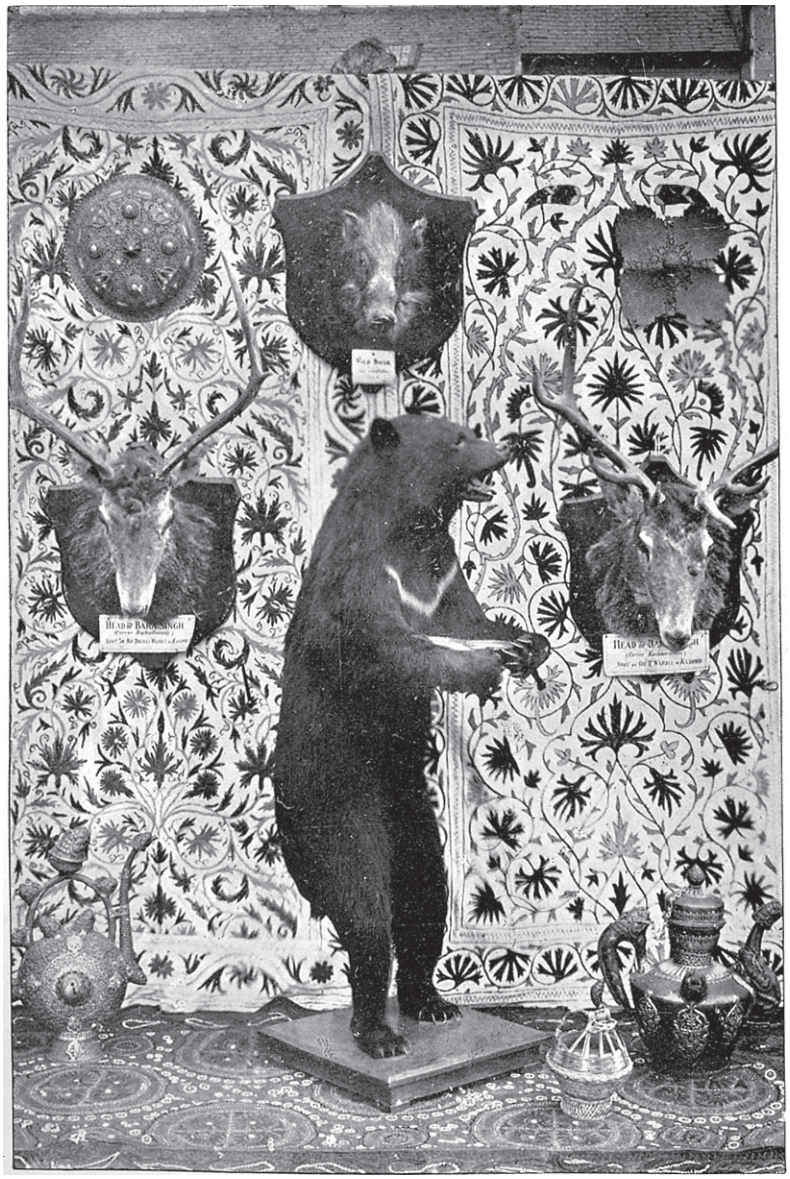
A coolie carried my hammer and specimen bag, another my shot-gun, my shikari carried my rifle, and I supported myself with a stiff alpenstock, or rather Himalayan-stock.

PLATE II.



Third Bridge and Srinagar City.

PLATE 42.



Souvenirs of Sport shot in the Himalayas by the Author, during his visit to Kashmir in 1903, also Curios collected.

On reaching one of the Himalayan ridges I tracked in the snow for about 200 yards the fresh footsteps of a leopard, but failed to find him, although the nullahs were well beaten by a staff of coolies. He had gone farther afield.

I shot a collection of birds, chiefly under the guidance of Colonel Ward, the authority on the Fauna of Kashmir, who kindly invited me to accompany him. He has the oversight of the big game and the Rukhs of Kashmir, and I shall not forget the pleasant week I passed with him and Mrs. Ward, both on the Jhelum and in camp. I am indebted to him for the names of the following birds I shot, whose skins, with others, I am bringing home :—

Black stork (Ciconia Nigra), coot, large (Fuleca atra), western spotted forktail (Henicurus Maculatus), common kestrel (Cerchneis Tinnunculus), koklas pheasant (Pucrasin Macrotopta), dabchick (Podiceps Phillipensis), yellow-headed wagtail (Motacilla citeoloides), Himalayan goldfinch (Carduelis caniceps), common sparrow (Passer communis), cinnamon sparrow (Passer cinnamomeus), the rufous-backed shrike (Lanius erythnonotus), the black and yellow crossbeak (Hesperiphona icterioides), white-cheeked bulbul (Otocompsa leucogenys), the Himalayan babbling thrush (Trochalopteron Simile), the Himalayan whistling thrush (Merula unicolar), the Himalayan pied woodpecker (Picus Himalayanus), the Western Himalayan pied woodpecker (Dendrocopus Himalayensis), hoopoe (Upupa Epops), wren

PLATE 12.

Mahomedan Mosque, Shahihumdan at Srinagar, on the Jhelum.

(Anorthura neglecta), woodcock (Scolopax rusticula), the Chikor partridge (Caccabis chukar), large spotted nutcracker (Nucipago Multipunctata), king crow (Decrurusater, or Black Drongo), Monaul pheasant (Lophophorus refulgens), the Himalayan tree creeper (Certhia Himalayana), the short-billed minevet (Pericrocotus brevirostris), the white-capped redstart (Chimorrornis leucocephala), the Indian Paradise flycatcher (Terpsiphone paradisi), the mango bird (Oriolus Kundoo), Imperial eagle (Aquila Heliaca), Indian bush-chat (Pratincola Maura), nut-cracker, tit-mice (several species), and tits.

The sparrows seem to be the most numerous species of bird; next come jackdaws, rooks, and crows; after them the Mynah. Swallows and martins were abundant.

Of the trees of Kashmir the following predominate: of fruit trees, glorious in blossom, peach, almond, apple, pear, plum, apricot, and cherry. The mulberry luxuriates all over the valley and is indigenous, in some places it occurs in forest quantities.

The willow, well pollarded, abounds. The finest trees are the chenars or planes in every village, some of them two hundred feet high. I measured he base of one of the largest, it was twenty yards in circumference. The leaves of the chenar constitute the chief motives in their beautiful designs for silverwork, wood-carving, embroidery, etc. Deodars, spruce, and other conifers abound on the mountain slopes amongst the snow.

The mulberry is very badly forested, and in my

PLATE 13.

Dhunga and Houseboat. Colonel Ward and Author.

Report I advised the appointment of a forestry expert; this will be done from the Indian Forest Department. The trees have been cruelly lopped and denuded of their boughs in many places, and years will elapse before many of them will be productive of leaves for silkworm food, but both the black and white mulberry are being extensively planted. In the Peshawar and Srinagar dyehouses I found a few interesting dyes. Fast yellow is dyed with barras, or barruc, imported from Cabul; also a yellow dye called mazath, or mazate, the root of the wild geranium; another yellow dye called rawan chini; reds, from cochineal; blues, indigo.

Of Kashmir flowers, they have only to be seen. The entire valley was teeming with fruit blossoms, and the sight of the wild iris, and the wild crown Imperial lily, as well as many other flowers, was of indescribable beauty and interest.

It is impossible to omit mentioning in this letter the exceedingly pleasant recollections I have of the delightful hospitality I received from Mr. and Mrs. Colvin, at each Residency, at Sialkot, Jammu, and Srinagar, and also of the kindness shown to me by Mr. and Mrs. Walton during my stay in Srinagar, a few days of which I had the pleasure of enjoying their hospitality.

It is fortunate for Sericiculture in Kashmir that Mr. Colvin, the Resident, and Representative of the Government of India, is taking such a keen interest in its progress.

It fell to my lot, at the request of the Government of India, to recommend a Director of this commencing Industry in 1897. The splendid results shown since that time prove that the appointment of Mr. Walton, who for many years previously had much experience in the Bengal silk districts, has been justified, and that under his able guidance and control, the industry has yet most promising prospects, and I am glad that I am able to report to the Government of India my entire satisfaction at the present state and future prospects of this important industry.

Knowing I should have to experience much change of temperature in the various parts of my journey to Kashmir, I carefully took both temperature and barometric readings daily, and often two and three times daily. In all I took 179 readings, the most interesting of which I give in the following table. Of course the great differences in the barometric readings were caused by changes of altitude rather than by the weather changes, for example, at Murree, where I had to pass through the snow on foot at a height of 7200 feet, one third of the way between Rawal Pindi in the Punjab plain of India, and Baramulla, the entrance into the Valley of Kashmir.

TEMPERATURES AND BAROMETRIC PRESSURES

FROM 13TH FEBRUARY TO 28TH MAY, 1903.

Place.	*Date.* 1903.	*Hour.*	*Temperature.*	*Barometer.*
Leek	13 Feb.	9 a.m.	45	29·7
London ...	13 ,,	6 p.m.	48	30·62
Paris	14 ,,	6 p.m.	50	30·0
Alais	15 ,,	8 a.m.	52	29·5
Marseilles ...	20 ,,	9 a.m.	55	30·0
Port Said ...	25 ,,	noon	70	30·45
Suez	26 ,,	4 p.m.	78	30·3
Red Sea ...	27 ,,	8 a.m.	73	30·3
Do. ...	27 ,,	4 p.m. (deck)	75	30·3
Red Sea ...	27 Feb.	7 p.m. (cabin)	82	30·20
Do. ...	28 ,,	6 p.m. (berth)	80	30·20
Indian Ocean	1 Mar.	1-30 p.m.	78	30·15
Do. ...	5 ,,	8 a.m.	76	30·15
Bombay ...	7 ,,	11 p.m.	76	30·10
Do. ...	9 ,,	5-30 p.m.	90	30-10
Bhopal ...	10 ,,	8 a.m.	80	
Gwalior ..	10 ,,	4-30 p.m.	86	
Delhi ...	11 ,,	8 a.m.	64	
Umritza ..	11 ,,	11-30 a.m.	62	29·25
Sialkot ...	12 ,,		64	29·6
Jammu ...	13 ,,	9-49 p.m.	57	29
Do. ...	15 ,,	8 a.m.	60	28·95
Do. ...	15 ,,	3 p.m.	68	28·9
Peshawar ...	18 ,,	8 a.m.	62	29
Do. ..	20 ,,	8 a.m.	64	28·76
Ali Musjid ...	20 ,,	9-18 p.m.	66	28·77

Place.	*Date.*	*Hour.*	*Temperature.*	*Barometer.*
	1903.			
Rawal Pindi	21 March	6 a.m.	60	28·35
Trez, en route to Kashmir	21 ,,	7-3 p.m.	52	26·75
Dulai... ...	22 ,,	7 a.m.	52	26·6
Murree ...	22 ,,	12 noon	42	24·8
Do. ...	22 ,,	4 p.m.	36	25·5
Dulai	22 ,,	8-30 p.m.	56	27·60
Guori ...	23 ,,	10-45 a.m.	54	27·45
Uri	23 ,,	4-30 p.m.	50	25·7
Baramulla ...	23 ,,	9 p.m.	38	25·15
Srinagar ...	Average from 25 March to April 1	8 a.m.	45	25·0
Acáhábl ...	Average of 4 days at	8 p.m.	44	24·9
Khanabal ...	6 April	8 a.m.	42	25·1
Srinagar ...	6 ,,	to 17 7 p.m.	51	25·1
Singpura ...	17 ,,	7 a.m.	55	25
Avantipura ...	21 ,,	7 a.m.	51	24·81
Srinagar ...	26 ,,	7 a.m.	52	24·93
Baramulla ...	2 May	noon	60	24·96
Uri	2 ,,	4-25 p.m.	58	25·4
Chakoti Dak Bungalow ..	2 ,,	6-30 p.m.	58	25·95
Garhi ,, ...	2 ,,	9-30 p.m.	60	27·05
Do. ...	3 ,,	6 a.m.	64	27·15
Domel ,, ...	3 ,,	8-20 a.m.		27·52
Dulai ,, ...	3 ,,	9-30 a.m.	72	27·77
Rawal Pindi	4 ,,	8 a.m.	79	28·2
Lahore ...	6 ,,	9-40 a.m.	90	

Place.	*Date.*	*Hour.*	*Temperature.*	*Barometer.*
	1903.			
Agra, in train	6 May	8 a.m.	85	29·35
Gwalior ,,	6 ,,	12 noon	104	28·8
Do. ,,	6 ,,	4 p.m.	106	28·8
Munmar ,,	7 ,,	8 a.m.	90	28·1
Summit Station, in train ...	7 ,,	8-30 a.m.	90	27·95
Kalyan, in train	7 ,,	1 p.m.	102	29·9
Bombay ...	8 ,,	8 a.m.	88	29·05
At Sea				
Bombay ...	9 ,,	5-30 p.m.	86	29·9
Indian Ocean	10 ,,	10 a.m.	84	30·025
Do. ...	11 ,,	8 a.m. (cabin)	86	30·02
Arabian Sea...	12 ,,	7 a.m.	84	30·08
Nearing Aden	12 ,,	9-30 p.m.	92	30·10
Aden	14 ,,	7 a.m.	86	30·1
Do. ..	14 ,,	2 p.m.	90	30·1
Do. ...	14 ,,	10 p.m.	88	30·1
Red Sea ...	15 ,,	7 a.m. (cabin)	87	29·05
Gulf of Aden	17 ,,	7 p.m.	80	30
Suez Canal ...	18 ,,	7 a.m.	72	30·25
Port Said ..	18 ,,	10 p.m.	78	30·22
Mediterranean	19 ,,	7 a.m.	73	30·22
Do. nearing Italy ...	21 ,,	8 a.m.	69	30·35
Straits of Messina ...	21 ,,	7 p.m.	71	30·36
Nearing Corsica	22 ,,	7 a.m.	67	30·45
Do. ...	22 ,,	8 p.m.	68	30·50
Marseilles ...	23 ,,	6-30 a.m.	70	30·5

