Vol II

# SOME NARRATIONS ON INDIAN AGRICULTURE, PLASTIC SURGERY, TANK IRRIGATION SYSTEM, CHRONOLOGY AND ARCHITECTURE, INDIAN COTTON TEXTILE INDUSTRY AND OIL WELLS IN BURMA

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## 1. DESCRIPTION OF AGRICULTURAL IMPLEMENTS AND PROCESSES IN THE PUNE AREA : c. 1789.

by Sir CHARLES MALET, British Ambassador to the Peshwa, I0L: MALET Papers

I have already written you by the packet of Prince William Henry. This is intrusted to the care of Ralph Allen a midshipman of that ship and this accompanies a box of models of the implements of husbandry used in this country. As agriculture is in my estimation the firmest base on which a state can found independence and raise within itself the grand structure of civil polity, commercial interests, and all those arts by which the nations of Europe are now so signally distinguished above the rest of the world. The means however simple by which that grand foundation can be improved and strengthened[1], nor in this point of view only, but also as enabling us some measure to form an idea of the present and past state of the arts of a society by the instruments used in the first grand object of all civilized nations (except I believe the Dutch) amongst which India has always held an eminent rank and is probably the source whence the western world has received through Egypt and Greece those lights by which it is now illuminated. The instruments of agriculture used in the Deccan combining as you will perceive, by the models now sent, the grand requisites of perfect simplicity and exclusive utility - the models if they were better formed or finished would give no idea of the rude construction of the originals, which, a circumstance when combined with the ingenious design of the instruments, leads me to conjecture that there must have been a time when mechanism was in greater perfection in the country than at present.

The soil of the Deccan is generally good tho not deep rockloon succeeding to it, and in many parts it is much incommoded with loose stones. It is neither so stiff as to require much labour nor so light as to be termed arid and sandy. Consequently labours and fares of the husbandman are not oppressive- shallow ploughing and the periodical rains suffice with few exceptions of dry seasons, for all the purposes of common cultivation, while the more improved and successive production are effected thro the year by the assistance of wells, whence the water is drawn as in Egypt by large wheels round which pots descending and rising (incessantly by the draft of oxen or turning of men) empty themselves into a trough placed as a receiver and conductor of the water.

The ploughing and preparing of the ground, in all the common grains of which samples accompany the models, begins in April and lasts till the rains set in about the middle of June. After the ground is turned up by the *hull* or plough with one, two, three or four pair of oxen as the ground or quality of the cattle make requisite, the kuloo or bhukkur is next employed to break the large clods. To that succeeds the phullu or loar (to reduce them still more) assisted by a man who breaks them with a stick. Thus prepared and previously manured the seed is sown in drills with the paubar or teepun the correct formation of which is an object of the finest solicitude of the Culumbee or cultivator. To this again succeeds the kuloo lightly applyd to cover the grain, to that the phullu or something lighter of the same kind with the loose boughs of a tree at once to press and as it were sift the earth over the new sown seed which thus deposited is left to itself till it makes its appearance. Soon after which the kolipa is introduced

[1] Word illegible

with muzzled bullocks to weed the ground and seems to me so ingenious and exquisite a mode of performing a tedious and laborious part of agriculture (at the same time that it kindly loosens the earth) as to merit particular attention. As it is to be drawn carefully and lightly two bullocks and those steady ones suffice, the irons are so constructed as to occupy the intervals of the teeth of the drill or paccla about ten inches and the opening, it scarce need be added, are for the young grains to pass through unhurt, the division of this instrument, one division being a little before the other with a man to each, the main stick or pole not issuing from the centre which at first sight looks like[2]... in its mechanism as in the kuloo, all arise from the principle of facilitating its operation in the ease of frequently turning up each division to clear the weeds which the conductors do with the handle of their goad or whip and to which some iron is fixed for the purpose. A second weeding of the same kind takes place when the grain gets 7 or 8 inches high which generally proves sufficient (tho a third is sometimes requisite) without further care than that of the bird keeper whose sling accompanys the instrument with which, and balls made of the soil and baked in the sun, he defends his charge.

Wheat and gram are not included in this mode of cultivation nor sown at the same seasons but after the rains, when the quantity of water already imbibed by the earth, the plentiful dews which refresh it during the cold season, and a few flying showers that generally happen in November are sufficient for their nourishment. Very little rice grows in the high country the cultivation of which you know is quite different. To the best of my recollection the same drill mode of sowing and weeding as the above is used in Gujarat, but I am told that in the north of Hindostan the practice is with one drill fixed to the plough.... I send you another letter with a box containing models of the instruments of agriculture used in this country and an explanation of them in the letter. I think there is a society in London for the improvement of agriculture. If so and you think them worth it you may make a present of them to it.

[2] illegible in original

## 2. COMPARISON OF INDIAN WITH BRITISH AGRICULTURE c. 1800

### MUCH HIGHER INDIAN PRODUCTIVITY AND HIGHER WAGES FOR LABOUR

*Edinburgh Review*, Vol 4, July 1804: Review of Dr. Tennant`s Indian Recreations, 2 vol, Extract pages 321-324

In this country [India] there exists a burden upon agriculture, which has no exact parallel in any other country with which we are acquainted. In the village of each zemindary, there are a certain number of officers and artificers who receive a percentage, or allowance of grain from each plough, or at each harvest. Among these is the bhaut or *poet*, the village-priest and the blacksmith. The zemindar is entitled to have his share of the work done at an inferior rate. Where a tradesman has no plough, he pays a certain sum of money. We can form no computation of the wages of these different people, as they receive payment for their work besides. In the Dooab, the tradesman is obliged to work for the allowance. This great division of labour, in the villages, is the more curious, as it does not occur in the manufactures of India.In Vol II. p. 18. it is mentioned that the manufacturer conducts the whole process of his profession, from the formation of his tools to the sale of his production. Unable to wait the market, or anticipate its demand, he can only follow his trade when called to it by the wants of his neighbours. In the mean time, he must apply to some other employment; and agriculture is the general resource. In the two chapters commencing at p.183.191. vol. II. we have a detailed account of a zemindary in the neighbourhood of Benares, which is chiefly valuable for the information it contains as to those singular practices which we have noticed above. The extent of the zemindary is 4000 cutcha, or 1500 pukka biggahs (500 acres). Of this, 300 acres are under the plough; the remaining 200 are waste or pasture land. The annual rent paid to government is 900 rupees (112 L. 10s.); the proprietor's share, amounting to 100 rupees (12 L. 10s.) or 10 *percent*. The number of inhabitants is 1000 living in one village, which, according to Dr. Tennant, is nearly *one* person to each *Scotch acre*. We believe, if he will take the trouble of turning up p. 184. vol II. of his own book, he will find that the 'small zemindary, of which we have lately had a description', consists of *five hundred* acres, which is exactly *two* persons to each acre. The number of working cattle is 400. The wages of the ploughmen are five seer of the grain which happens to be in cultivation, and two rupees at each *hulwary* or ploughing season, namely, after the setting in of the rains in June, and after they break up in October. The amount of these wages are 7 quarters 3 bushels 4 pecks 11 ½ pints, which is within a trifle of the wages near Allahabad, as will be seen presently. The wages of the other country labourers, are 5 seers of grain, and a 25th sheaf during harvest. The reaper has a tenth of the coarse, and a twentieth of the finer grains. After all these deductions, the share of the ryut must be inconsiderable indeed. The food of the husbandman in this district consists of rice, barley, with the various kinds of pea, either separately or mixed. Wheat is only used by the higher ranks. The most substantial meal to which the lower ranks can aspire, is a sort of porridge of fried *grain*, reduced to flour by a hand-mill.

In the district about Allahabad, the whole stock of the farmer is not worth 8 rupees (20s) exclusive of the value of his cattle. Wheat is the prevailing crop. A man and two cattle can till a biggah many times in a day. The protection of the seed and crop from the birds, is necessary all

over this country. This duty falls to the lot of the women and boys, though in some parts it forms the occupation of the men.

The rate of wages in this district, and the produce of an acre, as compared with those of England, will be seen from the following table, taking, according to Sir George Shuckburgh, 1s. 5d. as the average wages of a labourer, and 7s. I0d. as the price of a bushel of wheat. In order to get real and practical information upon the subject, it is necessary to state the value of the wages, & c. in grain, the money price of labour forming no standard of comparison.

| | ONE HARVEST | | | | WHOLE YEAR | | | |
|---|---|---|---|---|---|---|---|---|
| Quantity of seed to an acre in | Q. | B. | P. | P. | Q. | B. | P. | P. |
| India …….. | 0 | 2 | 3 | 1.5 | 0 | 5 | 2 | 3.5 |
| Ditto in England…… | 0 | 2 | 2 | 0 | 0 | 2 | 2 | 0 |
| Produce of an acre in India…… | 6 | 7 | 2 | 3 | 13 | 7 | 0 | 6 |
| Ditto in England……. | 2 | 4 | 0 | 0 | 2 | 4 | 0 | 0 |
| The rent of Wheat land in India, 18s. 9d. ……... | | | | | 1 | 4 | 1 | 3 |
| Ditto of arable land in England, 14s. 2 ½ d. …… | | | | | 1 | 1 | 0 | 5 |
| The wages of ploughman in India …….. | | | | | 7 | 1 | 2 | 4 |
| In England…… | | | | | 8 | 2 | 3 | 14 |

From this table it appears, that the quantity of seed sown in each country is nearly the same, while the produce is nearly treble in India. The circumstance most worthy of attention, is the high wages of the Indian. According to the usual calculations, a man in England consumes a quarter of wheat *per annum*, and the inhabitants over-head 6 bushels. Out of the remaining 7 quarters he has to pay for his house, his clothes, taxes and a variety of other things which custom has rendered necessary to his existence. The Indian labourer (for the ryut is by no means so well off) receives within one quarter of as high wages as the English peasant, without having any of those outgoings to diminish his income. If the fact is as here stated, (and it agrees with what the author himself states relative to the wages near Benares), we are at a loss to find a reason for such a singular circumstance. The labourer receives a certain allowance at certain periods of the year, entirely independent of his regular wages. From the largeness of that allowance, there is reason to think that it was fixed in a period of great prosperity, or adopted for the purpose of making the regulation of *wages* more easy. This custom prevails also in the southern part of the peninsula. Much light would be thrown upon the whole subject, if some person would communicate to the public an account of the Carnatic and the Mysore. This class of day-labourers appears now to bear a very small proportion to the *metayers*.

## 3. AN EARLY REPORT OF MENDING OF NOSES FROM PUNE c. 1794

(B.L. Add Ms 35262, ff 9r-11r: by Dr. H. Scott, Bombay)

In a conversation that I had some time ago with Captain Irvine of this presidency who had come to Bombay on some business from Poona where he is stationed, my curiosity was much raised by the account he gave me of a practice that is not uncommon among the Gentoos of putting new noses on people who have had them out cut. He told me that he first came to the knowledge of this from a sepoy who had his nose cut off by Tippoo during the last War. In consequence of it he had become an invalid in the Company's pay which he received every month from Captain Irvine. One day he came to Captain Irvine and begged his permission to go for a certain time to some distance that he might get a new nose, for he said that his wife could not bring herself to like him in his present situation. Captain Irvine thought at first that he wished to impose on him, but the man assured him that he was speaking only the truth and that he would shew him one of his friends who some time before had received a new nose. He accordingly brought him and Captain Irvine had reason to believe the story for he saw a nose which altho' not actually so perfect as if it had been formed by nature was yet sufficiently agreeable to the eye. Captain Irvine learned at the same time from Mr. Findlay the Company's surgeon with the Resident that the sepoy had some time before been with him to beg to have a new nose put on but Mr. Findlay had assured him that such a practice was not known among the Europeans. Captain Irvine gave the sepoy leave of absence and in some weeks afterwards he came back to Poonah with a pretty good nose. It was somewhat too roundand uniform but such as would not be taken notice of for being disagreeable. All the gentlemen in the Company's service at Poona were witnesses of this change. When Captain Irvine came to Bombay which was soon after the operation, the sepoy still wore plugs, I believe of cotton, in his new nose. There was a discharge from some slight ulceration within it, nor had the part acquired entirely the natural heat of the body. It appeared otherwise to be well joined and healthy and the man had acquired great security in his late acquisition.