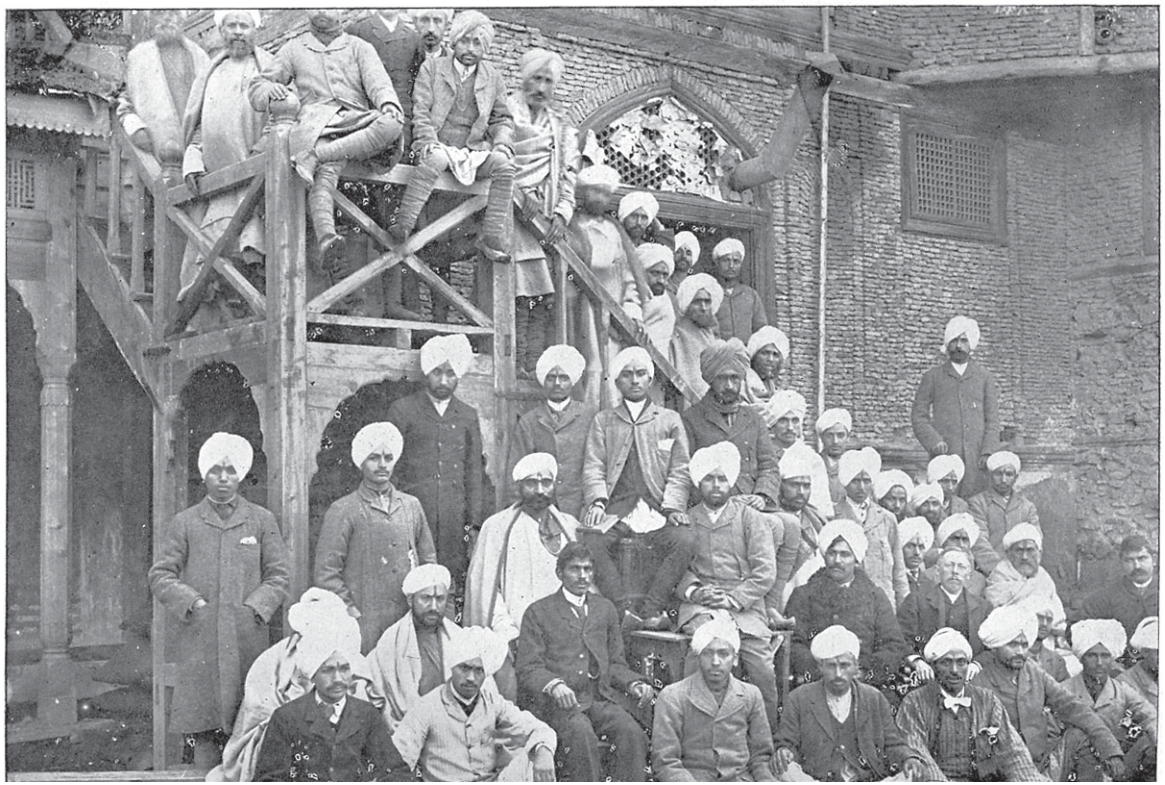
Place.	*Date.* 1903.	*Hour.*	*Temperature.*	*Barometer.*
Lyons ...	25 May	8 a.m.	74	29·8
Paris	26 ,,	8 a.m.	72	29·6
Boulogne ...	26 ,,	noon	75	29·8
Calais ...	26 ,,	1-5 p.m.	66	30·0
London ...	26 ,,	12 noon	64	30·45
Leek	28 ,,	8 a.m.	60	33·25

The stopping places from Rawal Pindi en route to Srinagar are eleven in number, at each of which is a rest-house or Dak Bungalow for travellers and horses, at very cheap rates. The journey generally takes four days, and the distance is nearly two hundred miles. I did the whole journey back in Tonga in two long days, changing horses about every six or seven miles, nearly all downhill.

The Dak Bungalows are at the following places, with their distances apart from each other :—Rawal Pindi to Barakao, 13½ miles, road level ; Tret, 12 miles, 4,000 feet above sea ; Murree, 13½ miles, 7,200 feet above sea ; Kohala, 27 miles, 2,050 feet ab ve sea ; Dulai, 12 miles ; Domel, 9½ miles ; Garhi, 13 miles ; Halli, 10 miles, 3,000 feet above sea ; Chukoti, 11 miles ; Uri, 13½ miles, 4,000 feet above sea ; Rampur, 13 miles ; Baramulla, 14 miles ; and Srinagar, 30 miles.

The climate of Kashmir in the summer and autumn is delightful, and very nearly that of Italy. The mean temperature in July is about 75 degrees. The annual rainfall is about 25 inches, and is much less than other Himalayan stations. The winter is

PLATE 15.



Assistant Masters and Pupil Teachers of the Rev. C. E. Tyndale-Biscoe's Church Missionary Society School in Srinagar.

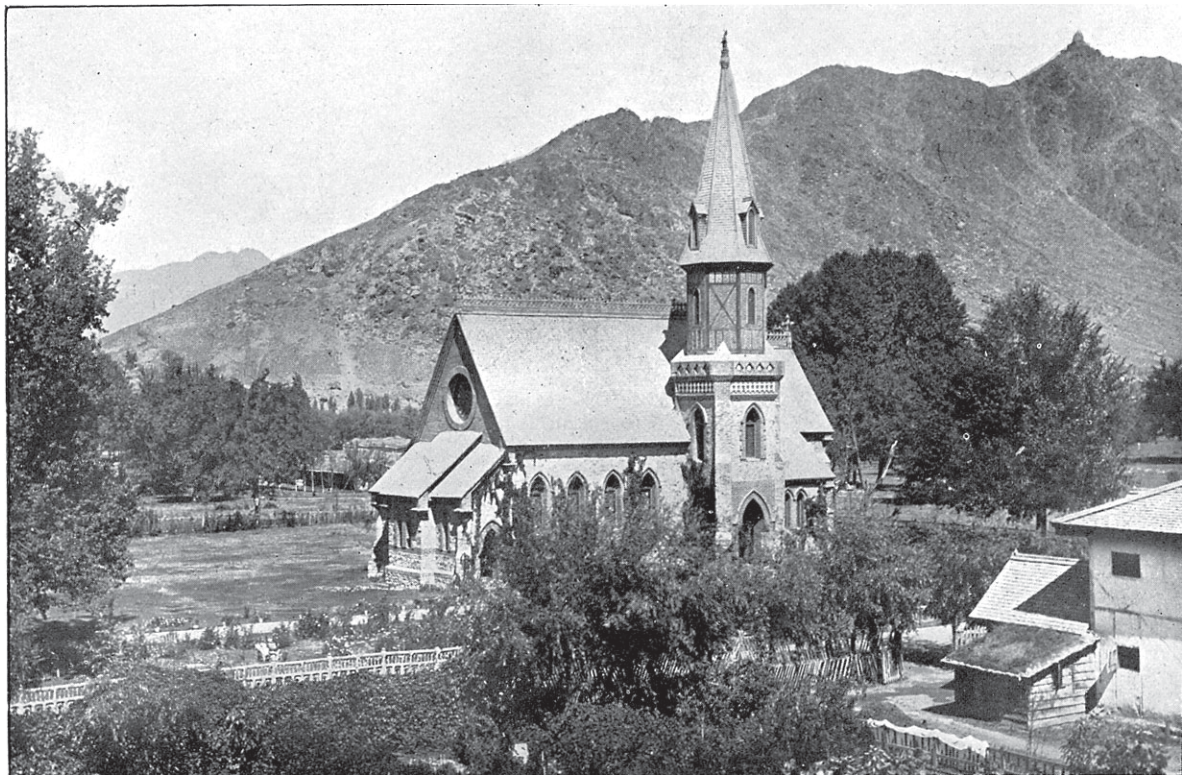
severe, ending in March. Snow falls in December with keen frost. In January more snow falls, which remains for about three months, during which time the valley is covered to a depth of nearly a foot.

Last but not least I must not omit to record my pleasant impressions of the admirable work that is being done in Srinagar by the ladies of the Church of England Zenana Mission, of whom Miss Hull, a sister of one of our ablest English Geologists, my friend Dr. Hull, F.R.S., is the head. Amongst other publications, she is the author of the charming little book entitled, "Vignettes of Kashmir."

Also the splendid work of the Church Missionary Society, under the guidance of the Rev. C. E. Tyndale-Biscoe and his coadjutors. He is also the Vicar of the English Church at Srinagar (see plate 14.)

His Schools are wonderfully popular, both amongst the Mahomedans and Hindoos. He has upwards of one thousand pupils, and I have much pleasure in reproducing two photographs, one showing the Assistant-Masters and Pupil Teachers of the Educational Department (plate 15), and another many of the Pupils and Teachers; in this the Rev. C. E. Tyndale-Biscoe is sitting, cap in hand, on the middle verandah roof on the right; Mrs. Biscoe and other ladies below (plate 17). Both these plates are reproductions of excellent photographs taken by my friend Geoffrey W. Millais, Esq., famous for his Kashmir photography, whom I had the

PLATE 14.



English Church at Srinagar; Vicar, the Rev. C. E. Tyndale-Biscoe.

pleasure of meeting in Srinagar at the time, and who has kindly given me permission to copy them.

Yours faithfully,

THOMAS WARDLE.

Leek, 8th June, 1903.

PLATE 17.

Rev. C. E. Tyndale-Biscoe and one of his Schools.

CHAPTER XXI.

ON BENGAL SERICICULTURE.

COPY OF THE PROCEEDINGS OF A CONFERENCE ON SILK HELD IN THE OFFICE OF THE REVENUE AND AGRICULTURAL DEPARTMENT OF THE GOVERNMENT OF INDIA AT CALCUTTA, ON THE 8TH JANUARY, 1886.

A MEETING was held at the office of the Revenue and Agricultural Department on the above date for the purpose of discussing questions connected with silk production, and with the special measures to be taken for the equipment of a special Silk Court at the forthcoming Indian and Colonial Exhibition. Mr. E. C. (now Sir Edward) Buck, Secretary to the Government of India, Revenue and Agricultural Department, presided, and Mr. Wardle, who had just returned to Calcutta after visiting the Eastern Bengal silk districts, took the leading part in the proceedings.

Mr. Buck introduced Mr. Wardle to the Conference as a gentleman who had come out from England to help the Royal Commission to prepare for the Indo-Colonial Exhibition such a collection of silks and information as might tend to awaken the

attention of manufacturers. When the Exhibition was first announced the Government of India was reviewing the various products of the country with the idea of determining which might be the most likely to reward any effort which might be made to promote its development, and decided that silk was of all the products of India the one of which there was most hope. Holding that opinion, it had allotted a larger portion of the Exhibition space at its disposal to a complete collection of silks than to any other class. During the year, however, information was received from the Royal Commissioners that they were extremely anxious the Exhibition should be utilised for the purpose of bringing prominently forward the question of silk production to the notice of the public, and it was, by the mutual wish of the Royal Commission and of the Government of India, that Mr. Wardle, at the sacrifice of much time and personal comfort, consented to come out to India to do what he could in the same cause. It was at the same time suggested that there should be a special Silk Court, of which Mr. Wardle would have charge, and the proposal was put before the Bengal Silk Committee; for, before the question of Mr. Wardle's coming out here had been raised, the Bengal Government had been asked whether they would undertake the preparation of the Silk section, seeing that, of all the provinces of India, Bengal was the most interested in the silk question. The Bengal Government agreed to a Committee being formed in Calcutta,

and the matter had proceeded so far when Mr. Wardle's arrival was announced. The Bengal Government readily agreed to the proposal for a Silk Court and offered their collections and assistance to Mr. Wardle.

Mr. Wardle then addressed the meeting. He began by saying that it might naturally be asked why he, as a silk dyer and silk and calico printer, should appear there to speak upon silk cultivation and the earlier operations in the manipulations of silk.

He would anticipate objections of that kind by showing that, apart from lengthened scientific investigation, he might be considered to have at least some claim to be heard on the subject from having been accustomed as a silk dyer and printer during his business life, to examine every variety of silk fibre and its diversified kinds of manufacture, and had therefore had lengthened opportunities of studying the nature and many forms of the silk which came to him to be dyed or printed.

He hoped he could at least from this long acquaintance speak thoughtfully on the subject, and he must add that he spoke also from a disinterested point of view.

Having as early as 1872 succeeded in making some important developments in bleaching and dyeing Tussur silk, at that time a very difficult fibre to dye, he had been consulted shortly afterwards by the Marquis of Salisbury, then Secretary of State for India, to report on the practicability of dyeing this silk in India and in examining the native dyes

of India. The investigation took eight years to complete, during which time he was requested by the Government of India to take charge of Indian silks at the Paris Exhibition of 1878, and now he came out to India at the request of the Royal Commission of the Colonial and Indian Exhibition of this year to undertake the same duty, but on a more extended scale, and to properly emphasise the capabilities of India as a silk-producing country. Naturally with so long an acquaintanceship with both the domesticated and the wild silks of India he had their progress and utilities very much at heart.

Further, he was led to accept the invitation at Mr. Buck's expressed wish that he should come out in the interests of Indian sericiculture.

He was here for several specific reasons; *first*, to stimulate and give encouragement to an extended production of Tussur silk, now a settled European manufacture and industry, requiring a much larger supply of the raw material than India was at present able to supply; *secondly*, to collect examples of the wild and domesticated silks of India in all their stages, from the eggs of the various silk-worms to the finished fabrics for the Exhibition; *thirdly*, to see for himself how it was that Bengal silks had gradually fallen into disrepute in England and in all the other European silk centres during the last twenty-five years until they now hardly held a place equal to their former reputation.

Also to make an examination on the spot of the present system of reeling silk and to point out how

it might be improved, and if possible, made equal to that of the best silk-producing countries.

Previous to that time in the town of Leek in which he lived, the staple trade of which was and is the manufacture of sewing-silks, the consumption of Bengal silk was the rule, that of other silks being the exception. Bengal silk, if properly reeled, has several properties which peculiarly fit it for sewing-silk, in addition to its suitability, when properly reeled, for weaving purposes, and a large quantity could be used for that important requirement.