Captain Irvine was informed that the operator cut a part from the skin of the forehead above the nose after he had beaten it for some time so as to make it swell and become insensible. In order to take away the skin of a proper form and no more than was necessary he first applied a piece of paper along the cuatrice of the patiant's nose and having cut it into the form of a nose according to his taste, he applied the paper on the forehead and from thence cut out just as much skin as it covered. He then put the skin in a proper situation on the old nose and secured it there by a paste. I suppose he cut off a little from the edge of the cuatrice of the old nose before fixing the skin on it but of this Captain Irvine could give me no information.

As I wished much to be further acquained with this curious subject I wrote to my friend Mr Findlay concerning it and I cannot do better than send you a copy of his own words in answer.

"On the second instant I was favoured with your last letter wherein you express a strong desire of having some facts collected respecting the custom in this country of putting noses on those who have lost them. It affords me pleasure to inform you that we have ascertained in the

most satisfactory manner that individuals or rather families of a certain cast of people in Hindostan have from time immemorial been acquainted with and practise the art of putting on noses, and I have ample grounds to believe that the operation is in general successful. I have at this moment before me two Mahrattas pensioners of the Bombay Government, whom I saw on their arrival here from Syringaputtam in may or june 1792 without noses. These two men have now their faces decorated with noses of a natural size and tolerable shape which are firmly united and receive nourishment from the stumps of their original noses. These two facts which have fallen under the observation of all the gentlemen of this Residency as well as my own afford sufficient testimony on this subject; but the following proof may be deemed still more satisfactory.

"Through Sir Charles Mallet's obliging influence Mr Cruso and I were permitted to see the operation performed on the 26 ultimo by a man of the Koomar cast ( a class of Hindoos chiefly employed in making the common earthenware of this country) who, with an old razor borrowed on the occasion, dissected with much composure a portion of the frontal integuments from the pericranium of the patient and grafted it, a new operation to us in surgery, on the stump of the original nose. He there retained it, by a cement without the aid of stitches sticking plaster, or bandages. The patient is at present in good health and high spirits. An adhesion has taken place seemingly in every part; when it is perfected and cuatrized I shall give you a particular history of the operation and subsequent treatment". (Poona 12 December 1793.)

The above is all the information that I have yet procured concerning the restoration of noses. It must be understood only of the soft and not the bony part of the nose; so much of it I suppose as a knife can readily remove; for this has been a common punishment with the despots by whom this country has been ruled. The cement, by which the old and new parts are kept together till they unite, appears to be a desideratum in our surgery. I cannot discover wherefore the skin is not taken from a more ignoble and a less conspicuous part than the forehead. I should suppose that a piece of skin would but ill supply the place of the septum and the other cautilages of the nose, its muscles, membrane & c ; but so far as appearance is concerned, and this must be acknowledged to be a consideration of great moment, it makes an excellent substitute.

Altho' this operation of the Gentoos is supported by the analogy of some well known facts there are people I doubt not who will call in question the truth of this relation. I beg leave to repeat that two of the Company's surgeons Mr Findlay and Mr Cruso both men of eminence in their profession have actually seen the operation performed and the sepoys who are mentioned above are known to all the gentlemen of the Residency at Poona. You are very welcome Sir to make use of my name in any way you may chuse to mention this singular operation for I am perfectly assured of the unquestionable honour as well as of the good sense of those from whom I have received the accounts.

H. Scott

Bombay, Jany 1, 1794.

## 4. INDIAN ORIGIN OF MODERN PLASTIC SURGERY

by J. C. CARPVE, F.R.S. Member of Royal College of Surgeons, London, 1816: from AN ACCOUNT OF TWO SUCCESSFUL OPERTATIONS FOR RESTORING A LOST NOSE FROM THE INTEGUMENTS OF THE FOREHEAD, 1816: extract pp 36-63

It was in this manner that the nasal operation had become forgotten or despised, in at least the west of Europe; when, at the close of the last century, it was once more heard of in England, from a quarter whence mankind will yet, perhaps, derive many lights, as well in science, as in learning and in arts. A periodical publication, for the year 1794, contains the following communication from a correspondent in India, which is accompanied by a portrait of the person mentioned, explanatory of the operation: "Cowasjee, a Mahratta, of the caste of husbandmen, was a bullock-driver with the English army, in the war of 1792, and was made a prisoner by Tippoo, who cut off his nose, and one of his hands. In this State, he joined the Bombay army near Seringapatam, and is now a pensioner of the Honourable East-India Company. For above twelve months, he was wholly without a nose; when he had a new one put on, by a Mahratta surgeon, a Kumar, near Poona. This operation is not uncommon in India, and has been practised from time immemorial. Two of the medical gentlemen, Mr. Thomas Cruso, and Mr. James Findlay, of Bombay, has seen it performed as follows; A thin plate of wax is fitted to the stump of the nose, so as to make a nose of good appearance; it is then flattened, and laid on the forehead. A line is drawn round the wax, which is then of no further use; and the operator then dissects off as much skin as it covered, leaving undivided a small slip between the eyes, This slip preserves the circulation, till an union has taken place between the new and old parts. The cicatrix ofthe stump of the nose is next pared off; and, immediately behind this raw part, an incision is made through the skin, which passes round both alae, and goes along the upper lip. The skin is now brought down from the forehead; and, being twisted half round, its edge is inserted into this incision; so that a nose is formed with a double hold, above, and with its alae and septum below, fixed in the incision. A little Terra Japonica is softened with water, and, being spread on slips of cloth, five or six of these are placed over each other, to secure the joining. No other dressing than this cement is used for four days; it is then removed, and cloths, dipped in *ghee* (a kind of butter), are supplied. The connecting slip of skin is divided about the twenty-fifth day; when a little more dissecting is necessary to improve the appearance of the new nose. For five or six days after the operation, the patient is made to lie on his back; and, on the tenth day, bits of soft cloth are put into the nostrils, to keep them sufficiently open. This operation is always successful. The artificial nose is se-cure, and looks nearly as well as the natural one; nor is the "scar on the forehead very observable, after a length of time."[3]

The same account was subsequently engraved under a detached portrait of Cowasjee, in which, as in the former, the new nose and cicatrix are marked. The portrait is engraved by Mr.W. Nutter, from a painting by Mr. James Wales, of Bombay; and published in London in the year 1793.

Pennant, in his View of Hindoostan, printed in 1798, gives a second description of this practice; "I must by no means omit," says this popular writer, "one branch of European surgery

[3] Gentleman's Magazine, 1794

which has of late been practised with great success by a Poonah artist, who has lately revived the Taliacotian art, differing only in the material; for he doesno apply to the `brawny parts of porters, & c. & c.' to restore the mutilated patient. I am not master of the process; but I am told it is by cutting the skin and muscles of the forehead on three sides, and drawing it over the deficient part. If the bridge of the nose is injured, I presume that must be supplied by some ingenious invention. The Hircarrah, or Madras Gazette, of August 5th, 1794, informs us, that Cowasjee, two years before, fell under the displeasure of Tippoo Sultan, who instantly ordered the nasal amputation. The sufferer applied to the great restorer of Hindoostan noses, and a new one, equal to all the uses of its predecessor, immediately rose in its place. It can sneeze smartly, distinguish good from bad smells, bear the most provoking lug, or being well blown, without danger of falling into the handkerchief. It will last the life of the wearer; nor, like the Taliacotian, need he fear,

"That when the date of Nock is out,
"The drop of sympathetic snout."

This art is practised by the Koomas, a caste of Hindoos. Some religious ceremonies are first performed. Betel and arrack are put into the patient's hands, and he is then laid on his back, his arms stretched along his sides, on the ground, and he is ordered, on no pretence whatever, to use his arms during the operation; and they impress him with this idea, that it cannot be successful unless he complies strictly with this injunction."[4]

On undertaking the first of the two cases to be hereafter narrated, I was induced to make such personal inquiries as were within my reach in this country, concerning the Indian method, I did myself the honour to write to Sir Charles Mallet, who had resided many years in India, and who obligingly confirmed to me the report, that this had been a common operation in India, from time immemorial; adding, that it had always been performed by the caste of potters or brickmakers, and, that though not invariably, it was usually successful.

Mr. James Stuart Hall, a gentleman who was many years in India, assured me, that he had seen the operation performed, and that it was of tedious length. From Dr. Barry, of the India service, I learned, that he also had seen the operation; that it occupied an hour and a half, and was performed with an old razor, the edge of which, being continually blunted in dissection was every moment re-set. Tow was introduced to support the nose, but no attempt to form nostrils, by adding a septum, was made.

I am obligingly informed by Major Heitland, of the India service, that in India, several years ago, in the time of Hyder Ali, Mr. Lucas, an English surgeon, was, in several instances, successful in the operation, which he copied from the Hindoo practitioners.

Boyer mentions, that the late M. Chopart once employed, in a manner, as it seems, similar to the Indian, a portion of the integuments of the neck, to fill up a void space, left by the operation for a cancerous lip. The union took place, and a tolerably well-formed lip was procured[5]. Mr. Lynn performed this operation successfully, some three years since; and it has been repeated,

[4] Pennant's View of Hindoostan, 2 vols. 4to. 1798, Vol. II, page 237
[5] Lectures on Inflammation, p. 230

also with success, very lately, by my friend and late pupil, Mr. Sutcliffe, of Rochdale. Do the Indian artists, like the Italian, undertake equally the restitution of the nose, ears, and lips ?

I have heard, that about the year 1803, the nasal operation, by the Indian method, was performed in London, without success. the patient, I am told, is still alive, in India.

I can add no more to the history of the Indian method; but what has appeared is sufficient to arrest the reader's attention both as it offers so great an improvement on the Taliacotian practice and as it illustrates the history of the operation in general. It cannot be otherwise, than that this discovery of its existence in the distant regions of India, should awaken our curiosity more earnestly than before, as to the place and date of its original use. Mr. Pennant, in the passage quoted, has evidently taken a very hasty view of the matter, where he calls the operation " a branch of European surgery;" where he speaks of it as "practised of late," and as a "late " revival; where he denominates it " the Taliacotian art;" where he attributes its revival to " a Poonah artist;" and where he intimates that there is but one "restorer of noses" in Hindostan. He himself soon after tells us, that the art is practised by a whole cast; and that its exercise is accompanied by fixed religious ceremonies. Do not these things savour of antiquity, and proclaim something very different from "a late revival of" the Taliacotian art, "and the adoption of" a branch of "European Surgery?" Assuredly, the Hindoos owe no part of their skill in this operation, either to Europe in general, or to Taliacotius in particular. With the exception of Mr. Pennant, all the names I have cited concur in deriving the Indian practice from " time immemorial."

It will be observed, that the whole of the foregoing accounts are agreed upon these points, that the performance of the operation is confined to a particular cast of Hindoos, and that this cast is said to be the Koomas, or potters, or brickmakers. The combination appears, at first sight, to be singular; but an explanation is not difficult, and may not be unacceptable. Most of the Hindoo casts, though fixed within positive limits, as to professions, trades, or other occupations, are yet allowed a certain range, a certain variety of pursuit, among which the individual is free to make his choice. The casts are known to be divided into sub-casts; and there are degraded casts, making branches of the pure casts, with respect to whom a still greater laxity is allowed; "The profession of *astrology*, and the task of making almanacs," says a late writer on India," belong to *de-graded Brahmins*; and the occupations of teaching military exercises, and *physic*, as well as the trades of *potters*, weavers, braziers, fishermen, and workers in shells, belong also to the descendants (meaning the outcasts) of Brahmins".[6]

Thus, astrology, medicine, and *pottery* are among the several pursuits allowed to one and the same cast.

That *astrology* and *medicine* should be thrown into the same lot, excites no surprise, In Persia, and all the eastern countries, the art of healing is consigned to the professors of these two sciences conjointly[7] ; and the same prevails, or has prevailed, in many other parts of the world.

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[6] Mrs. Graham's's Letters on India

[7] Chardin gives a clear view of the respective principles by which the two professions are governed, in the treating of their patients; " The physicians, " says he, " endeavour " to adapt their remedies to the phenomena of the disease, while the astrologers, on their "side, maintain, that attention is to be paid to

It is hence that our ancient almanacs contained instructions concerning the health of the body; and, at this day, "Francis Moore," though he calls himself "physician." is plainly an astrologer. The adjuncts of pottery, weaving, & c., in the same cast with the former, appear to evince, that the Indian institutions are less restrictive on the particular genius or disposition of individuals, than may have been commonly supposed.

**ORIGIN OF THE ART**

A due attention to the little evidence within our reach, will go far to fix us in the opinion, that the nasal operation is of the highest antiquity in the warm climates of the East; that its practice, in all the southern parts of Asia, from India to Persia and Arabia, has existed from very early times; that Greece shared it with Asia; that it afterward passed into Calabria, and from Calabria into other parts of Italy, and that in Italy it languished, and died; partly through its approach to severer climates, partly, perhaps, through the practice of a more complicated, tedious, and painful method; partly through the low state of surgery in Europe; and partly through the senseless incredulity and ridiculous misconceptions, arising out of that low state of surgery, with which it was met both by practitioners and people.

That the nasal operation was not first known in Italy is proved, in a great degree, by this, that with the more industry we trace its beginning, the further and further off we see it recede from us. Some would give the invention to the first Branca, the Sicilian. Gabriel Barri claims it for Vincent Vianeus, or Boiani, of Tropea. Cortesi ascribes it to Peter Boiani, his descendant. Multitudes resolutely fix it on Taliacotius; but, Cortesi, and, after him, M. Eloy, will have Peter Boiani to have been the instructor of Taliacotius. All unite in refusing an earlier date to this art than the sixteenth, or, at furthest, the fifteenth century. If we look for the grounds of the conclusion, we shall find them to be no better, than that at this period, the invention of printing, and revival of letters, gave an impulse to the reading and writing of books.

But Taliacotius was neither the inventor of the art, nor does it appear to be true, that he learned it of either of the Boianis. Taliacotius is himself careful to mention all that he could collect concerning the previous practice of the operation; and it is worthy of remark, that as far as I have been able to discover, little is to be added to what he has brought forward concerning its ancient history in Italy. He speaks of Branca, and of a reported existence of the art in Calabria; but, of the Boianis, at least by name, he appears to have known nothing. His own account of the art, and of his share in the cultivation of it, is to be found in his epistle-dedicatory to the the Duke of Mantua; "Very little,." he observes, " is left us by ancient writers, on the supplying of deficient parts of the body. The restoration of lips, ears, and noses, is said to have been formerly practised in Calabria; but the art, if it could be called an art, was rather pursued

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the phenomena of the planetary system, in "order to determine the most proper time for taking medecines." The professions, in the mean time, are not to be understood as further distinguishable, than as the one consists in physicians who combine astrology with their medicines, and the other in physicians who rely upon their medicines only. The English physician, described by Chaucer, is no other than the astrologer of Chardin:

"With us there was a doctor of physik. In al the worlde was there non hym lyk,To speak of physik and of surgerye; For he was groundit in astronomy. He kept his pacient a ful gret del,In hours by his magyk-naturel; Wel couth he fortunen the ascendent Of his ymagys for his pacient. "Full ready had he his apothecaryes,To send him his droggis and letewaryes (electuaries )" CANTERBURY TALES

at random, than according to any fixed method. On my part, beside the other services which I have rendered to medicine in general, I have placed this particular branch upon the basis of uniform rules, and have reduced the method of practice into writing." In other passages, indeed, he may be thought to have assumed for himself somewhat too large a share of originality in the art. In the nineteenth chapter of his first book, he writes as if he alone had taken the integuments, for the restoration of a lip or nose, from other parts than the immediate vicinities. There is, surely, some inconsistence in this portion of his language, (as well as in that in which he so greatly undervalues the ancient state of the art) both with what he presently afteward tells us of Branca, and with what he had read in Celsus, Calentius, Benedictus, and the rest; Branca, a Sicilian," says Taliacotius, "practiced the art with distinguished skill, though no one has ever explained his method". The truth appears to be, that Taliacotius's only instructors were books, tradition, and his own reflections and experiments; that upon these foundations he formed a method for repeating what had been done before ; and that he performed the further service of putting that method into writing, and making it public. Former practitioners had been famous for the art; but their method, and, in most instances, themselves, had afterward passed into oblivion.

"They had no poet, and they died".

Sir Charles Bernard, it is to be acknowledged, in his contribution to Wotton's Ancient and Modern Learning, appears willing to stop at Branca, as the earliest restorer of a deficient nose; but he can have had no other reason for this, than what may be thought a too circumscribed construction of ancient testimonies; "As for those operations", says Sir Charles, "which "the Greeks called--, *orcurtorum chirurgia*, they amounted to no more than cutting the hare-lip, or the like; "for that they knew and practised.".

Celsus, a native either of Rome, or of Verona, was born in the reign of Augustus; that is, before, or not much later than the birth of Christ. This writer teaches the art of supplying *curt* of deficient parts *by incision*, by dissecting the integuments from the muscles, by leading them to the deficient part, and by joining them thereto; and adds, that *sometimes* the skin of *other parts* was applied to the deficient part. He speaks of deficient parts generally, without naming either nose, ears, or lips.[8]

Galen, a native of the city of Pergamos, in Asia Minor, was born toward the middle of the second century. He tells us, that the Greeks gave the name[9] of to those of whom either the lips, ears, or nose, was deficient; "Now , the method of curing a deficient lip," says this illustrious physician, "is, first, to dissect the skin; then, to bring it in contact with the skin of the lips; then, to take away the callus; after which, what re-mains is to sew the two together, and to agglutinate them." [*]

[8] Celsus, vii, 9. "Many things," says Boerhaave, " which are to be found in Celsus, pass, at the present day, for new."

[9] in Greek; cannot be prescribed here.

[*] (Idem, 18.) He speaks also of supplying deficiences of other parts; and even inquires, whether, if a finger, or any similar part, were wanting, it would be wholly impossible to supply it?

Further on, "If the lips, ears, or nose, are deficient," says Galen, "additions may be made to them by incisions; the edges of the raw skins being brought together, and agglutinated."

Paulus AEgineta, of whom it is disputed , whether he flourished in the fourth, fifth, sixth, or seventh century, was born in the Greek island of AEgina, Paulus follows Galen, but with great brevity; he directs, for the treatment of deficient lips and noses, that the integuments be dissected from the part below; and, then, the callosity of the deficient lip or nose being dissected away, and the edges of the two integuments being brought into contact, to stitch and conglutinate the parts. This is the sense of the whole of Paulus's[10] short chapter on, of which the following is the old French translation of M. Tollet, in 1540: :" Curtes en lebvres et narines sont curees en ceste sorte. Nous -couppons le cuir vers la partie inferieure. Puis, apres les labies de la plaie conjoinctes, premierement la callosite ostee, nous cousons et congluti- nons."[11]

We have now seen that the nasal operation, and all the physiological *facts* upon which it depends, were known in Europe at least as early as the date of the Christian era; that the *fact* of adhesion was known to Hippocrates, and that where our history fails us, is simply the point beyond which we have no records. We have now, also, before us, the greater part, if not the whole of the information which was possessed by Taliacotius; and, beside satisfying ourselves that this eminent person was not (what he never pretended to be) the inventor of the art, we may venture to judge in what degree he advanced it.[12]

That the art has subsisted from the most ancient periods in India' and other southern parts of Asia, and was at no time carried thither from Europe, is probable from further evidence than the simplicity of the Indian method, as compared with the Italian; the ordinary recourse which is had to it in India ; its practice by a particular cast, and its junction with religious observances; it is probable, likewise, from the frequent occasions for it, from the favourableness of the climate, from the temperance of the people, and from the plainness of the road by which Nature leads to the invention. The adhesion of divided parts, however little understood, till lately, in France or England, was one of the first spectacles presented to mankind. If we fancy that we are entitled to refuse to the Orientals the reputation of science, this makes no alteration in the case; for no depth of science, but involuntary observation, was all that was wanted here. The operation of the hare-lip could not fail to suggest the supply of small deficiences of the nostrils; and this would lead to greater reparations. The taking the integuments from other parts was an enlargement of the plan, and the result of research, or at least of reflection.

In addition to the facility afforded to the nasal operation by the climates of the south of Asia, there is also to be remembered the extraordinary demand for its practice; a circumstance

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[10] in Greek, cannot be described here.

[11] La Chirurgie de Paul Aegineta, par M. Tollet, a Lyon, 1540. Lib. vi, chap. 26.

[12] None of the ancient writers were ignorant of the process of adhesion, as effected by bringing the lips of wounds into contact, or *healing by the first intention*; but the bringing foreign parts to adhere, seems to have been practiced only by the restores of noses, lips and ears, and not scientifically examined before Taliacotius; who proposes the questions, "In what manner, and by what means, is the new nose nourished" and "Does it live and feel?" He apprehends, that its nourishment must depend, either upon the formation of a new set of vessels in the new nose, or upon the inosculation of the vessels previously existing in it with those of the part with which it is brought into contact; and he gives the preference to the latter theory. (Chirurgia Curtorum, lib I, Cap. XXV).

which cannot but have combined with the former, both to give it birth, and to keep it in use; and a circumstance, also, which prevailed, as we may believe, even more forcibly in remote ages, than in the present. Even the demand, however, of the present age, were enough ! I shall have occasion, in another place, to mention the frequence of the amputation of the nose in India, and the accompanying popular persuasion, that one way or other, the sufferers may recover their loss. A direct example is exhibited in the case of Cowasjee, under Tippoo Sultan. Instances have recently occurred, attended with other cruelties, in the island of Ceylon, under Scindeah Rajah. But an example, upon the grand scale of eastern barbarity, which will at once suffice to strike the reader's imagination with the full force of the fact, presents itself in Father Guiseppe's Account of Nepaul, printed in the second volume of the Asiatic Researches. The city of Kirtipoor, in Nepaul, being besieged by the Ghoorka army. was betrayed by one of its nobles. The inhabitants might still have stood on their defence; but, on the promise of amnesty, they surrendered themselves prisoners. Two days afterward, Pritwinarayan, the king of Ghoorka, their conqueror, ordered the principal persons of the town to be put to death, and the lips and noses of everyone, even the infants who were not found in their mothers arms, to be cut off; directing, at the same time, that the lips and noses should be preserved, that he might ascertain the number of souls; and that the name of the town should be changed into *Nascatapoor*, which signifies (such relationships have the languages), *Nose-cut-Town*: "The order," says Guisepe, "was carried into execution with every mark of horror and cruelty, none escaping but those who could play upon wind-instruments ; although, Father Michael Angelo, who, without knowing that such an inhuman scene was exhibited, had gone to the house of Suruparatna [the officer fulfilling the order'], and interceded much in favour of the poor inhabitants. many of them put an end to their lives in despair; others came in great bodies to us, in search of medicines; and it was most shocking to see so many living people with their teeth and noses resembling the skulls of the dead." This event occurred in the year 1769, or 1770; and, after perusing this, no solitary instance in its kind, shall we remain in doubt, that the nasal operation was in early request in countries where tyrants are so ready to wound, and Nature is so willing to heal?

But, if we are now to account for the existence of the art in Calabria, at a time when it was unknown in the rest of Europe, and even in the rest of Italy, it will, perhaps, be agreed, that we have only to call to mind the geographical situation of Calabria, its neighbourhood to Greece, and to the frontiers of Arabia, and the rest of Asia; and the degree in which it resembles those countries in its climate, in the living and manners of its inhabitants, and how much it anciently resembled them, in its laws and punishments. It may deserve, nevertheless, to be further remarked, that even the political circumstances of Calabria, in times not very remote from those of the Brancas and Boianis, were favourable to the introduction into that country of every art, and, among the rest, of every medical art, which was practised in the East.

Through a great part of the middle ages, Italy and other countries of the south of Europe, were overrun by the arms of the Arabs. Francis II of Naples, the most enlightened monarch of his age, and whose policy required a counterpoise to papal domination, always maintained a strict friendship with these active Mohammedans, and carried on with them, even after he had expelled them from his kingdom, an extensive intercourse in literature and the arts. It was from Arabia that surgery was restored in Italy, as it was from Italy that it was carried into France. The connection of the Arabs with India has always been intimate.

The foregoing are some of the facts and considerations which present themselves on a hasty survey of the question. If weight is due to all of them, or to those of chief importance, we shall hardly think, as has been thought heretofore, that in tracing the art eastward to Italy in general, or even to Calabria in particular, we have found the seat of its birth; but we shall venture to place it among the acquirements of the whole eastern and ancient world, the rays of whose light have successively, from age to age, penetrated the forests and recesses of Europe; It is probable, nevertheless, that while the general principles of the art were early and widely spread, the particular methods had their origin in particular and unconnected inventors. The express rejection, by Taliacotius, of the integuments of the forehead, for the material of the new nose, as being alien to the part, and not to be commodiously joined with it[13], forms a total separation from the Indian method; while his choice of those of the arm was in exact conformity with the Calabrian.