Gradually the silks of China and Japan came in, and for many years past had almost entirely swept away the use of Bengal silk, and his motive was to try and restore this silk to its former position, one which he should be able to show from his recent visits to the silk filatures of Bengal, might easily be more than realized. He remembered that two great defects existed in Bengal silk, which, gradually increasing, had gradually led to its being in less demand, for many of the important purposes for which it had been used. One was the very defective way it was reeled from the cocoon, and the other the difficulty there was in winding it when reeled. He was disposed to think, after seeing the rough-and-ready way the natives reeled their cocoons in their village-huts, that native-reeled silk had too frequently been shipped to Europe instead of that of the better reeled Indo-European filatures, but no doubt even the high quality of the latter, although beyond all comparison with native reeling

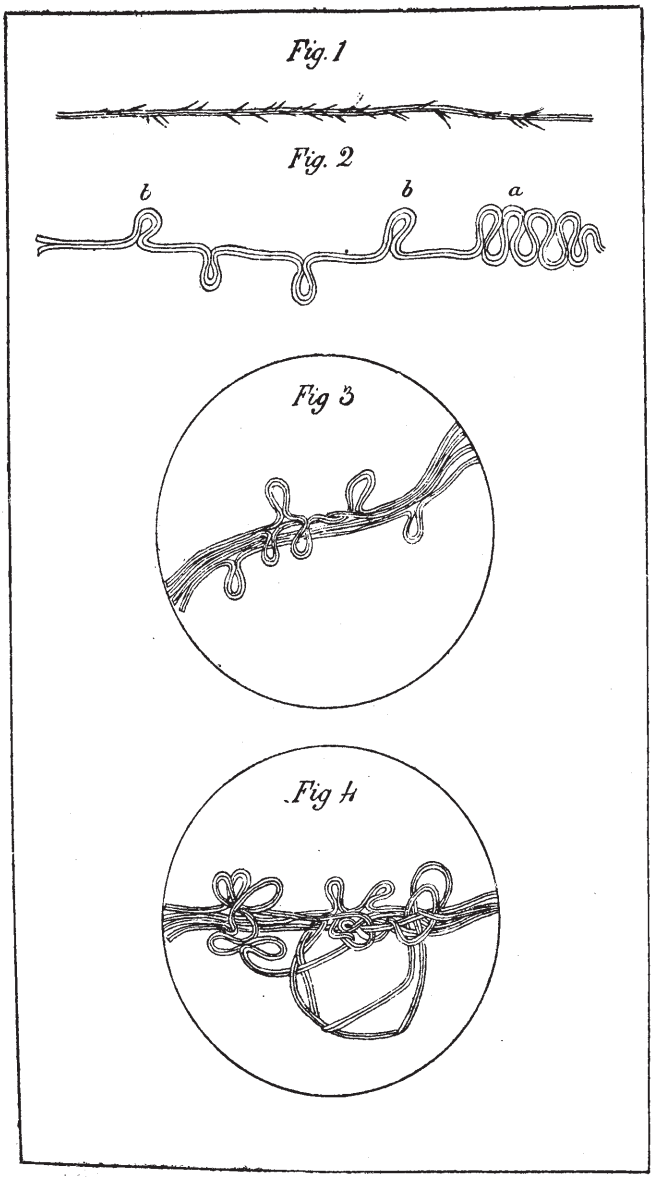
and also from other reasons, had fallen from its former excellence.

These were the principal causes which led to the decadence of the Indian trade not only in England but also in the other European silk manufacturing centres. From lengthened microscopical and other examinations of Bengal silk he had convinced himself that the fault was not in the fibre itself, for in comparison even with Italian silk its structure left nothing to be desired.

The principal cause of the irregularities in reeled silk is a defect termed by the French and Italians *duvet*, the precise nature of which he was told in all the filatures he had visited both in Italy and India he had been the first to point out and define. It was strange that this defect had not before been thoroughly understood, but as the use of the microscope in Indian sericiculture had hardly yet commenced, no one need be surprised at erroneous conclusions being drawn in matters almost invisible to the unassisted eye. He could not too strongly advocate the constant use of the microscope in every filature. It was not necessary to have an expensive instrument; he had brought out with him one of Beck's new small £4 4s. od. microscopes with objectives of 1 inch and $\frac{1}{4}$ of an inch power, quite sufficient for all practical purposes. To this should be added a micrometer eye-piece for making measurements of the thickness or diameter of the fibre.

Many opinions of the supposed nature of the *duvet* were given him by the several gentlemen

PLATE 18.



Cocoon Fibre, showing Bave and Duvet.

engaged in the filatures both in Italy and India. Amongst them were these principal ones, *first*, that the *duvet* consists of broken ends of the *bave* arising from the piecing of the thread by the reeler or by replacing carelessly the end of a fresh cocoon; *secondly*, that the silkworm does not deposit its silk in a continuous thread but leaves off and recommences at intervals throughout the cocoon, causing ends in its double parallel thread or *bave; thirdly*, that the fibre is hairy, somewhat as in fig. 1, plate 18; but this is not so. The silkworm deposits its silk with extraordinary regularity and method. The outer and inner threads of the cocoon are, indeed, finer than the central portions, the thickness increasing very gradually to about the middle of the cocoon, but the thread is, in every case he had examined, always continuous and of excellent regularity. He had never been able to detect the *bave* or fibre of any silk to be hairy or externally fibrous. It is in the *reeling* only that defects begin to appear.

The silkworm, by moving its head from one side to the other, deposits its double thread in loops as at *a* in fig. 2, plate 18.

At the points of contact the gum adheres more firmly than it does laterally, consequently in the reeling the *bave* frequently comes off in loops as at b . . . . b fig. 2, plate 18.

In fig. 3, plate 18, is given the appearance of *duvet* upon a thread of raw-silk composed of four cocoons reeled together.

Fig. 4, plate 18, is the microscopical appearance of an aggravated form of *duvet*, in which a series or layerlet of loops have come off together, and which having passed both *filière* and *croissure* without being reduced, have resolved themselves into a tangle which constitutes what is known as "knibbiness" or "bouchons" in the raw-silk.

In native reeling it is much worse and much more frequent. In the Bengal cocoon this defect is much aggravated from two causes—

1st, by the greater amount of gum or *grès* which the worm exudes to cover its silken thread than in those of the Italian, French, Chinese, and Japanese worms.

2ndly, from the Bengal cocoon being smaller than those of the countries just mentioned. This smallness increases the difficulty of reeling, especially towards the inner portion of the cocoon.

In the Italian cocoon the chrysalis is larger than the Bengal ones, and helps by its greater weight to prevent the cocoon being drawn out of the water in which it floats whilst being reeled. In the Bengal cocoon when the *bave* is nearly all reeled, it is often jerked from the water to the *filière*, many loops being loosed and drawn up on the reel at once. Often for want of care whole layers come off at once and form what are called "bouchons," "knibs," "foul," "slubs," &c. The cocoon, it should be stated, is as stratified a piece of construction in its way as the liassic formation, and the layers are very apt to come off *en masse*. This is particularly

noticeable in village native reeling, where irregularity of thread, however great, seems to be no drawback. He had seen the silk drawn off in positive lumps, and the wonder was that with the extraordinary rapidity of their reeling they obtain any but a thread of *chassum*, so clumsily and rapidly do they piece up the breakages, unavoidable in their rough-and-ready reeling.

In the best European filatures the irregularities are merely the occurrence of loops, *duvet* when only a few occur. "Knibs," "slubs," "foul" or "bouchons," when in quantity or in mass, are but very seldom found in the best reeled silk of Italy.

He had suggested that attention should be directed to a better and more perfect state of tension between the bassine and *filière*, and before the thread reaches the Tavelette, for no amount of *croissure* can reduce the *duvet* of a single *bave*; *i.e.*, before the cocoon fibres join together, as it is hopeless to attempt to reduce the loop on a single *bave* when it has passed through the hole of the *filière* which unites into one thread the *baves* of as many cocoons as may be reeled together—

Of Italian silk 4 cocoons reeled together are required to make a thread of 9 to 11 deniers;

and 10 to 12 to make a thread of 25 to 30 deniers.

Of Indian tussur silk 4 cocoons are required to make a thread of 40 deniers;

and three for 30 deniers.

He was cordially thanked in Italy for having pointed out the nature of the *duvet* and in having shown that by the slightest pull of the single *bave* this *duvet* was resolved into a perfect line, and steps are being taken to overcome the defect.

The *duvet* is not easily seen on the Italian silk except when on the reel and in a good north light, but its removal will mark a new era in all *Bombyx Mori* silks, particularly that of Bengal, in which they have hitherto been more numerous.

Referring to his visit of the past ten days to the Bengal silk districts, he said that at the invitation of Mr. J. J. J. Keswick and Mr. Lyall, he had gone through the filatures in the Rajshahye and Murshidabad districts. He had been very much impressed with his visit. He found beautiful raw-silks, although capable of improvement, being produced all over the district, and he had been received with the greatest courtesy and kindness; and while there, he had drawn up a few suggestions, which would, he hoped, be of special interest to Mr. Buck, as Secretary to the Government of India, in the Revenue and Agricultural Department. He had visited Mr. Morey, of the Surdah Filature, also Mr. Stocks, of the Bengal Silk Company at Murshidabad, and subsequently Messrs. Louis Payen & Co., meeting Monsieur Gallois. With regard to the properties, the structure, and the fibre of the Bengal silk, he had shown them side by side under the microscope with Italian silk, and proved to these gentlemen the accuracy of his former examinations,

that there was really no practical difference in the fibre, and that of the two, the Bengal silk might be preferred in several respects if it was properly reeled. It was surprising how near they were together both in size and homogeneity of thread. He was, however, bound to remark that the present mode of reeling in the Bengal filatures was a little old-fashioned, and he thought it was worth while to invest money in altering it, and to try the Italian mode of reeling. He was not sure whether he knew enough about the matter, but on his way to India he had visited Italy, and had seen there what he considered to be the very best method of reeling. He saw every detail in connection with the preparation of the cocoons and the subsequent reeling of the silk. He also saw the working of the reeling-machine known as the *Tavelette Consono*, a simplified and beautiful contrivance exactly suited to the reeling of the *finest* silks. Although the Italian and Indian worms were of the same genus there was a specific difference between them.* The Italian worm at full size was much larger than the Indian one. Mr. Wardle would not now enter into scientific considerations on the point, but he was quite certain, and had convinced the gentlemen he had visited, that the silk of the Indian worm was as good structurally as the Italian one. The Bengal cocoon was not as large as the Italian, and did not con-

* The European, Japanese and Chinese univoltine silkworm of commerce is *Bombyx mori*, the multivoltine ones of Bengal are *Bombyx fortunatus* and *Bombyx cræsi*.

tain so much silk. From measurements, he found that the white and yellow cocoons of the old Italian breed measured 650 metres in length each, the Bengal cocoon only averaging 150 metres. This was an immense difference. There was some cause for this, and he thought it might result from the Indian worms being multivoltine, and also from their being imperfectly bred and badly nourished. He had been at some trouble to obtain the matured opinions of the gentlemen engaged in the industry in Eastern Bengal, and he would place a summary of them before the meeting. On the authority of each of the filatures he visited, the rent exacted by the zamindars from the ryots who cultivate the mulberry plant is excessive. Before the American War it was Rs. 1-8 to Rs. 2 per bigha. During the war and the prosperous few years which succeeded, the rent became Rs. 14 and even as high as Rs. 16 per bigha. In the neighbourhood of Berhampur it is now Rs. 12 to Rs. 14; in Malda Rs. 16. There are three bighas in an English acre, and the rent would be Rs. 48 per acre—a rent very much higher than the average of English rents. Rather than lower their rents, the zamindars would sometimes allow their land to lie fallow. In the good years he had just spoken of, the ryots paid any price the zamindars asked, and it seems to be nothing short of a misfortune that rents have not come down with the depression of recent years, and the declining demand for Bengal silks.*

* Since the meeting he had received the following letter

It is the native zamindar who exacts such very high rents and not the European,† and who, if he would wish to see the industry again in a flourishing state, would do well to be wise in time, and assist the present effort of its revival by

from a native gentleman occupied with native interests but who did not wish his name to appear:—

"Dear Sir,—Government holds certain lands as intermediate proprietor or zamindar. These lands or estates are called *Khas mahals*. Government as a model zamindar can introduce in the *Khas mahals* all improvements and reforms which are likely to increase the material wealth of the country. The ryots hold land immediately under the Government and, while letting out land, the Government can make its own terms with them. For instance, if there be any mulberry lands in any one of the Government *Khas mahals*, and if the Government be convinced that low rate of rent is likely to improve the quality of cocoons grown and so foster the trade in silk, the Government can very easily set an example by reducing the rent in the *Khas mahals*. In fact, as a model zamindar, Government can introduce any reforms in the *Khas mahals* that are likely to develop agriculture, trade, or industry.

"In the Courts of Wards' Estates, Government has no such free scope as in the *Khas mahals*. In those estates, the Government holds the land temporarily in trust and can within a certain limit introduce reforms which the actual proprietor would have introduced had he been in possession. These estates are generally the estates of minors, and Government holds or manages them in trust for them.

"You would confer a great boon to the country if you could prevail on the Government to act as a model zamindar in these *Khas mahals* and show the poor ryots what can be done in the way of improving agriculture, trade, or industry."

Yours faithfully,"

† My correspondent in conversation rather questions the accuracy of this statement, and thinks there is not so much difference as might be inferred from it; but he admits there is a difference in favour of the European zamindar.

moderating his rent and so encouraging it. He was told that Rs.3 would be a very fair rent. There are at present some low-lying lands, which are rented at Rs.6 to Rs.7, and even as low as Rs.3, but not in the Berhampur and Surdah districts. In a letter he had received from Monsieur Gallois, of the filature of Messrs. Louis Payen & Co., since he visited the filature, the following opinion is expressed:—

"I told you in the course of our conversation that I consider the decrease of late years in the rearing of silkworms (*Bombyx Mori**) in Bengal to be entirely due to the excessively high rents the zamindars put upon the mulberry lands in years of prosperity in the silk-trade, and which they maintained when the value of silk in the world fell down 20 to 50 per cent.

"I could point out estates in the Maldah, Rajshahye, and Murshidabad districts where rents for mulberry lands are as high as Rs.12, Rs.14, and Rs.16 per bigha.

"I am perfectly aware that the Government is powerless to interfere with the zamindars to bring them down to lower rents for lands which they have collected for many years past, but I believe that a great deal might be done in the estates under the Court of Wards† if the Collectors in

* Not Mori but fortunatus and cræsi.

† NOTE.—It may be of interest to explain to readers out of India the nature and work of the Court of Wards and attached estates in Bengal. Mr. Wardle had been assisted

charge would fix a fair rent for all lands This step would at once increase the mulberry cultivation in these Courts of Wards' estates and be a very good example for the neighbouring zamindars to follow.