An additional remark suggests itself from this view of the history of the nasal operation. It has been insinuated, by those who would derive its birth from Taliacotius, that it had its origin in some of the consequences of Lues Venerea; which disease is said to have been first known in Europe after the siege of Naples, in 1494. But the year 1442, the date assigned, in the Dominican manuscript, to the age of Branca, precedes the date of the siege of Naples by half a century, as does the age of Celsus by almost fifteen hundred years. Again, something more than a whole century elapsed, between the siege of Naples and the appearance of the work of Taliacotius. Beside, the branch of surgery, which is the subject of that work, has no peculiar reference to the nose, but equally includes the ears and lips.

## PHYSIOLOGICAL PRINCIPLES

In concluding this sketch of the history of the nasal operation, it will be acceptable to add some account of the physiolo-gical principles upon which the branch of surgery to which it belongs proceeds, and from which it derives its success.

## ADHESION OF WOUNDED SURFACES

I. The first of these principles consists in that aptitude for adhesion which is found to subsist in all, or nearly all, the living parts of animal bodies; and the natural end of which is their restoration to the pristine state, after accidental division or separation. Such is the adhesion of the two extremities of a fractured bone; and such, in the case of a simple cut finger, is the adhesion of the two sides or edges of the divided parts.

The adhesion of the divided parts of a living Bone is effected by the pouring out of osseous matter from the arteries. Sometimes, from the state of the patient's health, or other cause, this does not happen, in which case, a callus forms, and prevents the desired union; but, the callus being removed, osseous mater may still be produced. A gentleman having fractured the tibia, the usual method of reduction was resorted to without success. Six months after the accident, he applied for my assistance. Knowing the pain and inconvenience experienced by the patient, from sawing away part of the ends of the bones, I made an incision through the integuments, and cut or scraped away the callus which had grown upon the extremities of the fracture. then I

[13] See above, page 12

brought the parts into contact, and applied splints and bandages. Osserous matter was secreted, a perfect union took place, and the gentleman was enabled to walk as well as before the accident.

The adhesion of divided Muscles and Integuments, is the express subject of our present inquiry. Of those adhesions, some extreme cases, in part old; and in part new, have already appeared in these pages. In modern surgery, the general fact is universally admitted; and the only subject of doubt is, the adhesion of parts which have been *entirely* separated; or, in other words, in one of which circulation has been wholly interrupted; Professor Thomson thinks, that we should "in no case despair "of adhesion, so long as the least degree of circulation remains "in both, or even in one of the parts, divided; "[14] and adds, we must learn, from experience, in what circumstances re-union may be attempted with probability of success. Dr. William Balfour, of Edinburgh, without regarding the continuance of the circulation, would attempt to procure adhesion between any divided parts, unless such parts were of a magnitude that the apposition of the wounded surfaces would not restrain haemorrhagy."[15]

[16]I have been informed by Mr. Abernethy, that an instance of union between a finger and its end, which had been cut off, occurred not very long ago at St. Bartholomew's Hospital.

I have before me a letter from Dr. William Ruddiman, in which are related some extraordinary facts, as connected with adhesion of divided parts of the nose in India, his acquaintance with which arose from his residence in that country; One of our senior surgeons on the Madras establishment in the year 1780," says Dr. Ruddiman, "was with Colonel Baillie's unfortunate detachment, which was cut off by Hyder Ali. The surgeon above mentioned, whose name was Wil-liam Raine, had his nose completely cut off by a sabre, all but hanging by a bit of skin. He poor fellow ! did nothing more to it, than put it carefully up in its proper place, and only bandaged it with a shred or two of his handkerchief; and, strange to tell, it did well, and we, Madras gentlemen, knew him well, many years afar he came out of prison. I remember, "continues Dr. Ruddiman, "an instance in one of our native troopers, when I was in the field, under General Coote, against Hyder, in 1781. this man had his nose completely cut through by a sabre, from - the termination of the bony part; to the degree, that when he came for chi-rurgical aid, it was literally hanging down on his mouth, and he was bleeding exceedingly. I did nothing more than wash it clean with luke warm water, put it carefully and steadily in its proper place, give it a few stitches with a ligature, support it on the outside with little bolsters of lint on the sides, and hollow dossils inside, and dress it simply as occasion required; and, in a few weeks, the trooper's nose was as firm, as handsome, and as sound as ever".

In neither of the foregoing examples, however, was there that perfect separation of the parts, which is described by Fioravanti, Garengeot, and others. The integuments were never wholly cut asunder. Dr. Ruddiman, in the mean time, subjoins an observation which, though under circumstances less conclusive than the foregoing, relates to examples of total separation: "Among the natives in towns and villages, says my correspondent, it is usual for male-factors,

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[14] Lectures on Inflammation, page 243

[15] Observations on Adhesion, with Two Cases, & c, Edinburgh, 8vo. 1814, page 13.

[16] pages 56 to 59 missing in the text in our possession hence the narration begins from page 60 again and ends at page 63

viz. in cases of petty theft and other minor crimes, to be sentenced to have their noses cut off in the *bazar*, or market-place, by the common *chuckler*, or executioner; on which occasion, the executioner always makes a point of throwing the amputated nose into the fire; because, say they, were the offender to have possession of his nose, he would have nothing more to do, than, the moment it is cut off, put it into its proper place, well secured; where it would unite, and be as good as ever again. This I have never seen done; but I have often heard it asserted as a fact by the natives. The recovery in India, adds Dr. Ruddiman, as a general remark upon these facts, of wounds of the most desperate description, many of which would be looked upon, in England, as incurable, is surprizing ; and I can only attribute it to the warmth of the climate, and to the very abstemious regimen to which the natives most rigidly adhere, chiefly boiled rice, with its water and decoction, and a very little salt, just barely to give it the slightest zest.

To these new examples of adhesion, it is proper that I should add a testimony of the opposite kind. Captain, a nephew of Sir Charles Malet, but whose name I have not the honour to recollect, has assured me, that he was present, a very few years ago in Syracuse, when a Turk lifted his scymetar against a Syracusan, and cut off his nose. A surgeon of the city was at hand, and immediately replaced the nose; but though every circumstance of expedition, climate, and season, was in favour of the experiment, it did not succeed.

Of the possibility of uniting the integuments of one man with the integuments of another, in other words, of the success of an animal graft, where the original circulation in the graft was not maintained till the new adhesion had taken place, an example is contained in a letter from my experienced friend and fellow pupil, Mr. Sawrey. Mr. Sawrey was some time ago applied to by a Swedish gentleman, now resident in London, who, "when a boy, exchanged a piece of the skin of his arm with a school-fellow, as a mark of indelible affection. The piece which was transplanted united with the skin of the arm, both in him and his friend, as he informed me; and, certainly, marks of its having done so remained in him at that time".

The adhesion of divided Tendons is now known to be easily procured. It was formerly the practice, in ruptures of the Tendon Achilles, to hold the parts together by stitches; but all which is at present thought necessary, is to bring them into contact, and leave them to the natural process of adhesion.

The union of divided Arteries, is a known act of nature: In many inflammations of the eye, says Mr. John Hunter,we find an artery, or arteries, passing from the tunica conjunctiva to the cornea, and ramifying on the part. These have often been cut across, to prevent the influx of blood; the two ends are seen to shrink; but in a little time they are again perceived to unite, and the circulation to be carried on as before."[17] -This union, however, must be understood of small arteries only.

[17] Hunter's Treatise on the Blood, & c. 4 to. Edition, p. 193.

## 5. BRITISH DISCOVERY OF OIL WELLS IN BURMA 1797

Captain Hiram Cox: Journal of a Residence in the Burmese Empire 8.10.1796-1.11.1797 London 1821

*January 5, 1797*. To-day I had a proof of the independence of the common laboures in this country; the crew of my boat went ashore with their little bundles, refusing to proceed further, unless the Laidaighee (the cockswain or owner of the boat) paid them the balance of their contracthire for the trip to Amarapoorah. They had received fifteen ticals in advance at Rangoon, and now wanted the remaining ten ticals: twenty- five ticals and provisions is the hire of a boatman from Rangoon to Amarapoorah, and the passage rarely exceeds two months. The Laidaighee pleaded that he had no security for their performing the trip, whereas they were sure of obtaining redress against him, if he refused to pay. The officers of government with me, never intcrfered to compel them; but at length compromised the business by becoming security for the owner of the boat. During the passage also, on several occasions, the boats' crews have been threatened with punishment for neglect of attention; the rattan has been brandished, and even the culprit bound, but I never saw a blow inflicted.

*January 7.* At noon we came to the upper town of Raynangoong: or, as it is pronounced by the natives, Yananghoong: I stopped here on purpose to pay a visit to the wells of Naphtha, or earth-oil. The town has but a mean appearance, and many of its pagodas (of which there are a great number) were falling to ruins; the inhabitants, however, were well-dressed, and many of them had gold spiral ear-ornaments, and were undoubtedly rich from the great trade they carry on in the earth- oil. At this time thirty-three large boats, besides numerous small ones, were lying here; and thirty three large merchant-boats, at two villages dependant on this place a little higher up the river. At two P.M. I set off from my boat, accompanied by the Mewthaghee or Zemindar of the town and several of the merchants, to view the wells. Our road lay to the east-north-east through dry beds of loose sand in the water-courses, and over rugged arid downs and hillocks, on which were scattered plants of euphorbium, the cassia tree, whcih yields the cutch or terra japonica, used throughout India, to add to the astringency of the betel when formed into pawn: it also yields a very durable timber for lining the oil-wells, and, lastly, the hardy biar, or wild plum of India. The sky was cloudless, so that the sun shone upon us with undiminished force, and, as I had been unwell for some days, I walked rather slowly; but at the expiration of an hour we reached the wells. I compute the distance therefore to be three miles from the river. The wells we saw are scattered irregulay about the downs at no great distance from each other, some perhaps not more then thirty or forty yards. At this particular place we were informed, that there are 180 wells; and four or miles to the north-east there are 340 more.

In making a well, the hill is cut down, so as to form a square table of 14 or 20 feet for the crown of the well, and from this table a road is formed by scraping away an inclined plane for the drawers to descend, in raising the excavated earth from the well, and subsequently the oil. The shaft is sunk of a square form, and lined as the miner proceeds with squares of cassia wood staves; these staves are about six feet long, six inches broad, and two thick, and are rudely jointed and pinned at right angles to each other, forming a square frame about four and a half feet in the clear for the uppermost ones, but more contracted below. When a miner has pierced six or more feet of the shaft, a series of these square frames are piled on each other, and

regularly added to a top; the whole gradually sinking as he deepens the shaft, and securing him against the falling in of the sides. The soil or strata to be pierced is, first, a light sandy loam intermixed with fragments of quartz, silex, &c. Secondly, a friable sand-stone easily wrought, with thin horizontal strata of a concrete of martial ore, talc, and indurated argil, at from ten or fifteen feet from the surface, and also from each other, as there are several of these veins in the great body of free-stone. Thirdly, at twenty cubits, more or less, from the surface, and immediately below the free-stone, a pale blue argillaceous earth (schista) appears, impregnated with the petroleum, and smelling strongly of it. This, they say, is very difficult to work, and grows harder as they get deeper, ending in schist and slate, such as is found covering veins of coal in Europe. Below this schist, at the depth of 130 cubits, is coal. I procured some (intermixed with sulphur and pyrites), which had been taken from a well deepened a few days before my arrival; but deemed amongst them a rarity, as they are seldom obliged to proceed to such a depth. They were piercing a new well when I was there; had got to the depth of eighty cubits, and expected oil at ten or twenty cubits more.

The machinery used in drawing up the rubbish, and afterwards the oil from the well, is an axle crossing the centre of the well resting on two rude forked staunchions, with a revolving barrel on its centre, like the nave of a wheel, in which is a score for receiving the draw-rope; the bucket is of wicker work covered with dammer; and the labour of the drawers, consisting in general of three men, is facilitated by the descent of the inclined plane, as water is drawn from deep wells in Hindostan. To receive the oil, one man is stationed at the brink of the well, who empties the bucket into a channel made on the surface of the earth leading to a sunken jar, from whence it is laded into smaller ones, and immediately carried down to the river, either by coolies or on hackeries. When a well grows dry, they deepen it. They say, none are abandoned for barrenness. Even the death of a miner from mephitic air does not deter others from persisting in deepening them when dry. Two days before my arrival, a man was suffocated in one of the wells; yet they afterwards renewed their attempts without further accident. I recommended trying the air with a candle, &c., with seemingly little effect.

The oil is drawn pure from the wells in the liquid state, as used without variation; but in the cold season it congeals in the open air, and always loses something of its fluidity; the temperature of the wells preserving it in a liquid state fit to be drawn. A man, who was lowered into a well 110 cubits, in my presence, and immediately drawn up, perspired copiously at every pore : unfortunately I had no other means of trying the temperature. The oil is of a dingy green, and odorous : it is used for lamps, and, boiled with a little dammer ( a resin of the country) for paying the timbers of houses, and the bottoms of boats &c.,which it preserves from decay and vermin. Its medicinal properties known to the natives, cause it to be employed as a lotion in cutaneous eruptions, and as an embrocation in bruises and rheumatic affections. The miners positively assured me, that no water ever percolates through the earth into the wells, as has been supposed. The rains in this part of the country are seldom heavy, and during the season a roof of thatch is thrown over the wells. The water that falls soon runs off to the river, and what penetrates into the earth is effectually prevented from descending to any great depth, by the increasing hardness of the oleaginous argil of schist. This will readily be admitted, when it is known, that the coal-mines at Whitby are worked below the harbour, and the roof of the galleries not more than fifty feet from the bed of the sea. The deficiency of rain in this tract may be owing to the ligh range of mountains to the eastward, which run parallel to the river, and arrest the clouds in their passage; as is the case on the eastern side of the peninsula of India.

Solicitous to obtain accurate infromation on a subject so interesting as this natural source of wealth, I had all the principal proprietors assembled on board my boat, and collected from them the following particulars: the foregoing I learnt at the wells, from the miners and others. I endeavoured to guard against exaggeration, as well as to obviate the caution and reserve, which mercantile men in all countries think it necessary to observe when minutely questioned on subjects affecting their interest; and I have reason to hope my information is not very far distant from the truth.

The property of these wells is in the owners of the soil, natives of the country, and descends to the heir general as a kind of entailed hereditament, with which it is said government never interferes, and which no distress will induce them to alienate. One family perhaps possesses four or five wells. I heard of none who had more, the generality of them have less, they are sunk by, and wrought for, the proprietors. The cost of sinking a new well is 2,000 ticals, flowered silver of the country, or 2,500 sicca rupees, and the annual average net profit 1,000 ticals, or 1,250 sicca rupees. The contract price with the miners for sinking a well is a follows: for the first forty cubits they have forty ticals, for the next forty cubits 300 ticals, and bcyond these eighty cubits to the oil, they have from thirty to fifty ticals per cubit, according to the depth (the Brimah cubit is nineteen inches English,) taking the mean rate at forty ticals per cubit, and 100 cubits as the geenral depth at which they come to oil; the remaining twenty cubits will cost 800 ticals, or the whole of the miner's wages for sinking the shaft 1,140 ticals. A well of 100 cubits will require 950 cassia staves, which at five ticals per 100, will cost forty-seven ticals and a half. Portage and workmanship, in fitting them, may amount to 100 ticals more. The levelling the hill for the crown of the well, and making the draw-road, c.according to commen rate of labour in the country will cost about 200 ticals ropes and c., and provisions for the workmen, which are supplied by the proprietor. When making a new well, expenses of propitiatory sacrifices, and perhaps a seigniorage fine to government for permission to sink it, consume the remaining 512.5 ticals. In deepening an old well, they make the best bargain in their power with the miners, who rate their demand per cubit according to its depth, or danger from the heat or mephitic air.

The amount, produce, and wages of the labourers who draw the oil, as stated to me, I suspect was exaggerated, or erroneous from misinterpretation on both sides. The average produce of each well per diem, they said was 500 viss, or 1,825 lbs. avoirdupois, and that the labourers earned upwards of eight ticals each per month; but I apprehend this was not meant, as the average produce or wages for every day or month throughout the year,as must appear from a further examination of the subject. Where facts are dubious, we must endeavour to obtain truth from internal evidence. Each well is worked by four men, and their wages is regulated by the average produce of six days labour, of which they have one-sixth, or its value, at the rate of one and a quarter ticals per hundred viss, the price of the oil at the wells. The proprietor has an option of paying their sixth in oil; but I understand he pays the value in money, and if so, I think this is as fair a way of regulating the wages of labour as is any where practised; for, in proportion as the labourer works he benefits, and gains only as he benefits his employer. He can only do injury by overworking himself, which is not likely to happen to an Indian. No provisions are allowed to the oil drawers, but the proprietors supply the ropes, & c., and Iastly the king's duty is a tenth of the produce. Now supposing a well to yield 500 viss per diem throughout the year, deducting one-sixth for the labourers, and one-tenth for the king, there will remain for the proprietor, rejecting fractions, 136,876 viss, which at 1.25 tical, the value at

the wells is equal to 1,710 ticals per annum. From this sum there is to be deducted only a trifle for drawing, ropes, & c., for I could not learn that there was any further duties or expense to be charged on the produce; but the merchants say they gain only a neat 1,000 ticals per annum for each well; and, as we advance we shall have reason to think they have given the maximum rather than the minimum of their profits; hence we may infer, that the gross amount of produce per annum is not 182,500 viss. Further, the four labourers share, or one-sixth, deducting the king's tithe, will be 2,250 viss per month of thirty days, or in money at the above price, twenty-eight ticals, fifty avas, or seven ticals, twelve avas each man per month; but the wages of a common labourer in this part of the country, as the same persons informed me, is only five ticals per month when hired from day to day: they also admitted that the labour of the oil-drawers was not harder than that of common labourers, and the employment no way obnoxious to health. On being more indirectly questioned, (for on this part of the subject perhaps owing to the minuteness of my inquiries, they were most reserved,) they allowed that their gain was not much greater than the common labourers of the country, nor is it reasonable it should; for, as there is no mystery in drawing of oil; no particular hardships endured, or risk of health; no compulsion or prevention pretended; and, as it is the interest of the proprietors to get their work done at the cheapest rate, of course the numbers that would flockk to so regular and profitable an employment would soon lower the rate of hire, nearly at least to the common wages of the country. Besides, I observed no appearance of affluence amongst the labourers; they were meanly lodged and clad, and fed coarsely; not on rice which in the upper province is an article of luxury, but on dry grains, and indigenous roots of the nature of cassada, collected in their wastes by their women and children. Further, it is not reasonable to suppose that these labourers worked constantly: Nature always requires a respite, and will be obeyed, however much the desire of gain may stimulat; and, this cause must more particularly operate in warm climates, to produce what we often improperly call indolence. Even the rigid Cato emphatically says, that "the man who has not time to be idle is a slave." A due consideration of this physical and moral necessity ought, perhaps, to vindicate religious legislators from the reproaches too liberally bestowed on them, for sanctioning relaxation. Be that as it may, I think it is sufficiently apparent that the article of wages is also exaggerated, and that 500 viss must only be considered as the amount produce of working days, and not an average for every day in the year. The labour of the miners, as I have observed above, is altogether distinct from the oildrawers, and their pay proportioned to their hard ships, and the risks they endure. Assuming therefore as data, the acknowledged profit of 1,000 ticals per annuam for each well, which we can hardly suppose exaggerated, as it would expose the proprietors to an additional tax, and the common wages of precarious employment in the country, that is one month with another, including holidays, the year round, four and a quarter ticals per month as the pay of the oil-drawers, which includes the two extremes of the question, it will make the average produce of each well per diem, 300 viss, or 109,500 viss per annum, equal to 395,675 lbs. avoirdupois, or 173 tons 955 lbs.; or in liquid measure 793 hogsheads of sixty-three gallons each; and, as there are 520 wells registered by government, the gross amount produce of the whole per annum, will be 56,940 viss, or 92,781 tons, 1,560 lbs., or 412,360 hogsheads; worth at the wells, at one and a quater ticals per hundred viss, 7II,750 ticals, or 889,687.5 sicca rupees.

From the wells the oil is carried in small jars, by coolies or on carts, to the river; where it is delivered to the merchant exporter, at two ticals per hundred viss; the value being enhanced three-eighths by the expense and risk of portage; therefore the gross value or profit to the country of the whole, deducting five per cent for wastage, may be stated at 1,081,860 ticals, or

1,362,325 sicca rupees per annum, yielding a direct revenue to the king of 136,232 sicca rupees per annum, and perhaps thrice as much more before it reaches the consumer; besides the benefit the whole country must derive from the productive industry called into action, by the constant employment of so large a capital on so gruff an article. There were between seventy and eighty boats, average burthen sixty tons each, loading oil at the several wharfs, and others constantly coming and going while I was there. A number of boats and men also find constant employment in providing the pots, & c., for the oil; and the extent of this single branch of internal commerce, (for almost the whole is consumed in the coutnry,) will serve to give some insight into the internal commerce and resources of the country. At the wells the price of the oil is seven anas seven pice, per 112Ibs. avoirdupois; at the port of Ranghong it is sold at the rate of three sicca rupees, three anas, and six pice, per 112 lbs., or per hogsheead of sixty-three gallons, (weighing 504 lbs.) fourteen rupees, seven anas, nine pice, exclusive of the cask; or per Bangal bazar maund, two rupees, five anas, eight pice; whereas the mustard-seed and other vegetable oils sell, at Ranghong, at eleven rupees per bazar maund.

To conclude, this oil is a genuine petroleum, possessing all the properties of coal-tar, being in fact the self-same thing; the only difference is, that nature elaborates in the bowels of the earth, that for the Burmhans, for which European nations are obliged to the ingenuity of Lord Dundonald.

*January 14*, *1797*. Passed the modern city of Gneayan, its N.W. face towards the river extends about one mile and a half. At this station the former deputation was met by two woondocks from Ava, attended by a gilt and several other war-boats, and conducted to a house prepared on shore, and entertained with music, dancing, and sweetmeats, according to the fashion of the country. As my appointment took place at his majesty's request, I of course expected the same attention, but in this I was completely disappointed; and, from the neglect with which I have been treated during the whole of my journey, have just reason to apprehend that the enemies of Great Britain....

## 6. A NARRATIVEOF ANCIENT TANKS IN MADRAS PRESIDENCY

by R. Baird Smith, F.G.S., Lieut. Col., Bengal Engineers., Director, Ganges canal Works & Supdt, Canals N W P, The Cauvery, Kistnah, and Godavery: Being a report on the works constructed on these rivers, London 1856, Chapter IV, pp.139- 148

The extent to which it has been carried throughout all the irrigated region of the Madras Presidency is truly extraordinary. An imperfect record of the number of tanks in 14 districts shows them to amount to no less than, 43,000 in repair, and 10,000 out of repair, or 53,000 in all. It would be a moderate estimate of the length of embankment for each to fix it at half a mile; and the number of masonry works, in sluices of irrigation, waste weirs, & e., would probably be not over-rated at an average of 6. These data, only assumed to give some definite idea of the extent of the system, would give close upon 30,000 miles of embankments (sufficient " to put a girdle round the globe" not less than 6 feet thick) and 3,00,000 separate masonry works. The whole of this gigantic machinery of irrigation is of purely native origin, as it is a fact that not one new tank has ever been made by us, and the concurrent testimony of those best informed on the subject shows that a great many fine works of the kind have been allowed to fall into utter disrepair and uselessness.The revenue dependent on existing works is roughly estimated at 150 lakhs or 1.5 million sterling per annum, and the capital sunk in them is materially under-rated at ten times this amount, or 15 milions.