"I consider Rs.3 per bigha a fair rent for the best mulberry lands. The best rice-producing lands are seldom rented higher than Rs.1-8 to Rs.2 per bigha."

The industry appears to be crushed because of this high rent. There are hundreds of square miles of land under mulberry cultivation, but the quantity is rapidly declining, and the land used for other crops. The mulberry is not grown as a tree for

in this by an interesting article on the subject in the *Englishman* of the 11th January, 1886.

There are 170 wards, and 90 attached estates under the management of the Revenue authorities, who fix and collect the rents of these estates.

Indifferent harvests have made the collection of rents difficult. In the Bhagalpur Division the collections only amounted to 84·1 per cent., and they were also unsatisfactory in the Burdwan and Rajshahye Districts.

There would probably be increased revenue if the silk industry of Bengal could again flourish, so that more land might be put under mulberry cultivation.

The estates have to bear subscriptions, donations to schools and to dispensaries, and for keeping the property in good order for the benefit of the wards, who are minors, who are educated first in the zilla and other district schools, then in some cases by special tutors, whilst "others are educated at various colleges with private tutors to direct their studies. One good feature in the curriculum of education is that, as soon as any minor reaches the age of eighteen, he is, in addition to his ordinary education, taught the principles of zamindari business, and is practically inducted into the management of his own estate."

silk-rearing in the Bengal district proper, but is planted over the land as a shrub, and does not grow higher than from one to two feet. It is the *Morus indica* and not the *Morus alba* of Italy. Land for mulberry-growing has come to be more highly rented than for any other crop. Even land used for growing rice adjoining the mulberry plots is only rented at twelve annas to one rupee per bigha. A striking difference this it must be owned. Other causes are also in operation increasing the difficulties of recent sericiculture in India, and, as it was one of his missions here to stimulate the industry and to point out reasons for its improvement, he hoped it would not be considered out of place if he placed on record all the hindrances to sericiculture recorded to him in his visits to the filatures. Mr. Morey, of the extensive filatures of Messrs. Robert Watson & Co., of Surdah and other parts of the province, told him that another great reason of the decline of this industry is mainly due to the low price of the silk market and the failure of the cocoon crops. The cultivation of the mulberry, too, had considerably decreased, owing to the reasons already given, and in consequence of the ryots finding better remuneration by sowing rice, sugarcane, and other crops, the cultivation of which had considerably increased. He considers the failure of the cocoon crop to be principally due to the bad seed selected by the native breeders. Formerly they themselves went to purchase seed from other districts, and saw the worms building their cocoons

before buying their seed cocoons. In doing this they also rejected any bad cocoons. Now, the system is that brokers, "Sanchoo-Pikars," go instead and buy indiscriminately and sell to the rearers. The consequence of the absence of proper selection is that diseased and weakly worms are bred, the crop fails, and the rearers get disheartened. Mr. Morey suggests that Government should come to the rescue and rear cocoons for *seed* purposes only, and also in growing mulberry properly to feed these seed worms. This latter would take, perhaps, a year to do, but the benefit would be very great; the natives would also gladly purchase good seed. He suggests that at first the Government might distribute the seed to the native rearers gratuitously in order to get them to take it, but as soon as the natives were found to use this better seed eagerly, it could be sold, and funds would be created as well as the silk industry greatly improved.*

Further, Mr. Morey suggests that, as during the hot months worms are killed by the extraordinary hot winds, because of the matted walls used in the construction of the native village huts, it would be well for Government to help in erecting huts with mud walls in all large cocoon-rearing villages, in order to show the rearers that by this plan they

* Mr. Wardle had called upon Dr. King of the Royal Botanic Gardens, Calcutta, who had kindly offered to cultivate the various species of mulberry and to distribute plants gratuitously to any mulberry-growers who cared to apply for them.

would save their worms and secure much larger crops than at present. In those villages where the rearers have mud-walled huts, the cocoons seldom fail. This, he thinks, is a very important fact. Mr. Morey had told him that during the last three years at least 60 per cent. of the worms had died from disease and the hot winds. He thinks Government should employ some responsible person to visit the rearing districts, and show the rearers what is required. He also thinks the zamindars should be asked to interest themselves more. He also thinks it worth suggestion that Government might commence the rearing of brood cocoons in jails under the supervision of a paid expert.

Now, as he, Mr. Wardle, knows from long experience that many gentlemen connected with Government administration in England "pooh-pooh" any request or suggestion for the substantial and practical aid of anything connected with trade or commerce, and are ever ready, too ready he thinks, with their pet expression, "It must be left to private enterprise," it is quite possible that some or all these thoughts may receive similar treatment, yet he cannot help hoping that Mr. Buck, who has repeatedly proved to him the very strong interest he feels in this industry, and at whose call he has at great sacrifice come out to India, will consider the wants of Indian sericiculture with a breadth which he thinks it needs, and a determination not to let the subject pass away until it meets with that great resuscitation which

with proper care and assistance awaits it. He earnestly appeals to him to support this industry.

He ventures to say that collective action is what is most needed to restore our silk industry both at home and in India; it is, in his opinion, necessary that Government should take the initiative in a well-thought out application of any lever which will help to raise so beautiful and artistic an industry to its proper and ancient proportions. The wearing down of any artistic industry is a national loss which requires national aid and encouragement.

The silk industry of England has received no real encouragement from her Governments, not even in providing well and correctly compiled statistics. In this respect we are behind every other western silk country, and its present state is dreadful.

As the silk industry gradually travelled westward, Rulers and Governments assiduously welcomed and nurtured its growth, never more so than in France and Italy in the past and especially at the present time. Extraordinary effort is there made outside private enterprise for the retention and extension of this their valued industry. We have an advantage which France and hardly any other nation possesses in having a great silk-growing country in India, capable of supplying not England merely, but all Europe. In England we have silk centres, such as Spitalfields, Coventry, Macclesfield, Congleton, Middleton, and other districts, not long ago great centres of silk industry, now paralysed, and the

want of collective action and Government supervision has had not a little to do with it.

In what way it would be best for the Government of India to support this effort is hardly for him further to suggest, but he is sure there is an immensely important future in India, not only for the ordinary silk of commerce, but also for the newer industry of Tussur silk, with which he has had something to do during some years of persevering effort to bring into life. With regard to the silk of commerce, he has been able to convince the gentlemen who have charge of the Bengal filatures he has had the pleasure of visiting, that they are manipulating a fibre quite equal, if not superior, to that of Italy, in respect of structure and regularity. He is certain, from the microscopical and other examinations of many species of silks he has had the honour to make for and at the request of the important Chamber of Commerce at Lyons, a report of which had been circulated in India by the Government, and which should be read and studied at every filature, that Bengal silk is capable of as much refinement as any other silk of the same species, be it Eastern or Western. He repeated that it is all the produce of species closely allied to the *Bombyx Mori* of Europe, and the fibre is, for all practical purposes, nearly the same. With care and perseverance India will realise the truth of these examinations and assertions. On the table will be found specimens of silk which he has seen reeled with the appliances of which he

has spoken other than those at present in use. The silk produced is almost as good and pure as Italian, in fact much better than some of the Italian silks.

To those inclined to doubt what he says he commends a careful examination and comparison of the specimens which he saw reeled in the Rajshahye filatures and which now lie on the table.

India only wants the application of progressive observation, and the immediate adoption of whatever method the progress of sericicultural science and mechanical art bring to add better results in Europe. That there is ample scope may be inferred from the fact that for the ten years ending 1883, we in England have been purchasing manufactured silks from countries in Europe to the extent of about eleven millions pounds sterling annually, and that whilst during that period Europe has been annually consuming 6 million lbs. grown in Italy, 1½ million lbs. grown in France, 7 million lbs. grown in China, 3 million lbs. grown in Japan, India can only show an export of one million lbs., and last year it had sunk down to an export of only 457,600 lbs. This does not include that grown for native consumption, which is no doubt very considerable, and has much increased since the very low prices of Bengal silks of late.

He found at Poona, as well as at other places, the silk manufacturers were all buying their raw silk from China on account of superior quality, and had given up the use of the silk of their own

country. At Lahore he found Bokhara silk exclusively asked for.

The value of the exports of silk from India in 1884-5 was Rs.46,35,613, whilst that of the silk imported was Rs.74,75,633, or nearly twice her exports.

Is it not high time that collective as well as individual effort should be made to alter so serious a state of things? *

From these statistics it may be inferred that every acre of mulberry land may be multiplied many-fold.

From the short time placed at his disposal by the Royal Commission he had not had an opportunity which he should have desired of visiting those

* NOTE.—He extracts from Mr. J. E. O'Conor's "Review of the Trade of India in 1884-5" the following interesting statement:—

"Silk was imported to a much smaller extent than in the last two previous years, only 1,831,702lbs., which was 17 per cent. less than in 1883-84, though still a very large quantity for a country which is held to be a great silk-producing country. Whatever may be the capacity of the country for producing silk in large quantities, it is clear enough that while India imports more silk than it exports (the bulk of the exports being, moreover, only waste or chassam), the country must more properly be called an importer and consumer than a present producer of raw-silk. Most of the imported silk comes from China and Siam *via* the Straits for Bombay mainly and Burma in smaller degree. Even Bengal, however, the great silk-producing province, imported 212,349lbs. of silk last year. It is understood that this silk, like the silk imported into Bombay, is for the use of a local mill which has been at work for a couple of years weaving silks for the Burma market."

districts in India where sericiculture has been attempted or is being to a less extent carried on, namely, the North-West Provinces, the Punjab, and Kashmir.

The mulberry thrives luxuriantly in these provinces, and he has no doubt there is a good prospect in store for them under sufficiently trained European superintendence and patient development on a moderate scale.

There will be shown at the coming Exhibition in London cocoons of the *Bombyx mori* of excellent quality and form from these provinces.

He would strongly urge that Government should annually ascertain the quantities and values of native-reeled silk used chiefly in India and Burma, and also that produced by European reelers in India for export. In France and Italy the quantity of cocoons annually raised is recorded and published, and it should be so in India; also the quantities of Tussur, Eria, and Muga, not omitting the waste silk of all kinds carefully defined. The want of these statistics is very great, and it is a reflection upon our system of compiling our Board of Trade returns that comparatively no information of value can be as yet obtained. It is particularly necessary, now the Tussur utilizations promise a most important augmentation to the silk trade of India, for if it is properly cared for he predicts for India an enormous expansion of Tussur silk growing and reeling, and, as he is fully convinced that a great future also lies before Bengal in the revival of her

at present distressed and unremunerative silk industry, he thinks it will not be denied that his suggestions on this head of accurately compiled returns are of the first importance. He repeats that what is wanted is—

(1) An annual return of the quantity of cocoons raised of the mulberry-fed worm of each bund, distinguishing the univoltine and multivoltine kinds ;

(2) An annual return of silk reeled in Bengal in the European filatures ;

(3) An annual return of native-reeled silk, which could be obtained without much difficulty. All the silk produced in the different districts comes through the bazaars in the raw state, and the Magistrates could easily obtain statistics by finding out the quantities annually sold at the different marts ;

(4) An annual return of all waste, *chassam*, knubs, pierced cocoons produced in the reeling, breeding, and manufacture of silk proper ;

(5) Tussur silk, quantity of cocoons raised in the various provinces ;

(6) Quantity of waste, raw-silk, and cloths of Tussur ;

(7) Similar returns of Eria, Philosamia ricini ;

(8) Similar returns of Muga, Antheræa assama ;

(9) The nature and quantities of the exports of each kind to be severally and accurately defined.

Another subject which had specially occupied his attention was the development of the trade in Tussur silk, and he had been engaged in attempts in this direction for some years past. He could not for some years induce the manufacturers in England to utilise Tussur Silk; he had to visit Germany to have his ideas of Tussur plush first carried out. The Government of India sent home in 1874 a quantity of Tussur cocoons of various sorts, and he had succeeded in reeling them in Italy. Later on people began to see that there was something in Tussur silk. In 1878, at the Paris Exhibition, the French manufacturers were very much struck with his examples of improved reeled Indian Tussur, telling him that they could give orders for almost any amount if it could be reeled as well as that exhibited. He told them that such silk was not yet in the market. He then appealed to India for it, and the Indian producers did not at all respond to this appeal. There was then nothing left for the manufacturers but to go to China and there they have found what they wanted; but although China had got the start in the race in the competition with India, India had now begun at the right end. China began by sending out the worst rubbish she could possibly find, and India had begun by sending her best reeling. The fibre of Indian Tussur silk is a better one than that of Chinese Tussur, which is quite another species, *Antheræa Pernyi*. It must be a great pleasure to all who were connected with sericiculture in India to find several

gentlemen vieing with each other to produce the best quality of real Indian Tussur silk; and the task of comparing one production with another had now become a most invidious one. The new appliances and inventions for reeling were all good, but they might all be improved. In an adjoining room will be found various specimens produced by new methods. Mr. Cleghorn had been paying a good deal of attention to the softening and reeling of cocoons, and with a great deal of success. In the silk districts Mr. Wardle had heard high opinions expressed as to the value of Mr. Cleghorn's patent. Mr. Peppé of Arrah had also been working in the same direction, and had produced some beautifully lustrous Tussur. M. Gallois had been working in the same way, and had produced Tussur which was in great demand on account of its softness and excellent reeling. He was supplying extensively the Lyons market, and could not produce it rapidly enough. While at Surdah he happened to be present at the reeling of silk by Mr. Cleghorn's method; Mr. Marshall, the manager of one of the filatures of the Bengal Silk Company, came over to Berhampur to meet him, and brought with him his own developments in the production of Tussur silk. This morning M. Gauthier of Hazaribagh had brought examples of his reeling. They were all beautiful, and the gentlemen present could judge which of them were the best. Specimens of each kind of improved reeling lay on the table. Mr. Wardle urged the adoption of the *Tavelette*

Consono in the reeling of Tussur cocoons. He believed it to be indispensable and as yet the best and most simple appliance for reeling. Fig. 5, plate 19, is a full-sized drawing of this little instrument. Its position in the reeling machine is easily recognised in fig. 6, plate 20. The framework is of brass.

A. A. fig. 5, plate 19, enamel guiders through which the combined threads pass from the reeling basin and *filière* upwards to the reel.