The methods of forming these works are as varied as the accidents of the ground they occupy. Valleys are taken possession of, and the natural drainage lines flowing through them are checked by embankments sufficiently long to close the gorges, and sufficiently high to retain a volume of water proportioned to the areas of irrigation situated below them. Descending steppes of land are occupied by a succession of reserviors, the higher feeding the lower from its surplus supply, and the whole forming one connected scheme of irrigation. Dry basin-shaped hollows have banks carried round their ridges, and supplies introduced from adjoining rivers by means of special channels; or long slopes, where the fall is considerable, have portions embanked more or less regularly on three sides, and the included space forms a storage area for such volume of water as local wants may call for, derived either from natural or artificial sources. Examples of these, and other methods which need not be dwelf upon, are to be found scattered throughout the irrigated region, and no mean skill has frequently been shown in the selection of the sites, and the adaptation of the different subsididary works of distribution and protection to their respective purposes. I have already mentioned how great the scale is on which some of the most ancient of these reservoirs have been constructed; citing as illustrations the Ponairy in Trichinopoly, with its embankment of 30 miles in length and probable area of 60 or 80 square miles now lost to the community, and the Veeranum tank, with its 12 miles of embankments and 35 miles in area, happily still in full operation, and securing at this time, after an existence of almost fabulous duration, an annual revenue of 114,500 rupees, or 11,450 pound, to the Government.

Instead, however, of limiting myself to generalities like the preceding, I will, from the plans before me, give some details of those two examples which have been specially selected to

illustrate the system, and from these a fair idea of the practical working of the whole may be formed.

The tank which bears the rather formidable name of Chumbrumbaukum is one of the finest in the Madras Presidency.It is picturesquely situated in the vicinity of bold hilly ground, and looks like a natural lake in a position where such a sheet of water might very readily be looked for. Beyond furnishing the water and the site, however, nature has had very little to do with its creation. It is purely artificial, and its supply is retained by an embankment 3 miles 5 furlongs 20 yards in length, ranging from 9 to no less than 28 feet in thickness, and from 16 to 26 feet in height. Its area is 9.5 square miles, and its volume may be extimated at 3,000 millions of cubic feet of water. It maintains a sheet of rice cultivation, nearly 10,000 acres in extent, yielding to Government an annual revenue of rather more than 50,000 Rupees, or 5,ooo pound, and the cost of improving its various works and keeping them in efficient repair has averaged,during the last 20 years, about 7 per cent. on the revenue derived from it. Its apparatus for distribution consists of 10 irrigation sluices, the details of which will be understood best by reference to the plans. Its safety during floods is insured by the action of 6 waste weirs or escapes (locally termed " Calingulas"), giving in the aggregate a breadth of escape channel of 676 feet, with a depth below the crest of the embankment ranging from 6 to 13 feet according to position. Through this area an emormous mass of water can escape, and as the supply is dependent almost exclusively on natural rainfall and merely local drainage, the protective provision has proved adequate, and breaches have been very rare. The last formidable accident of this kind occurred in 1818,when, on the 3rd of January, a breach 248 feet in length, and excavated 15 feet below the natural surface of the ground, was made, and through it the whole volume of the tank was poured upon the lower lands. The origin of the catastrophe was traced to the failure of one of the ancient irrigation sluttes, which was very injudiciously placed, and has been gradually undermined by the action of the water. This, however, was substantially repaired, and the other works of the same kind strengthened and improved, so that from that period up to the present time no similar mishap has been experienced, and the works are all now in excellent order.

The Cauverypauk tank differs essentially from that just described, in being independent of local rains, by its supply being derived from the pellar river, a stream carrying a large volume of water during the season of culture: it is even more purely artificial than the preceding, there being no hills or broken ground in the vicinity which could have been taken advantage of. Its antiquity is great, and it is only a few years ago, that in taking down one of the ancient masonry sluices, an inscription was found upon it, showing that it has been in operation 400 years, during which period the bed of the tank had clearly been raised 12 feet by gradual deposits of mud or sand; the tank itself is doubtless far older than even this.

The length of the Cauverypauk embankement is 3.75 miles, the area of the tank about 7 square miles and its greatest water-spread nearly 2 miles. The tank is revetted along its entire length with stone, sometimes in very massive but roughly- squared blocks, and without mortar, except at a few spots; the revetment wall is 6 feet thick at bottom, 3 feet at top, and 22 feet in height. The earthen embankment behind this wall rises 5 or 6 feet higher, and in 1849 its top was fixed uniformly about 9 feet above high water-mark. The breadth is nowhere less than 12 feet at top, with a front slope of 2.5 horizontal to 1 perpendicular, and a rear slope of 2.5 to 1.

The whole surface is carefully turfed or planted with a grass, the roots of which are an excellent means of strengthening the soil.

The supplying channel is about 7 miles in length, originally most tortuous, but now much imporoved in this respect : it is provided with adequate escapes to regulate the volume of water admitted into the reservoir, and besides filling this it supplies two smaller tanks close to it, having an area of about a square mile.

The extent of land irrigated from the Cauveryapuk tank is mearly 7,700 acres, yielding to Government an annual revenue of a little more than 58,000 rupees, or 5,800 pounds. The water is distributed from 9 masonry sluices, of which details will be found in the plans; and as the irrigated land lies 20 feet below the ordinary level of the water in the tank, the supply is of course delivered all over it with perfect ease. The safety of the tank is insured by the action of two waste weirs, of the combined length of nearly 580 feet, with a depth of from 4 to 6 feet for the passage of the surplus water. These have proved efficient in preserving the tank from actual breach; but it has occasionally been very nearly subjected to an accident of this kind.

One of the most formidable cause of injury to tanks having such water-spreads as those under description, is found in the action of the waves on the embankments during gales. Even with moderate winds the force thus generated is, as I have had opportunities of witnessing personally, an enemy of a very serious order. The action is counteracted by long slopes in front or on the water face of the bank, and protective coverings of rough stone, either with or without mortar, the latter being, I believe, the best method where materail is abudant.

In October 1836 the Cauverypauk tank was nearly destroyed during a tremendous gale, which rose so suddenly that no previous precaution could be taken to guard against its effects by opening the waste weirs. The waves washed over the embankment, cutting it away and forming deep ravines in rear of it, until at the deepest part of the tank a thickness of only about 3 feet of earth intervened between the country below and the mass of water above the bank. The probabilities against the safety or the work were excessive, and had the scale been turned against it by any one of several very likely contingencies, the results would have been fearful,for the bursting of the Cauverypauk tank would inevitably have entailed the bursting of every other reservoir of the kind between it and the coast, including that of Chumbrumbaukum, previously described, as they could not possibly have contained the additional volume that would have been thrown into them, filled to overflowing as they already were by the same rain-storm. The accumulated contents of all these basins would have been poured into the city of Madras through the adjoining river channels, themselves previously full from bank to bank; and the fatal conseqneces to life and property must have been most deplorable. The risk was sufficient to justify the most vigorous measures of repair and protection. The embankments of the Cauverypauk tank were carefully strengthened and raised throughout; the old waste weir was so remodelled as to make its action more effective and its management easier than were in its ancient form, and a new escape was added with a waterway of 275 feet. These measures have hitherto been successful in preventing any recurrence of the danger formerly experienced.

The tank system of Madras being, as I have already mentioned, essentially native in its origin and nearly all its details, does not present unobjectionable models for introduction elsewhere. The exmples I have given are, however, among the best types of the class; and the professional

details shown in the plans present ideas that might be usefully adopted by ourselves.We have many rivers of the same spasmodic character as those of the Carnatic, and other regions of tank irrigation-- the whole series of sub-Himalayan torrents and local drainage lines in the Northern Doab and Central India belong to the class; but as yet we have done little to utilize their waters, though what we have done has proved very encouraging. That a tank system is destined to grow up in connection with and subservient to our local canal system I have not a doubt, and I believe that we shall yet economize, if not the whole, cartainly a large portion of that volume now running waste every season through districts to which its retention would be the greatest of boons; we may not find it expedient to sdopt all the details of the Madras plans, but they cannot fail to be instructive, and some of them may occasionally be applicable in practice.

I cannot close my report without reverting for a moment to the field of improvement presented by the presidency of Madras in the single department of irrigation. In all parts of India profit to the State and the people follows, as certainly as effect follows cause, the provision of an abundant supply of water for agricultural purposes; but in Madras the results go far beyond the general average. The staple of agriculture in the irrigated districts being rice, the want of water brings with it abject poverty and discontent; its abundance, wealth and contentment. Every acre that is newly watered passes at once from the revenue rate of dry, to that of wet cultivation, guaranteeing to the Government an immediate return paid with far greater ease to the cultivator of the land than the lower tax leviable before. The return is immediate and its amount great. I have almost hesitated in adopting the data given by the Madras Commissioners of Public Works, so extravagantly large do they appear. But they are statements founded on official returns, open to verification, and unlikely to be seriously in error. When these show returns varying from a minimum of 77 to a maximum of 259 per cent. on the original cost of the works, it is unconceivable that fields paralleled only, if paralleled at all, by those of Australia and California can be left much longer unwrought. Whether the pictures given to us in public documents of the state of the people and the country, except in a few favoured localities, be correct or not, it is certain that the Government of Madras cannot increase its resources in any more certain, or more legitimate, or more profitable way than by extending over the length and breadth of the territories under its control, the means of turning to useful account the vast volumes of water which are annually poured into the sea through hundreds of now useless channels. I have spoken in this report only of those tracts which I have seen and judged of for myself. But other authorities equally trustworthy, and, from local knowledge, far more competent, bear testimony to the rich capabilities of other regions than those of the Cauvery, the Kistnah, and the Godavery, to which my own observations have been confined; and I only hope that the results in these, most successful as they have even already, may ensure the steady progress of that course of improvement of which they are the first and most encouraging evidences.

19th October, 1853.

## 7. AN EARLY BRITISH INTRODUCTION TO ANCIENT INDIAN CHRONOLOGY AND ARCHITECTURE

from Picturesque Illustrations of the Ancient Architecture in Hindostan by J.Furgusson, London 1847. Preface (2 pp) + Introduction (22 pp) + 23 plates with Narration

The Governments of this country never thought of India but with reference to the supply of troops wanted, and the amount of the revenue out of which they were to be paid, and the local governments have steadily discouraged their servants from wasting their time in unprofitable enquiries into the history or customs of the natives. It is sufficient for them that the Magistrate keeps his district quiet, that the collector allows no arrear of tax, and that the Judge does not trouble them with appeals; and should any officer, with more Zeal than wit, perpetrate a report on the subjects of local interest in his neighbourhood, it is quietly conveyed to the care of the white ants, who have long been constituted keepers of all the government records, except the revenue accounts.... and what information may have been collected by the zeal of individuals is allowed to perish unpublished in the archives of the different Presidencies.

2. We have hitherto, as a civilised and organised people, existing among nations disorganised by a long period of foreign domination, and degraded from their former civilisation by the loss of their independence, been able to subdue and keep them in control by the superiority of our knowledge and the perfection of our organisation, but long familiarity with us and our means is daily decreasing the distance between us, and, unless we can keep the advance we now possess, the time may not be far distant when we may be called upon to resign the sceptre of the East; for it requires no great knowledge of the subject to be able to assert that we must either continue to lead, or be prepared to loose the hold we have upon the minds of the people of India.

Much, however, of this indifference on the part of the public to Indian subjects may, it must be confessed, be traced to the fault of the writers who have hitherto written regarding them, many of whom have treated the whole as a tissue of puerile fables, quite unworthy of serious consideration; totally forgetting that, if the same test of sober reason were applied to the deities or heroes of heathen antiquity, the whole fabric would appear supremely ridiculous, instead of being, as it is now in this country universally acknowledged to be, the only thing worth impressing on the mind of every educated youth. On the other hand, it is also true that many, as if infected by the contagion, have indulged in speculation, scarce less wild and absurd than those of the modern Hindoos themselves. Between the two, the public has been content, in speaking or writing on the subject, with a few set phrases, ringing the changes on which has served to explain all difficulties. In the monuments, their acknowledged "primeval antiquity" has prevented any further elucidation; and when it is urged that they are very like those recently erected, the difficulty is explained by the equally well founded doctrine of "the immutability of the Hindoos"; while, perhaps, there is no country in the world to which these terms are less applicable (as far, at least, as monuments are concerned ) than Hindostan.