B. B. light pulleys of wood with glass spokes revolving on steel pins.

C. the *croissure* or crossing of the silk whereby a gentle friction upon itself by itself is given. This method of *croissure* is superior to that which was used in France and Italy some years ago and known as the *Tavelette Chambon*, and which he had described and figured in his "Handbook of the collection illustrative of the Wild Silks of India in the Indian section of the South Kensington Museum" in 1881. It has since given way to the improvement effected by Consono in the form of the *Tavelette* known by his name and illustrated in fig. 5, plate 19. Of its superiority and efficiency too high praise cannot be accorded. For reeling Tussur cocoons it is absolutely necessary as he had proved in the several filatures where he had mounted and worked it.

D. point of attachment by a screw to the Tavelette stand or support.

The difficulty of softening the cocoons preparatory

PLATE 19.

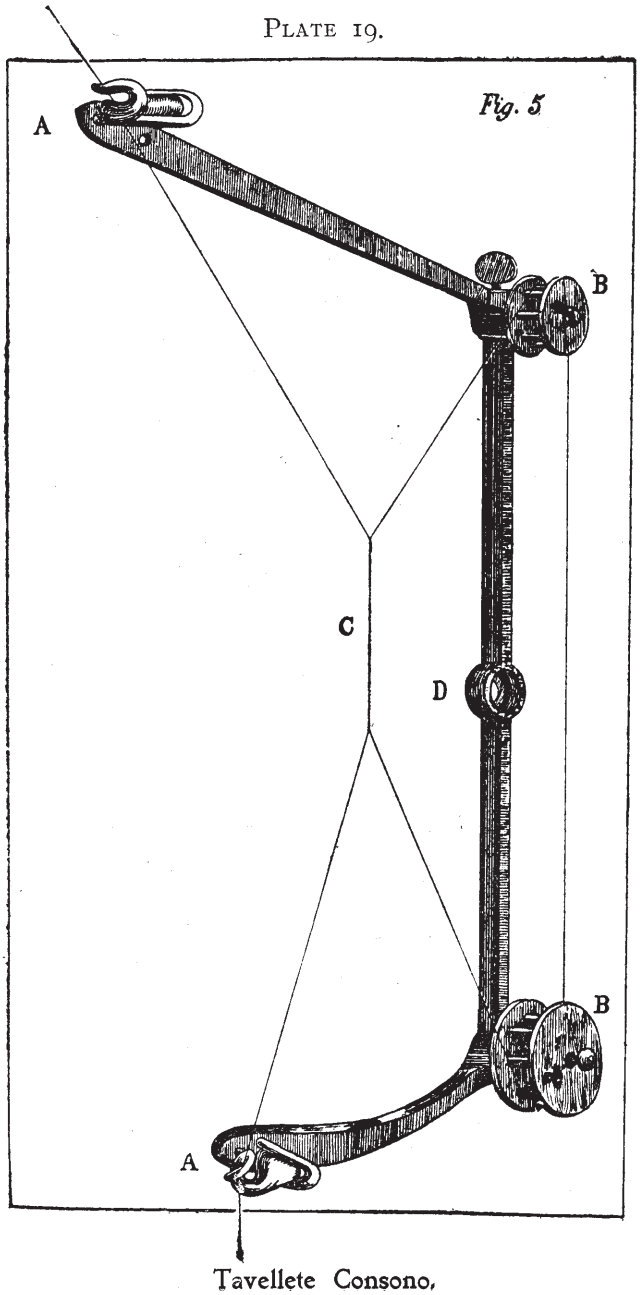


Fig. 5

Tavellete Consono.

to reeling is evidently wholly overcome in each of the new methods. Submitting them to the action of steaming appears to him to be the chief point in overcoming the difficulty of softening* so hard and shell-like a cocoon. It was now left to the Government to come forward and facilitate the cultivation of Tussur silk and the collection of cocoons, as well as giving facilities for buyers of cocoons to transmit cash readily into the innermost jungles to pay the natives on the spot. It is at present most difficult to send money into the interior. Tussur was entirely wild and uncultivated, and would possibly so remain, but it could be and was managed as an outdoor production. These results had clearly proved that Tussur silk could be well reeled and produced and made to pay as an article of commerce, and Mr. Wardle considered his work in connection with it was coming to an end. He had been assured that Tussur silk as an article of dress was rapidly gaining favour and becoming very fashionable in France, and that the demand for it might increase to such an extent as to make its price almost as high as that of other silks.

There were two other silks which now engaged his attention, and which would be found mentioned in his Handbook published in 1881 and the various

* Since the meeting he had visited Futwah in the Behar district and had seen the natives reeling Tussur and found that they softened their cocoons perfectly by boiling them for three hours with *sagi* and reeled them by hand and thigh, a decoction of myrabolans being used as a lubricant and to cement the thread.

Government Reports before and after that time. Since then he had been working at them, and he could now speak of them with much greater confidence. The first was the Eria silk of Assam, the worm of which fed on the castor-oil plant, a plant which he found abundantly all over the district he had just visited and in the other parts of India he had travelled through. He suggested that they could as well cultivate the Eria with the mulberry-fed worm at the same time, and he thought this would soon be tried. The cocoons of this worm could not be reeled to pay, and he would suggest they be packed up in pressed bales and sent to the spinners of Europe to be carded and spun. The next was the Muga silk produced by the larvæ of *Antheræa assama* at present chiefly an Assam worm but found also in North-East Bengal feeding on the Soom tree, *Machilus Odoratissima*, a laurel which abounds in Assam.

Of this silk he could not report too highly; it had an immense future before it. It was already exported from Assam to Calcutta, and beautiful embroidery made with it. At present the only difficulty in connection with it lay in its limited production, in overcoming which lay bright hopes of promise, for the improvements effected in Tussur reeling applied exactly to Muga. He should have more hopes for it than for the other. It was a beautiful silk, which took dyes more readily than Tussur, and was worth the attention of every one who was interested in producing it.

The immense district of Chota Nagpore was being opened up to Tussur enterprise. Cocoons are found abundantly, and agents at Ranchi are now buying them largely from the natives, who bring them in from the jungles on the plateau, 2,200 feet high, where he believes both the mulberry and Soom trees would flourish, and the *Bombyx Mori* and Muga silk, if not Eria, could be cultivated advantageously, because labour is there so cheap and plentiful. Besides this district, Mr. H. G. Turner, Collector of Vizagapatam, has just arrived in Calcutta and told him of an enormous area there where Tussur occurs. The other day a firm in Madras purchased Rs.42,000 worth of Tussur cocoons from the Chota Nagpore district.

Mr. Wardle then explained the method of working the reeling-machine which is universally in use in Bengal, and then contrasted it with the improved reeling-machines used in the largest filatures in Italy. Fig. 6, plate 20, shows the whole machine at work and the following is a description of its parts :—

A. Woman reeling cocoons.

B. Construction of brick supporting the bassine with fire or steam arrangement as desired.

C. Bassine from which the cocoons are reeled.

D. Four cocoons being reeled together.

E. Small bassine, in which the cocoons are first washed, softened, and arranged for the reeler.

F. Filière uniting the four cocoon baves into one thread of raw-silk.

G. The Tavelette Consono.

H. The tavelette support.

I. Brush by which the reelable threads of the cocoons are found. It is turned downwards when used, and is worked backward and forward.

J. Bassine for another reeler.

K. Pulley guiding the silk to the reel.

L. Reel on which the silk is wound.

M. Pulley and strap for turning the reel. The turning can also be done by hand when desired for cottage reeling. The silk when taken off the reel constitutes the raw-silk of commerce.

Mr. Wardle stated that the value of Italian silk in England was about 19 shillings per pound; whereas the value of Indian silk in England, reeled by the crude apparatus in use, was but from 8s. 6d. to 11s. 6d. This difference was mainly due to the different method of reeling and to the great attention paid to the sizing of the silk in Italy. He also explained the difference between the kinds of labour employed in the two countries and the greater speed at which the reels were driven in India compared with that of Italy. He concluded by stating that he thought he had sufficiently explained what he had to say, and had exhausted his subject. He was much obliged to all present for the earnest attention which they had paid to his remarks. He was obliged to all those gentlemen who had aided him in his visit to the silk districts, and particularly to the kindness of Mr. Keswick and Mr. and Mrs. Morey of Surdah.

PLATE 20.

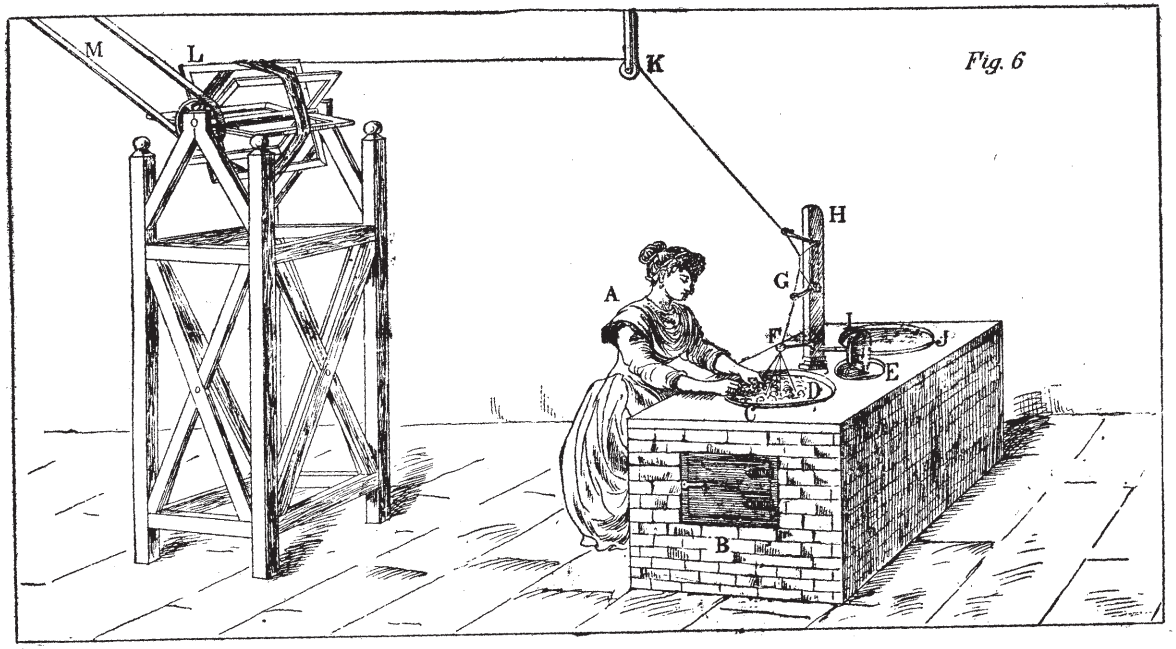


Fig. 6

Woman reeling Cocoons.

Mr. J. J. J. Keswick then proposed a vote of thanks to Mr. Wardle for the very interesting report on what he had seen and heard, and he felt certain that the suggestions he had been able to give to the managers of silk filatures in Bengal would produce most satisfactory results.

Mr. Buck said he had one word to add to what had fallen from Mr. Wardle as to the assistance which was expected from the Government. The policy of Government was to confine any assistance which it offered to private enterprise to the pioneering stage, and that in most directions silk enterprise had passed that stage. He admitted that Government might perhaps do something towards investigating the various kinds of silk-worms and moths of the country, and in ascertaining whether the area of useful worms could in any case be extended to other parts of India. The recent investigations in connection with the Exhibition have added much to our knowledge of the distribution of silkworms, &c., and that there seems no reason why some of the best wild silks should not be more widely cultivated. The Bengal Silk Committee have been invited to place before the Government any suggestions they might be able to make as to the directions in which Government aid would be otherwise useful.

Mr. Keswick remarked that it might be worth the while of the Government to take an interest in improving the *Bombyx* cocoons of Bengal, but he was not prepared to say how they could

best assist private enterprise in this direction. He did not believe in importing seed but in the more skilful treatment and selection of what we had in the country.

Mr. Liotard remarked that the real objection to the cultivation of the silkworm lay in the high rental of land. There was one class of cultivators of mulberry, who sold the leaves of the plant, and the rearer of the worm, who purchased the leaves, often, to raise his income as much as he could, did not feed the worms sufficiently, which resulted in their producing a small quantity of silk. There was no hope for improvement, unless the zamindars reduced their rents.

Mr. Keswick thought that land, like anything else, must be governed by the laws of supply and demand.

Mr. Buck thought that it might be safely left in the hands of the Bengal Committee to consider any steps which it might consider useful to take in the matter.

Mr. Wardle, in acknowledging the vote of thanks, wished to call attention to the interesting entomological and industrial additions which had that morning been made to the collection he had brought to India illustrative of the utilisations of Tussur silk in England, and of the examples of the successful application of the tinctorial matters of India, paying a strong tribute to the value of Dr. Watt's most interesting collection of raw products in Indian cocoons, silks and dyeing plants,

and of his energetic collection of them throughout India, and also to the great benefit which would accrue to Indian sericiculture by Mr. Buck's wisely calling in the aid of the resources of the Calcutta Indian Museum with its beautiful entomological collection now in the next room, and to the scientific investigations of Mr. Wood-Mason, Officiating Superintendent of the Museum, who, at the request of Mr. Buck, had undertaken to prosecute a thoroughly scientific and continuous examination of the numerous silk-producing larvæ and their moths of India, a more complete knowledge of which is anxiously called for in both England and France, and which will greatly aid the silk rearers of India in lessening disease and in promoting goods bunds.

A vote of thanks to the Chairman brought the meeting to a close.

Plates 18 and 20 were drawn at the Mayo School of Art, Lahore, under the superintendence of J. L. Kipling, Esq., Principal, during my stay there as Mr. Kipling's guest, by Shah Muhammad, chief student. Fig. 5 plate 19 was drawn at Calcutta.

CHAPTER XXII.

SPORT IN BENGAL IN 1886. BIRDS, FOXES, JACKALS, CROCODILES, MY TIGER HUNT, ETC.

IN this final chapter I hope I may not unfitly supplement the account of my Sericicultural work in Bengal during my first visit to India in 1885-6 as recorded in the preceding chapter, and narrate the occurrences of a few of the happy days of sport I was privileged to enjoy with the rifle and shot-gun, and on horseback, especially as I had the exceptionally good luck to kill a tiger, the account of which I wrote at the time, but which has not been previously published.

On learning from me that I greatly desired an opportunity to shoot a tiger, Mr. J. J. J. Keswick, of the firm of Messrs. Jardine, Skinner and Co., the zamindars of the property in which the Surdah and other filatures are situated, telegraphed from Calcutta to Surdah to enquire if any tigers had been seen in that neighbourhood, and on learning that two had been lately seen, I left Calcutta on the night of the 27th December, 1885, by the Eastern Bengal State Railway to visit the principal silk filatures of the Rajshaye and Mur-

shidabad districts in the interests of Indian Sericiculture at the request of the Government of India. Four o'clock next morning brought me to Damookdiaghat on the Ganges which I crossed in a steam-ferry, and proceeded by train to Melanchi station, on the Darjeeling railway, where a car was waiting for me from Surdah, some fifteen miles by road through jungle of bamboo and mango topes.

At Galampore is the first cocoon-reeling branch of a number of country filatures in the Rajshaye district. I stayed at this filature on my way to Surdah to get my first experience of Indian cocoon-reeling. The sight of the golden yellow cocoons as they lay occupying a large space on the ground, drying in the sun, was very striking.

I breakfasted with Mr. Renwick, who has an extensive business in this district in supplying it with roller sugar-cane crushers. Sugar-cane cultivation is a large industry in this part of India, and the growing, cutting and crushing of the cane are very interesting operations.

I arrived at Surdah in time for tiffin, and the rest of the day was spent in the inspection of this extensive filature, the most important in Bengal. It is situated by the Ganges, close to the house occupied by Mr. and Mrs. Morey, my host and hostess. Mr. Morey is the director of the silk industry of the district.

At sunset I had a stroll with my gun and

killed a few interesting birds, also a jackal which I could not then find owing to darkness coming on so quickly at night. A great number of them came prowling about the filature in search of the refuse chrysalides of which they are very fond. The howling they make during the night and early morning is appalling. I think all the jackals of the neighbourhood came under the window of my bedroom as if to avenge themselves for the slaughter of their comrade. They howl and shriek to each other in batches from river side to jungle. Their howling is humourously imitated locally by "Here's another roast Hindoo." "Oh! where, where, where?" "Oh! here, here, here!!"

A welcome dinner at eight, and bed at ten ended a pleasant day.

Next morning before seven Mr. Morey gave me a mount, and we trotted off with two resident friends to the Maidan for a gallop, one of whom was Mr. Walton, now Director of the Kashmir filatures; we had four dogs of various breeds, accustomed to the chase. We soon put up a hare, and had an eleven minutes run; then a fox, which gave us a splendid run, then two runs after jackal and another after a second fox. We were unlucky in every case, the dogs not being in good form and the animals managing to escape either into jungle or sugar-cane bush. We returned at nine to breakfast and spent the

day at silk investigation. In the evening I shot a kite, then found my jackal of the previous evening with a pair of vultures upon him, and several grey headed crows. They had skinned him for me beautifully, and had left nothing but the skin and bones. As I approached, the vultures easily got on wing and I killed them right and left. I shot also a beautiful yellow mango-bird, a very large horned owl, and two species of swallow-tailed gulls on the Ganges banks. The indigo plant is extensively grown in the mud flats left on the banks and islands after the rainy season. It is an enormous industry in this part.

Next morning we were in our saddles again at sunrise, in the fresh and cool air, and we took spears to try for pigs, traces of which we had seen the previous morning. We rode out several miles, and our first chase was a fox which after a fast run we killed, two of us being in at the death. We then took a wide beat through green crops in another direction and found again, and after a most exciting run of three quarters of an hour again killed, I alone being there to see. My host, an excellent rider, in trying to turn the fox had been unhorsed, but not much hurt, by a bough lifting him out of his saddle. We came upon plots of sugar-cane into which the pigs had been seen to retire two days before, and with the help of forty natives, sugar-cane cutters (with just enough clothing but not too

much), began to beat the canes. It was a fine sight to see the coffee-coloured skins and fine black hair of these villagers as they beat with loud shouts the sugar plots.

We were unsuccessful, and hurried homeward, having a good run with a jackal which I very nearly speared as he ran into his beloved sugar-cane cover, eight to ten feet high, and from which no efforts could dislodge him. It was ten when we returned, after a heavy but delightful morning's hunting. The open spaces of country are of great extent, quite flat between jungles, but the ground is rough with deep ditches and low raised field divisions. In the afternoon we rode out to a silk-reeling village where native reelers were working outside their mud huts. The villages are almost hidden from the sun by large trees of cocoa-nut, date, jan palms, banyan, peepul, tree-ferns, plaintain, with its beautiful broad leaves and fruit, mango and bamboo topes (with the slender tops of the latter gracefully rising over and bending above the other trees), the cocoanut palm, also the Bel (Aegle Marmotis,) the sacred tree of India from which they make their sherbet, with its bare stemless trunk and fanlike top, standing out high above the other trees, a striking sight in the beautiful golden evening after-glow.

The native reeling is very badly done, and the silk not fit for export. It is used for

dhoties, chuddars and saris for women's and men's wraps.

It is a curious sight to see the villagers and their sericiculture completely hidden from the ordinary traveller, who sees from the road nothing but forest jungle.

In the evening I shot two jackals, a large Brahiminee duck, and a blue jay.

The charm of Surdah is Mrs. Morey's beautiful lawn and extensive garden, a grand floral sight. I never saw such a profusion of flowers. The hibiscus, bouganvillia, oleander, ponciana with its immense pods, gold-mohr tree, Livingstone and other palms, great and striking kinds of coles, begonia, the grand red poinsettia in long hedges, also white ones, tree-ferns, cones of immense convolvuli, African marigolds, large cockscombs, a large slender shrub a mass of orange flowers, and many others, made up such a floral scene as I never saw before, the whole bounded on the east by immense casuarina trees—landmarks for miles by their great height, and on the west by a great avenue in which the banyan and peepul trees (always planted together as man and wife) were conspicuous by their great size.

Mr. Morey had arranged for a couple of days shooting in the jungles at Rhurclikia, and next morning we set out at eleven, and drove through eighteen miles of delightful jungle, passing the English station of Rampur Bauleah in which

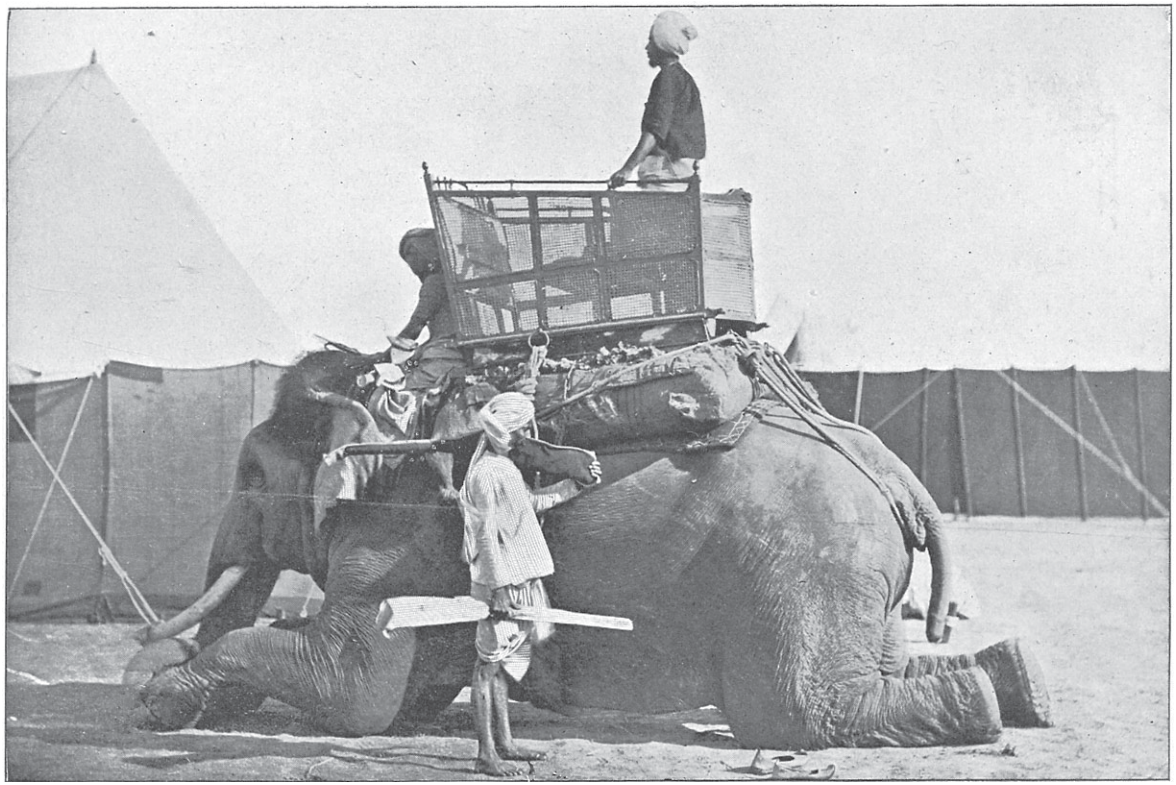
are located the Judge, Magistrate, Doctor, and other officers charged with the administration of the needs of the locality.

We arrived at a long stretch of short dry grass about a mile from Rhurclika, where we were met by twenty coolies waiting to beat for us. We took off our coats and waistcoats and began to beat for partridges. It was scorching hot, and very trying in so bright a sun. We killed two brace of black partridges which afterwards proved excellent eating, a large quail and a wee button quail about the size of a jack snipe, and a beautiful large white hawk that swooped down upon the little quail the moment it fell. It must have been following us, falcon like, high above waiting its opportuuity to swoop down upon any game we killed. Nothing lies many minutes undisturbed nor remains in *corpore vili* long; vultures by scores, crows, eagles, hawks, kites by hundreds, jackals, the white ant and other scavengers soon leaving nothing but the bare bones of any bird or animal, be it ever so big.

After shooting a few other birds and a hare, we mounted ponies and rode to Rhurclika, an indigo factory on the Ganges, with a house beautifully situated on a bend of the river, here about two miles wide. We had a most glorious sunset over the water, and the bend of the river is such that the sun both rises and sets over its waters.

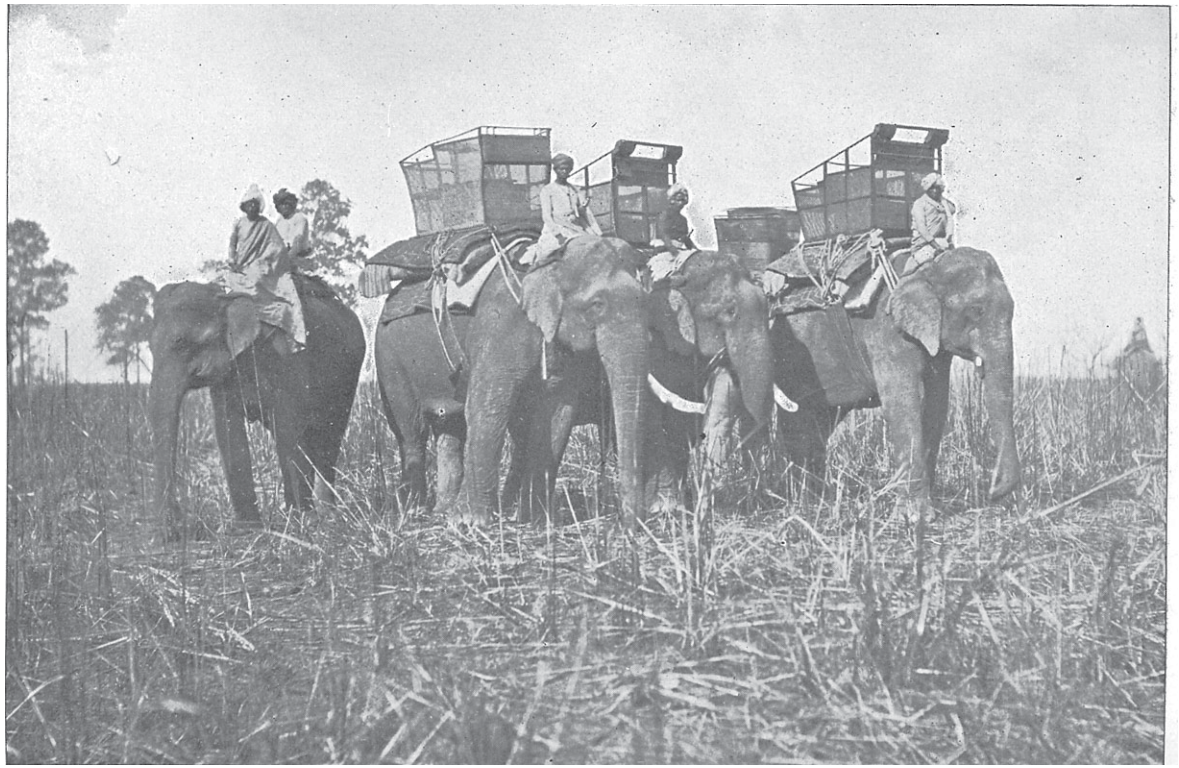
After dinner I strolled out in the starlight to

PLATE 21.



Preparing for the Tiger Drive. The Howdah fixed.

PLATE 22.



Waiting to commence the Tiger Hunt in the Maidan Bamboo Grass in Bengal.

look at the elephants that were to carry us on the morrow. Several had arrived and were crunching up leaves and branches of trees, and near them were two clusters of natives, mahouts and coolies, sitting round their fires telling stories of former hunting adventures, and no man has a greater right to recount his dangers than a mahout, as sitting on an elephant's neck he is often the first to be pulled off when a tiger charges, his is always the post of danger, and no nervous or fearful man could take it.

We were up by sunrise the next morning, and I went out to see the howdahs put on the elephants. (Plate 21.) The roping of the howdah to the elephant's back with its big mattress between is a rough operation, and it is well the animal is pachydermatous. Two of the elephants were bathing in the large tank, their trunks upraised, and were swimming about with ease, enjoying their bath immensely. They came out at the call of their mahouts, and were soon dressed up for the chase waiting to start. (Plate 22.) We set out for the jungle—a most goodly sight—the elephants and forty half naked coolies with sticks, one carrying the ladder for mounting and dismounting the elephants, others with necessary odds and ends of things that would not bear the shaking of an elephant's back. We soon met a dusky farmer, who, putting his hands together, besought us piteously to come to his farm and kill a

leopard which had during the night carried off a calf for which he had only paid fourteen rupees the night before. He led us through tangled jungle until we came to his little holding. He showed the broken enclosure out of which the leopard had dragged his calf, and we tracked it through two green fields of young crops, of which at least half a yard wide had been destroyed; and under some thick bushes we found the remains of the poor calf. We set about beating for his slayer, but after two hours of unavailing search we gave it up and went deeper into the jungle to try to make the acquaintance of the Royal Bengal Tiger.