If the assertor of the latter doctrine would only study the accounts, left by the Greeks of that country, he would see how inapplicable their descriptions are to the habits and customs of the people in the present day; but, without putting it to so sever a test, I would ask him to accompany me to Ellora; and there standing by the European bungalow to remark that in the cliff under his feet there is a long series of caves, extending through a period of at least two centuries, all purely Buddhist; a little to his right another series, less pure, and shewing traces of the Hindu religion, which at last becomes distinct and reigns supreme in the far famed Kylas. From the period of its excavation, all trace of the Buddhist religion is lost, for a period of probably equal duration. This, again, gives place to the Jaina religion, a mixture of the former two, which seems to have supplied their place at the time the last caves were dug, in the 11th and 12th centuries. Again, if he turns and looks behind him, he will find the two large cities of Aurangabad and Dowlatabad - in all their buildings and forms as purely Mahometan as Bagdad or Damascus - and within a gun shot of the caves the modest tomb of Aurangzebe, the most bigotted and zealous of all the Mahometan Emperors of India! In front of him, again, are to be seen in the distance the temples of the Jangams and Vaishnavas, sects that have no representatives in the caves; while his race may probably, be the germ of the sixth form of faith, which in less then twelve centuries have succeeded each other on the spot. Did the cities of India retain these monuments as perfect as these rock-cut edifices, they would all, I believe, exhibit a like fickleness of faith on the part of the inhabitants. Indeed we have seen the religion of the Sikhs and many of the sects of Bengal spring up almost in our own day, and among ourselves spread over whole masses of the people.

The primeval antiquity of the monuments is even more easily disposed of, as the earliest of them are undoubtedly the rock-cut ones, and the earliest caves are the Buddhist ones; while the founder of that religion died only 543 B.C. and his faith did not become the religion of the people till three centuries after his death. But even this is too early, for I believe no cave can claim a higher antiquity than those of Dasaratha, near Gya, which date from about two hundred years before our era. Earlier than this, we have only the laths or inscribed pillars of Asoka, and his inscriptions on the rocks of Cuttack and Guzerat, and at Kapur di Giri, in Afghanistan. ( Anyone acquainted with the apathy with which the English regard all things Indian that do not concern their present interests, would be surprised that the discovery of a contemporary copy of a series of edicts of an Indian monarch of the third century B.C. should not have induced an enterprising publisher to risk 50 pounds in reprinting them in this country. No one in the trade, however, has thought it worth his while to throw away his money, and no amateur to waste his time, or what no one cares about.)

3....It is needless now, in speaking of Indian History, to return to the absurd system of Yugs, or astronomical eras, invented with the present Hindu system shortly before the Mahometan invasion; but there is one date, that of the Kaliyug, 3101 B.C., which forms no part of the astronomical system, but, on the contrary, appears to be a fixed historical date, representing whether correctly or not, the first irruption of the Sanscrit races into Hindostan. But, even if this is assumed, it is not certain whether it should be referred to Swayambhuva, or to Manichi, or Ikswaku. My own belief is, that it certainly belongs to one of the latter two, and they are so near to one another, that it is for my present purpose of little consequence which is taken. From this period we have, from many different sources, lists of 96 or 102 kings of the Solar race, who ruled as lord supreme of Northern India, from their capital Ayodhya (Oude), certainly supreme till the time when Ram (about 1800 BC) undertook the conquest of the South of India and

Ceylon. This was, however, apparently the great effort of his race; for from this time we find lunar races fast rising into importance, and their capitals of Canauge and Hastinapoora rivalling the glories of the olden metropolis of the solar line. And from the era of the Mahabharata, or great war of the Pandus, an event as nearly as possible contemporary with the war of Troy, the solar race dwindles into a line of petty rajas, and the imperial throne of India is occupied by the sovereigns of Magadha, of the Lunar race, ruling from their new capitals of Rajagriha and Palibothra (now perfectly ascertained to be Patna). Fortynine (including the nine Nandas) of these sovereigns occupied the throne till the accession of Chandragupta, the Sandracottus of the Greeks, who usurped the supreme power about the year 325 BC.

These dates are confirmed from so many sources that I am convinced that a little industry and sound criticism would render them at least as certain as any of a similarly remote age in Greek chronology. In the first place, they are confirmed by the Greeks themselves, as Arrian gives the same number of 153 kings as reigning from Bacchus (Ikswaku ?) to Sandracottus, and though he gives a date that allows the absurd duration of forty years to each king's reign, still it is some consolation to think that the chronology was in that age falsified *only* to that extent, if the date is not entirely a mistake of the historian, which I suspect it to be.

They are confirmed in the second place by the persian historians, especially Ferishtah (twice abstracted, but never yet translated into English) from whom I have principally taken these dates and also by the Mackenzie MSS as analysed by the Rev. Mr. Taylor (Madras Literary Journal, passim); and lastly by the Puranas and scriptures of the Hindus themselves; for, though the dates in these works are falsified to a ridiculous extent, the lists in all are so that, applying to them to correction of about eighteen years for the duration of each reign, which is the average given by the best modern lists, the dates come out almost exactly as I have stated them.

Were I, however, equal to the task of settling this much-vexed question, it is not here that I would attempt it, as not one of all this long line of monarchs has left a monument behind him.

*Temple of Juggannath*. So much has been written about the horror of this festival --- of the hundreds of dead and dying pilgrims that strew the road, and of their bones that whiten the plains- and of the victims that threw themselves under the wheels of the car, that I was most agreeably disappointed to find the pilgrims hurrying to the spot, talking and laughing like people to a fair in England, which in fact it is. There are fanatics measuring the road with their length, and others rolling along, and devotees doing absurd things of all sorts, but not more than one sees in every town in India; and as for victims, none had been heard for many years before the time. Many threw themselves down before the cars, it is true, but a kick or a slap from those who were standing started them long before the wheels came near, amidst the laughter and shouts of derision of the people. Nor were the bones more plentiful than the victims. I looked out everywhere for a pilgrim's skull to examine his bump of veneration, and keep it as a curiosity if I found at large, but neither skulls nor bones were to be found anywhere that I could see. Still the authorities are so respectable, that it is but charitable to believe that a different state of things did once exist, and, if the missionaries and talkers of the India House have their own way, probably will return.

....According to these strange reasoners. there is nothing wrong in our interfering in all the civil and political affairs of these idolators, and governing them as we best may. They find no fault

with our taxing their honest industry till we have destroyed their manufactures and ground the agriculturist to the dust....

*Temple of Kanaruc* (Black Pagoda) Plate III. Taken altogether, this building may, as far as my experience goes, be considered, as one of the very best specimens of Indian architecture as an exterior, though in Upper india there are interiors infinitely finer. There is altogether so much consonance in the parts and appropriateness in the details, that the effect of the whole is particularly charming. In speaking, however, thus in its praise, I must be understood to limit that to its effect as an artistic architectural composition; for the sculpture that covers the walls- not the roof - is generally bad in design and execution, and of an obscenity of expression which it is impossible to describe, and which it would be difficult for even a very depraved European imagination to conceive. It is, however, so completely subordinate to the architecture, that this defect is not perceived in contemplating the building at such a distance as enables one to grasp it as a whole.

...The temple itself had a narrow escape from being employed to build a light house at False point. It was, however, found that the river afforded an easier communication to the miners of the port and palace of Barabatti, which was therefore pulled down for this laudable purpose; and the road to Puri, the nearest European station, is so bad that it has hitherto escaped being employed to build a gaol or repair the station bridges. But as there can be little doubt that the active intelligence of the present rulers of India will soon find some useful purpose to which to apply so splendid a quarry, I can only regret that the burning sun and dashing rain of the month of June on the shores of the bay prevented me from doing more than I was able to accomplish for the illustration of so splendid a building.

## 8 . THE BRITISH IMPACT ON THE INDIAN COTTON TEXITLE INDUSTRY 1757-1865

by Jitendra Gopal Borpujari: Cambridge Ph.D. Thesis No. 1773 (1969-70): Extract from concluding part

It is the cardinal conclustion of this dissertation on the question of the British impact on the ICTI (Indian Cotton Textile Industry): 1757-1865 that purely political means were adopted by the British to reduce the profitability of the `old' methods relative to the profitability of the `new' methods and that the actual nature of this impact changed with changes in the nature of these political means. While limitations of data do not permit the derivation of any strong form of this impact, the following pattern has the support of the sources consulted.

From *circa* 1757 to *circa* 1813, the basic principles of British policy in India was to acquire a cut in the net output of the ICTI without participating directly in the production processes. The manifestation of this policy, in the experience of the ICTI, was the emergence of two markets for the same product in India. In one market the raw cotton-growers *had to* sell their raw cotton and the weavers *had to* sell their cloth at prices and in quantities determined arbitrarily by the British while, in the other market, the cotton-growers and the weavers sold the remaining portions of their outputs at free market prices. Such a simultaneous existence of two prices for the same product at a given place was made possible by the exercise of the coercive authority of the British Governement of India in favour of retaining such a system of economy. As the period 1757-1813 progressed, the share of the free market in the total marketted output of the ICTI declined and by the end of the period the British were virtually the sole Purchasers of the ICTI output. The cotton-growers' absence of incentives and shortage of investible savings, the peculiarities of the British demand for India raw cotton and the failure of the British merchants to invest in the expansion of Indian raw cotton output contributed to a stagnation of that output. The secular increase in the British demand for Indian raw cotton, in the face of a general stagnation of the supply, resulted in a shortage and increase in the price of the raw cotton residual output available for the ICTI spinner. The ICTI spinners, who were mostly women of all castes adopting spinning as a subsidiary source of income, never came under the control of the British in the sense in which the ICTI weavers did. The spinners faised their offer price of yarn at a given finess and often gave up spinning if the demand for their yarn was not effective at that price. By contrast, the weavers employed by the British had become, in effect, the chattels personel of their employers compelled physically to produce cloths prices and in `qualities' and quantities determined arbitrarily by the employers. In response, the weavers resorted to the clandestine sale of cloths legally belonging to the British and to attempts at reducing the quality of the ICTI cloth in terms of the raw cotton content per given area of cloth. This state of afairs continued until after the great reductions in the costs of spinning and weaving cotton in Britain which made a great part of the ICTI yarn and cloth output unprofitable relative to the BCTI (British cotton Textile Industry) yarn and cloth output at the given wage-rates. Unable to reduce any further the labour cost of the ICTI output and largely unconcerned with the idea of introducting the new methods into the ICTI, the British merchants began to relinquish their trade in ICTI cloth in the 19th century.

The basic principle of British policy in India after 1813 was to find a market in India for products manufactured in Britain. The manifestation of this policy, in the experience of the

ICTI, was on the one hand, the rapid cessation of the British trade in ICTI output, and the continuation, on the other hand, of many of the political means by which the British had reduced the profitability of the trade and manfactures conducted by Indians prior to 1813. The cessation of the British trade in ICTI output freed the ICTI weavers from their chattel status by default and with little or no political coercion upon them to remain as weavers, they generally gained the option of continuing as weavers only if they found weaving profitable relative to the alternative price of their labour. The repid expansion of the impact of BCTI cloth into India immediately after 1813, when the ICTI producers were still handicapped by such political devices as `the British India transit duty system' led to a repid decline of the ICTI in terms of output and employment during the twenty odd years following 1813. With political means decreasing the profitability of old method yarn and cloth, new method yarn and cloth sold cheaper than their old method competitors to a greater extent than they would have on purely economic grounds and, accordingly, the decline in the number of spinners and weavers and the quantitiy of their output was greater than what it would have been on purely economic grounds.

From *circa* 1830 onwards, new method yarn began to be imported into India regularly on a considerable scale. The weavers found the new yarn unambiguously and very considerably more profitable than the old yarn for all counts of yarn except for the very finest, namely, about 250 or above, and the coarsest, namely, about 20s or less. Besides, from 1836 onwards, there was a reduction in the political means such as the British India transit duty system which had earlier reduced the rofitability of the ICTI. By *circa* 1848, India became a market in which the new and the old methods could compete without any large-scale intervention by the British Government of India in favour of either side. Under these changed political circumstances the rapid decline of the ICTI, which had occurred in the twenty odd years following *circa* 1813, came to a halt. The weavers of cloths using yarn of lower fineness continued with either new yarn or old yarn or a mixture of new and old yarn. The old yarn continue to be spun in the very coarse range of fineness for special purposes as well as for weaving. While there was certainly a great decline in ICTI spinning ICTI weaving seems to have increased generally during the 25 years following the 1830s. Some of the characteristics of the British impact on the ICTI: 1757-1865 were brought into clear and exaggerated relief by the impact of the `Cotton Famine 1860-65' which occurred intitially in Britian as a result of the American Civil War.