After passing through and beating some thick jungle, we came upon a large open plain or maidan, about two miles long and half a mile broad, which during the rainy season, by the overflow of the Ganges becomes a lake, and which afterwards dries up and a large growth of high bamboo grass succeeds. We commenced to beat this maidan in line, with beaters both between and flanking the elephants; we beat the whole of the ground except a small portion, disturbing nothing but partridges and a few jackals and foxes. We saw abundant marks of wild pigs and several large circular tiger lairs, in one of them the remains of a cow killed not more than two or three days before. We returned to beat the thicker jungle by the side of a jheel,

probably an ancient course of the Ganges, about two miles long and a hundred yards across, with here and there a little island, on one of which were three crocodiles basking in the sun, a beautiful and impressive sight in the solitariness of deep jungle. Our search for tiger prevented our running the risk of disturbing them by firing, so we merely paused to watch them leisurely glide into the water and disappear. We beat the jungle for the rest of the day unsuccessfully but saw several footprints of the tiger, and set out with a "parvanah" (never mind, as the natives say) from my friend, for our night's resting place. Mr. Morey had ordered his boat to meet us two miles higher up the Ganges than our previous night's resting place, in order to be nearer to the next day's beat.

We retired to new lodgings on board a capacious boat, to dine and sleep on board. Next morning we were out at sunrise in the bracing fresh morning air, and by 7-30 were all on our way again to the jungle. As there was much uncertainty as to finding the tiger, my friend suggested that we should beat for partridges, but he allowed me to overrule him, and we stuck to the tiger quest.

We beat fruitlessly over a considerable range of jungle, and decided to try a more thorough beat in the high bamboo grass of yesterday's maidan. We accordingly beat it up and down

in wide beats, leaving no part unvisited. The bamboo grass was generally from about five to seven feet high, and in many places not less than eight to ten feet; splendid cover but not difficult for the beaters to get through.

We were rewarded at length for our trouble, for on getting into the only part we had neglected beating yesterday, the elephants became excited and gave unmistakable signs that something was near; presently someone called out "Tiger" and there he surely was bounding across our front, 150 yards away, Morey and I both fired, the tiger stopped momentarily, and then went off at a leisurely trot. He then tried to outflank us, not wishing to leave the high grass. For some time we had great difficulty in seeing him as he often stayed in hiding. We outflanked him several times, and at length drove him to some rising ground between us and the jungle, where he stopped and turned to look at us. I fired at him about 250 yards away, and my bullet went just over his shoulder and struck the ground beyond him. We presently got nearer and I fired at about 150 yards and hit him in the rear. He seemed very undecided whether to charge us or not; after taking stock of us and the situation, he decided to proceed and haltingly disappeared into thick jungle. We put our elephants, now very excited, into a trot, but for some time could not find any trace of him. We

had given him up for lost, and on returning by a slight detour we found him under a dense mass of wild plum bush, zizyphus jujuba—one of the trees on which the Tussur silk-worm feeds.

After several ineffectual attempts to get two of the smaller elephants to oust him, we sent in the big one, said to be a most savage brute and fond of fighting a tiger.

He did not like the work, and it was amusing to see him as assiduous in piling up scrub to place a barrier between him and the tiger, as he was at first in tearing it away; his mahout forced him in, but after a terrible charge of the tiger right on his forehead, he retreated with force enough to have knocked down a house had it been in his way.

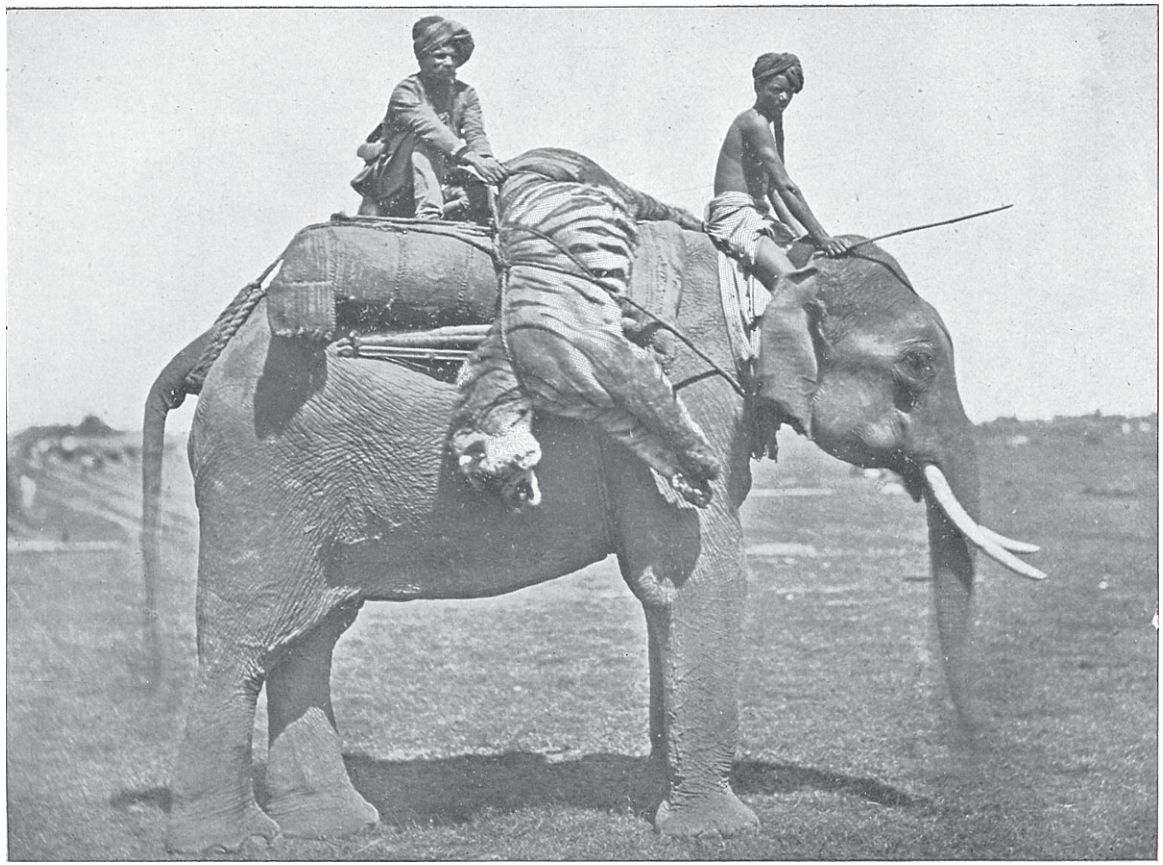
The roaring and screaming of tiger and elephants was awful; the ground seemed to shake. After a brief struggle the elephant shook off the tiger who retreated into the bush. It was of no use trying to get him again anywhere near the tiger, he had been hurt and much scratched in the encounter and had had enough of it. We were close to him when the tiger charged, but could not see to shoot for the bushes, and it was well the elephant did not back upon us for we should certainly have been upset. There was nothing left but to put our elephant at the high bushes and see what would come of it. We advanced a few paces, very cautiously, what with coaxing

and hard hitting, our mahout got him up to the thicket enclosing several big trees where the tiger lay completely hidden. He very cautiously lifted aside with his trunk a portion of the plum bush, just enough to show us the tiger within three or four yards of us, growling and prepared to charge us. He had not time, for the moment the view of him came, Morey called out, "Now," and a shot from my Holland's single barrel Express, a splendid weapon, laid him low. It was all over in a shorter time than it takes to write it.

The coolies, who had run away, slowly gathered round from their hiding-places, but for some time none of them dared venture near the tiger, who lay hidden by the falling of the curtain of boughs. The shikari came up and peering round the beast announced a kill. I then got down by the aid of the ladder which the ladder-bearer cautiously brought up, and with a coolie crept under the plum bushes to the tiger. He was quite dead; I tied a rope round his neck and shoulder and it took about a dozen of us to drag him out. He was a splendid beast, measuring ten feet three inches from nose to tip of tail.

As soon as he was well laid out in the open, natives who had flocked in, and our coolies, began to cheer, and for a few minutes we all had a good bout of it. It was a very picturesque sight, nearly a hundred almost naked brown skins cheering round

PLATE 23.



After the Kill. The Tiger attached.

the tiger, the elephants looking on very much relieved and satisfied. We mounted and roped the tiger across the back of one of the elephants (see plate 23) and after sandwiches and welcome bottles of Bass, a most enjoyable lunch, we set off to search for a tigress which the natives told us had been seen half a mile further in the jungle, and near to the jheel of yesterday. It was too thick to be beaten thoroughly, and as it was now three o'clock, we decided to go up the jheel where we had seen the crocodiles. We soon came upon a small one about eight feet long basking on the slope below us. We timed our shots and rolled him over in the water. He struggled for a few minutes and then sunk in deep water.

We came to the little island where we saw three yesterday, a large one at least 15 feet to 16 feet lay on it. We again timed our shots at its head and shoulders with such effect that the contortions of its long heavy tail were awful to see. He wriggled himself into the water, and came up in a little while on the opposite side, another couple of timed shots laid him out, but he slid down the waterside into the deep, and as it was dangerous to get off the elephants, and a long way round to the other side, we were unfortunately obliged to leave both of them.* The

* A few weeks afterwards I had the good fortune to kill six crocodiles in one day from a small boat floating down the Ganges a few miles below Cawnpore.

crocodiles were of the species *crocodilius palustris*. A long ride home brought us by six o'clock to Raleetollaghat where our boat was moored. On our way to the river we shot a fish eagle, a beautiful large wild lynx and several interesting birds.

We dined on board and at half past seven o'clock I took my leave of my good friend, Mr. Morey, in a small rickety bamboo boat with two local boatmen, also sixteen coolies who had to carry me in palky next morning to Berhampore, and who squatted with me under a cover of cane work about three feet above deck. In this hole I was rowed and towed about the Ganges until midnight. I had only to cross the river one and a half miles as the crow flies, and to land two miles lower down, and should only have occupied about two hours in crossing, but there were long mud banks which had to be passed, on which we often came aground amidst loud vociferations of alarm from the coolies. At last we got to the other side, and a man got out and towed us with a thin line, which broke and away we went drifting. It was the most comfortless and anxious night I ever experienced, very cold, just starlight enough to see where we were, amongst an oasis of mud banks split up into chasms by the rains.

At last we reached a landing-stage, but to my disgust the boatman refused to land us, and

after a long harangue with my coolies and they with me in our own respective languages, he jumped into the water and waded up to his middle to the shore, having fastened his boat a few yards out of reach of landing, and disappeared. The coolies began talking to me but not a soul could understand or speak English nor I their language. It was clear, however, that he had bolted to leave us there until backsheesh liberated us. After waiting nearly half an hour, I began to be very cross with my sixteen stupid men, but they were quite helpless, so I unstrapped my revolver and took the lamp, and put my arms on the shoulders of two men who carried me to the land. I then went in search of the boatman, whom I found crouching under a wall some distance away. I showed him the revolver and pointed to the boat, used mild English language and made him go back and land both the men, the palky, and the luggage.

I then unstrapped my bedding and arranged it in the "palky" (palanquin), lay down inside as well as I could in five feet of room, and was hoisted on the shoulders of four of the men, and consigned myself to fate and sleep. The men began a sort of doleful, melancholy kind of chant, rather Gregorian, and continued it nearly all the way to Berhampore, and I found it was a much easier mode of progression than in a howdah, the sixteen men taking turns at carrying me.

On my friend Mr. Morey's visit to England some time after I told him of this circumstance and asked him if he knew what the words the men were singing were likely to be. He said very probably it would mean

"The Sahib is a heavy man,
A very, very heavy man."

I felt sorry, the explanation was a blow, my imagination had led me astray.

It was a curious palky experience altogether from Ralleetollahghat to Berhampore, thirty miles in all of broken sleep. I awoke before daybreak, and found approaching daylight a blessing.

I had only brought a little bread and cheese and whiskey and water. I arrived at Berhampore at eleven o'clock, and after a good breakfast, I occupied myself in visiting the filatures of the Bengal Silk Company, and that of Messrs. Louis Payen and Co., at both of which I was most kindly and hospitably received, at the former by Mr. Stocks, and at the latter by Monsieur Gallois.

The tiger was skinned the next day at Surdah, the skin was sent down to Calcutta to be cured en route for England to Mr. Rowland Ward, who set it up in the attitude in which it was shot, and it now adorns my shooting box at Swainsley.

APPENDIX.

The following is a list of Silk Filatures and Mills in Bengal.

It has been compiled for me by Mr. B. J. Rose, the head of the India Trade Enquiry Office, Portland House, 73, Basinghall Street, London, E.C., from Thacker's Indian Directory for 1904.

It will be seen from this extensive list how important and progressive Sericiculture is in Bengal.

There is no better silk produced for sewing-silk purposes, it takes all dyes beautifully and with excellent lustre; it is also much used in the manufacture of crêpe, crêpe-de-chine, and similar light textiles, as well also for the silk textile requirements of India, and for many other textile purposes.

It is one of those important branches of Indian Industry which forcibly emphasises the great desirability of obtaining from our own Empire all raw material, which, with its varying climates, it is possible to produce.

LIST OF BENGAL SILK FILATURES.

BARAGARIA SILK CONCERN.

Filatures—Baragaria, Chula, and Jalalpur.

BENGAL SILK CO., LTD.

Gonatea Division: Filatures—Gonatea, Somergunge, Kattasore. Berhampur Division: Filatures — Rangamatty, Chiretty, Bilser, Azimgunj, Joykristapur, Sucktipur, Kamaberi, Beldanga, Babulbona, Banjetty, Bhudderpur and Rajtha.

BERHAMPUR SILK CONCERN.

Filatures—Rangametty, Chiretty, Geridaripur, Binker, Joykristopur, Sucktipur, Kamarberi, Beldanga, Beldanga No. 2, Banjetty, Rampara, Bhudderpur and Koyta.

DHARUPUR FACTORY.

Rearing Stations—Dharupur, Rampur, Agai, Lalganj, Bhatin, Bhadari, Purehasi.

DUN SERICICULTURE.

Filatures—Lister Grant and Dehra Dun.

FURRIDPUR SILK CONCERN.

Filatures—Furridpur, Cattamari and Sankarpur.

KALAKANKAR FACTORY.

Rearing Stations—Kalakankar, Hinahun, Gajapur, Paingon, Janmamin, Rajinapur and Bazidpur.

L. PAYEN & CO.'S SILK FILATURES.

Cassella, Khajapur, and Shahebgunge in Rajshahi, Bholahat in Maldah, Plassey in Nudden, Goorellee in Midnapur, and Gadi, Choa, Teakattah, Dharrumpur, Narainpur, Bazarpara, Panchkattiah, Suzapur, Kapas-

danga, Hatibanda, Satoye and Gouripur in Murshidabad.

SARDA (SURDAH) SILK CONCERN.

Sarda, Motihar, Dacra, Chattaria, Pananagur, Doorgapur, Mirzapur, Belgaria, Bharraghurria and Checla, and also at Furridpur.

ROSE SILK FILATURES.

Ramnuggur, Beldanga, Balligotta, Shaitora, Shirool, Babda, and other places in Rajshai.

INDIAN FILATURES AND SILK MILLS.

	FILATURES.		MILLS.	
Year.	*No. of Works.*	*Persons Employed.*	*No. of Works.*	*Persons Employed.*
1893.	73	8,638	28	3,045
1894.	78	9,360	27	3,143
1895.	89	9,018	28	3,586
1896.	68	8,263	29	3,914
1897.	67	5,625	31	2,795
1898.	66	13,918	31	2,773
1899.	67	14,139	33	3,092
1900.	66	12,292	29	3,220
1901.	71	11,061	12	3,102
1902.	62	10,652	10	3,040

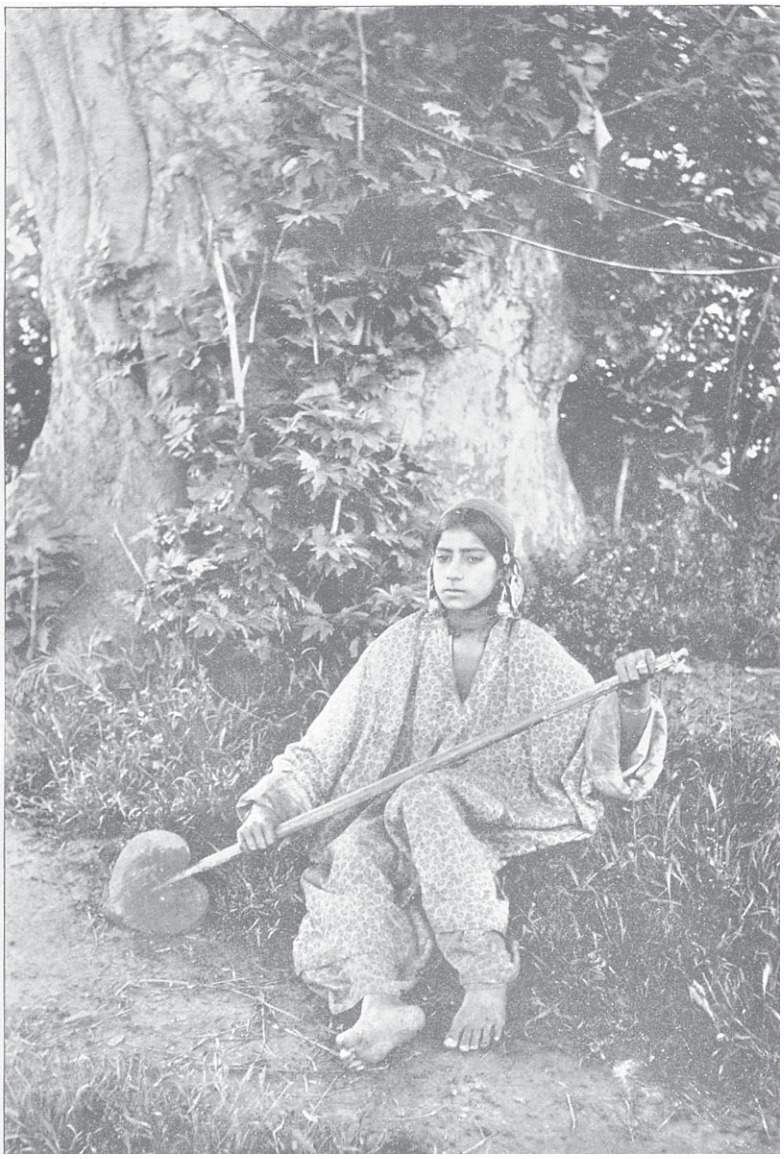
FINIS.

Kashmir Woman spinning wool.

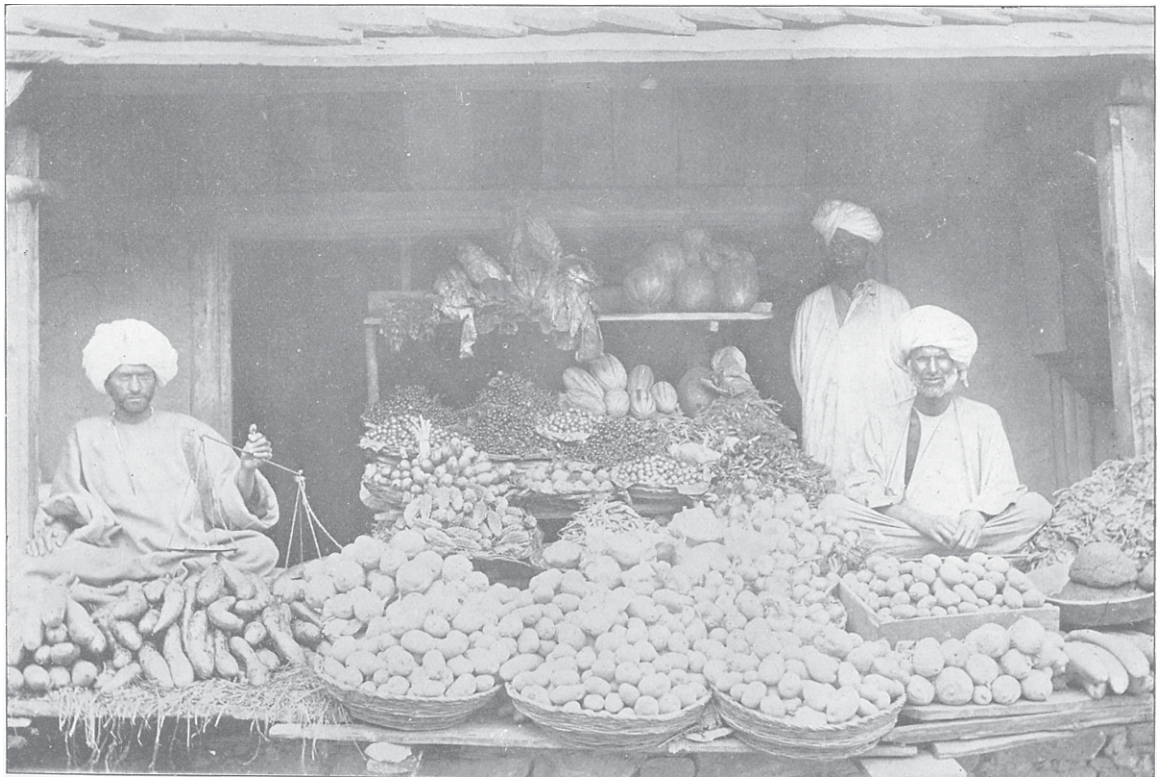
PLATE 25.

Kashmir Women husking and winnowing rice.

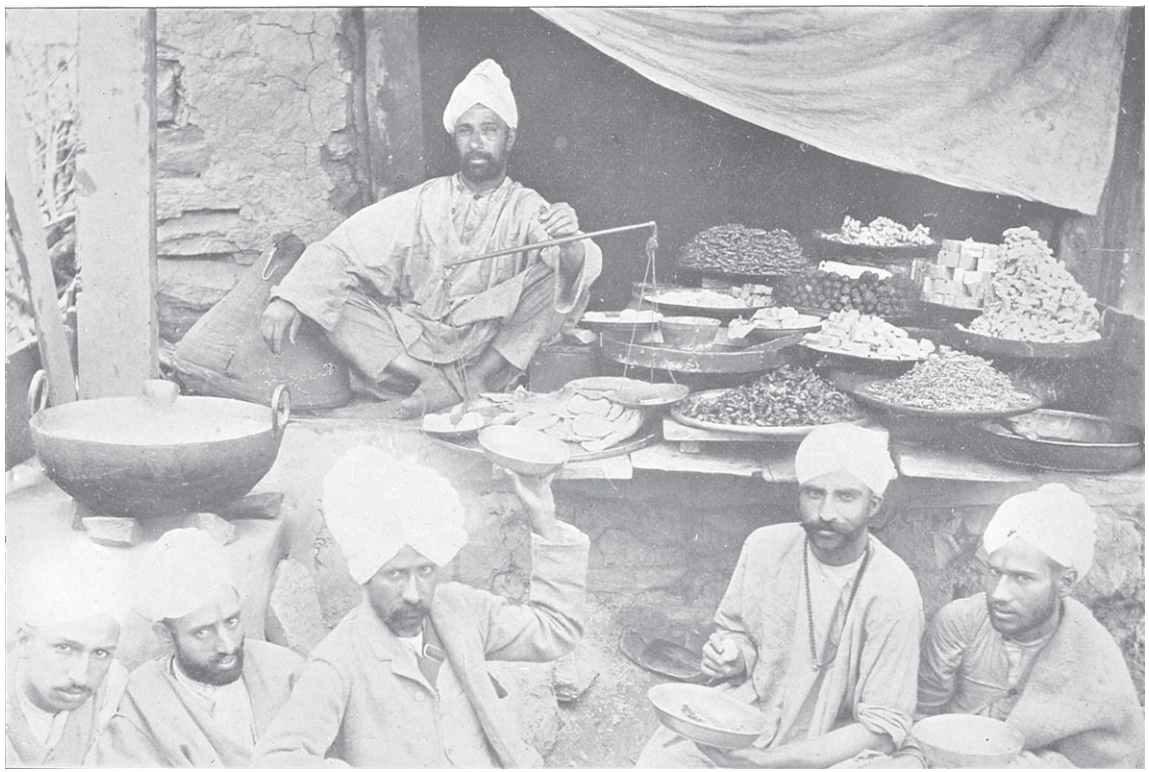
Srinagar Hindoo Woman carrying water.



A Jhelum Steering Boat-girl, with the customary heart-shaped oar.

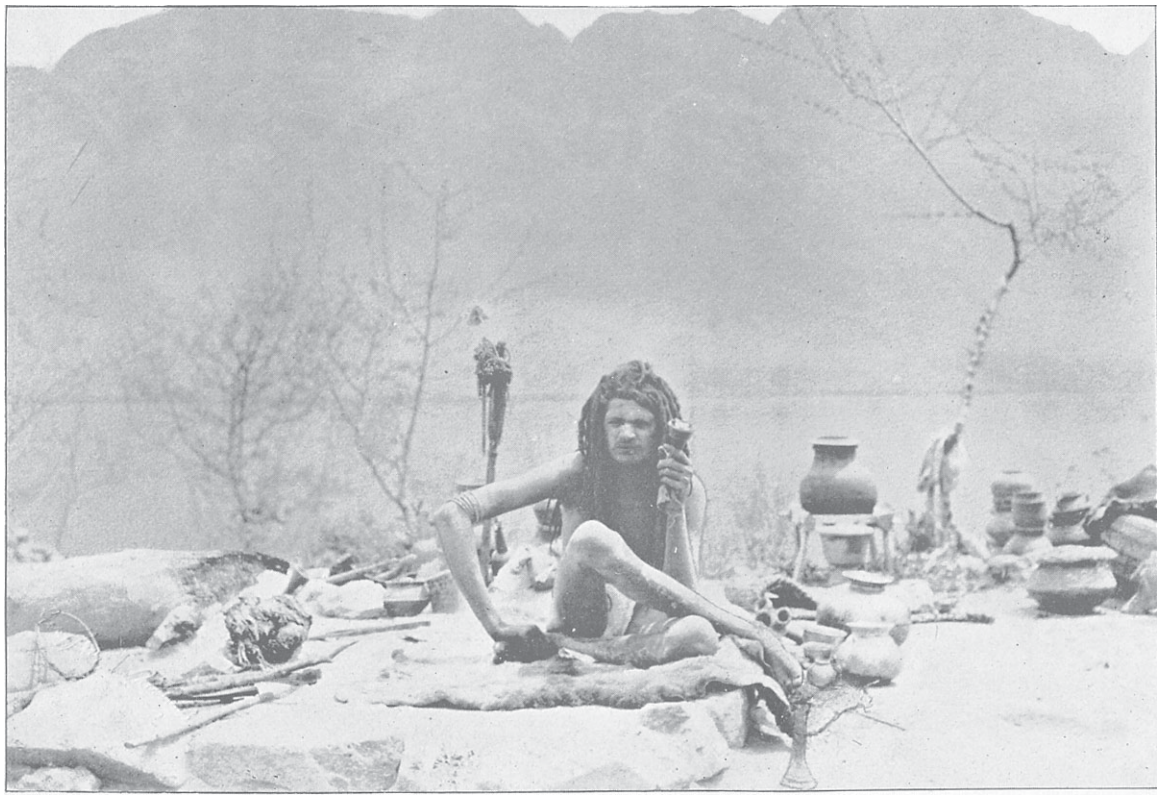


Vegetable Bazaar in one of the streets in Srinagar.



Sweet-makers' and sellers' Bazaar; Street in Srinagar.

The Potter's Wheel and Work in a Kashmir Village.



Fakir or Holy Man on Lunka Island, Dal Lake, sitting in the snow.

View of the terraced agricultural operations between Srinagar and Islamabad.

Rughu-Nath at Jammu, Hindoo Cenotaphs and Temples containing the Ashes of deceased Maharajas.