Throughtout the three broad phases of `stagnation,' `rapid decline' and `revival' outlined above, the history of the ICTI revealed certain charactristics of the Indian economy. Throughout the history reviewed, the ICTI cotton-growers, spinners and weavers had their activities constrained by the shortage of investible savings and the fact that a certain proportion of the market for their products revealed a preference for exotic varieties of raw cotton compared to Indian Varieties of raw cotton and for new method yarn and cloth compared to old method yarn and cloth. The main advantage of the old ICTI over the new BCTI consited of the existence in India of `zero wage cost family labour' and a generally low level of labour cost per unit of output relative to the corresponding wage cost of the BCTI. Given such `stylised parts', one can argue the a programme exists for a policy of simultaneous investment in new and old methods with the objective of maximising the rate of growth of investible savings from a given intitial stock of investible savings.

[extract from numbered conclusions]

8th, given some of the characteristic features of the Indian economy revealed by this historical analysis, the old ICTI has an arguble claim to be a solvent to the vexed problems of `disguised' and `seasonal' unemployment in India in the context of a planned development of Indian economy.

## 9. A SKETCH OF THE TOPOGRAPHY AND STATISTICS OF DACCA, CALCUTTA, 1840.

BM 1298 L3. James Taylor (Surgeon) : A Sketch of the Topography and Statistics of Dacca, Calcutta, 1840.

(Printed by order of Government)
(Margin notes in the document not typed)

(p.164) Throughout succeeding times the Dacca muslins have maintained their high reputation, and even in the present day, notwithstanding the great perfection which the art of weaving has attained in Britain, these fabrics are unrivalled, and in point of transparency, beauty and delicacy of texture are allowed to excel the most finished productions of the loom in any country in the world. "Yarn continues to be spun, and muslins to be manufactured at Dacca." Dr. Ure writes in 1836 "to which European ingenuity can afford no parallel, such indeed as had led a competent judge to say it is beyond his conception, how this yarn greatly finer than the highest number made in England can be spun by the distaff and spindle, or woven afterwards by ANY machinery.[18]

All the fine muslins are made of the desee or indigenous cotton of the district. The cotton (p.165) imported from Mirzapore yields the thread for the baftas, hummums and other assortments of cloth of an inferior quality. The Arracan cotton ranks next to the Mirzapore: it is imported in small quantities, but is never used, as has been represented, in the manufacture of the fine muslins. Bhoga cotton, the produce of the Garrow and Tipperah hills, is employed exclusively for the manufacture of the coarsest description of cloths, which are worn by the poorer classes. The importation of these different kinds of cotton has greatly diminished, however since the influx of British yarn into the district, and probably does not amount to one-sixtieth of the quantity imported in 1787. The cotton is cleaned by the women who spin the thread. The instruments which are used to separate the seeds from the wool are the cherkee and dullun cathee. The former is the common hand mill, or pair of fluted cylinders, which is in use throughout the country, and which is employed here to clean cotton for the second rate qualities of thread. The dullun cathee is used to clean small quantities of the material for the finest thread. It is simply an iron pin that is rolled upon a flat board, upon which the cotton is laid; and which is made a little thicker at its middle than at the extremities, which project beyond the sides of the board, so as to admit of its being worked or rolled by the hands of feet. It is on the same principle as the Maharatta machine which (p.166) has been described by Dr. Lush of Bombay, and of which there is an engraving in the "papers on cotton, &c." lately published by the Court of Directors. The only difference between the two implements consists in a board being used here instead of the stone slab, which is employed in the Maharatta country. About Dacca, the dullun cathee is of a small size, and is worked with the hands, but in Mymensing the roller is moved by the feet, which are protected by wooden soles, similar to those used in the Maharatta country. The dullun cathee is said to crush the fibre, less than the mill. The next step is to teaze the cotton, or to free it from the remains of husks. This is done by means of a small bow made of bamboo, with a string of catgut or moonga silk. In the town there are a few persons, who make the bowing of cotton a distinct trade, but what they clean, is

[18] So named, from being, when wet, not discernible from either.

never used for the manufacture of thread, but is exclusively applied to the manufacture of quilts and articles of winter clothing for the Mussulmauns. The cotton that is used for the finest thread, undergoes a carding before it is teazed or bowed. The instrument, which is employed for this purpose, is the dried jaw bone of the Boali fish (Silurus Boalis). This part forms an arch about 2 inches in diameter, and presents on its inner surface a great number of very fine recurved teeth: it is used in the manner of a comb, and allows only the fine fibres of the cotton (p.167) to pass through it. After this process of carding, the cotton is reduced to a state of downy fleece by means of the bow; and is then carefully spread out upon the smooth surface of the dried skin of a Cheetul or Cuchia fish. This is next rolled up into a small cylindrical case, which is held in the hand during the process of spinning.

All the thread is spun by women, who generally employ their leisure hours in the business. The coarser kinds, consisting of the Bhoga and other inferior qualities of cotton below No.30 of English yarn, are manufactured by the churkhee or wheel; but all above that number, are spun with the tukwa or spindle. A tukwa for the finest quality of thread, is a fine polished steel spindle about ten inches in length, and of the size of a large needle; with a small ball of clay attached to it, about an inch from its lower extremity. It is held in an inclined position, with its point resting upon the hollow surface of a broken cowrie shell or a piece of turtle's egg imbedded in a small mass of clay, which serves as a stand for it: and is revolved between the finger and thumb, while the cotton, which is held in the left hand, is gradually raised from it, and the filaments, as they are drawn out, are formed into a thread. This is the mode of spinning that is practised here, by which, a person expert at the business can form a thread upwards of four miles in length from (p.168) one rupee or sicca's (180 grains) weight of cotton. The best spinners are Hindoo women from 18 to 30 years of age. After 30 they begin to fall off, and at 40 their sight is generally impaired, and they are incapable of spinning very fine thread. They usually work in the morning and afternoon, when the light is less dazzling to the eyes, and there is moisture in the air to prevent the thread from breaking. "The cause of the perfection of the muslin manufacture of India," as Dr. Ure observes, "must be sought for in the exquisitely fine organization of the natives of the east. Their temperament realizes every feature of that described under the title nervous by physiologists." The depressing passions, I may further remark, materially influence their handiwork, the most expert spinners being incapable, while suffering from grief or any domestic affliction, of manufacturing even the second rate qualities of thread. There is a specimen of Dacca thread in the Museum at the India House, which was presented to it many years ago by Sir Charles Wilkins; and which has been much admired for its fineness. It was weighed and measured by the late Sir Joseph Banks, and was found to be in the proportion of 115 miles, 2 furlongs and 60 yards to the pound avoirdupoise of cotton[19]. Thread however has been spun in England of the length of 167 miles (p.169) to the pound weight of staple, but this yarn, which ranks as No. 350 is of too great a tenuity to be manufactured or woven into muslins in Britain. The finest, that muslins are ever made of there, is No. 250, which is in the proportion only 119 1/3 miles to the pound weight of cotton, though it is seldom that a number above 220 is used. No. 250 has been imported into Dacca, and muslins have been made of it; but it falls far short of the finest quality of native thread. Thread is spun here, and can be woven into muslin, which is in the proportion of 7200 yards to 1 tolah or 180 grains weight of cotton, or upwards of 160 miles to a pound of the staple. I had lately in my possession a specimen of this kind which was spun in 1837. It was very carefully

[19] Baines' "History of Cotton Manufactures."

weighed and measured and was found to be 200 yards in length, and 5 grains in weight. The Dacca thread is generally allowed to be softer than English mule twist, and the cloths made of it, it is well known, are much more durable, although from imperfect bleaching, they do not always look so well as the English muslins. It is said to be irregularly twisted, and that it appears under the microscope like an ill-made hair rope bristling with loose strands. The filaments vary in their diameter from 1/1000 to 1/1500 of an inch, and are flat and ribbon-shaped. It is on this shape of the filaments in their separate state, that the transparency of the Dacca muslins depends, and it is said, that if (p.170) they were more closely twisted they would form an opaque yarn like the British thread. The more cylindrico-spiral, the longer and more elastic the filaments of cotton are, the better adapted they appear to be for manufacture by machinery, and less suited for spinning with the fingers. Accordingly the American cotton, which possesses these several qualities, is well adapted for the British looms, but cannot be manufactured into the finest thread here. A small quantity of Sea Island cotton, which was sent to the Commercial Resident in 1811 was subjected to a trial and the result was unfavourable, the spinners not being able to make good thread of it, and pronouncing it to be unfit for the manufactures of the Dacca aurungs. The spinning of thread afforded employment to all ranks and classes of the inhabitants of the district in former times. This branch of industry began to be affected in 1824, when British yarn was first imported into the district, and since 1828 it has been in a rapidly declining state. Most of the cloths, that are now manufactured here, are made of British twist ranging from No. 30 up to No. 200. Numbers 60, 70 and 80 are principally used. The following is a comparative statement of the different numbers of English twist usually imported into Dacca, and of the corresponding (p.171) qualities of country thread, with the prices of each kind.

| Nos. of English thread | Weight of Country thread corresponding to the English numbers | | | Price of ¼ of a Morah or 1 and ¼ of Hank of English thread | | | Price of ¼ of Morah or 1 and ¼ of a Hank of Country thread | | |
|---|---|---|---|---|---|---|---|---|---|
| | Siccas. | As. | Gds. | Rs. | As. | Gds. | Rs. | As. | Gds. |
| 200 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 13 | 0 |
| 190 | 1 | 0 | 18 | 0 | 2 | 15 | 0 | 10 | 0 |
| 180 | 1 | 1 | 15 | 0 | 2 | 15 | 0 | 6 | 0 |
| 170 | 1 | 2 | 16 | 0 | 2 | 10 | 0 | 5 | 0 |
| 160 | 1 | | 0 | 0 | 2 | 10 | 0 | 4 | 0 |
| 150 | 1 | 5 | 7 | 0 | 2 | 10 | 0 | 3 | 10 |
| 140 | 1 | 6 | 17 | 0 | 2 | 5 | 0 | 3 | 0 |
| 130 | 1 | 8 | 12 | 0 | 2 | 5 | 0 | 3 | 0 |
| 120 | 1 | 10 | 13 | 0 | 1 | 15 | 0 | 2 | 15 |
| 110 | 1 | 13 | 5 | 0 | 1 | 15 | 0 | 2 | 0 |
| 100 | 2 | 0 | 0 | 0 | 1 | 5 | 0 | 2 | 0 |
| 90 | 2 | 3 | 11 | 0 | 1 | 5 | 0 | 1 | 15 |
| 80 | 2 | 8 | 0 | 0 | 1 | 5 | 0 | 0 | 15 |
| 70 | 2 | 12 | 0 | 0 | 1 | 1 ¼ | 0 | 1 | 15 |
| 60 | 3 | 5 | 5 | 0 | 1 | 2 ½ | 0 | 2 | 0 |
| 50 | 4 | 0 | 0 | 0 | 1 | 5 | 0 | 2 | 0 |
| 40 | 5 | 0 | 0 | 0 | 1 | 7 ½ | 0 | 2 | 0 |
| 30 | 6 | 10 | 0 | 0 | 1 | 10 | 0 | 2 | 0 |

The English thread, independent of its cheapness, will always be preferred by the natives, on account of its uniform size, and the facility of obtaining any quantity of a particular quality that may be required. To procure country thread of a certain quality is a task attended with considerable labour and expense; it can only be done by visiting the different marts in the district, and it is estimated that two-thirds of the time occupied in preparing the fine muslins, are spent in searching for thread suited for the manufacture.

(p.172) There are about thirty-six different kinds of cloth manufactured in the district, and it is estimated that of the whole quantity made, 6-8ths are manufactured of English twist, ranging between numbers 30 and 200 : one and half of an eighth of country thread below No. 30 and one half of an eighth of fine country spun thread above No. 200 of English yarn. The muslins that are manufactured of thread, above the latter number, consist of plain fabrics which are generally made to order, and are called "muhnul khas." It is said that in the time of Jehangire a piece of Abrowa muslin could be manufactured, measuring 10 cubits in length, by 2 cubits in breadth, and weighing only 5 siccas or 900 grains, the price of which was 400 rupees. The finest that can be made in the present day, of the same dimensions as the above, weighs about 9 siccas or 1600 grains, and is sold at 100 rupees. Flowered, spotted, striped and chequered muslins are manufactured in considerable quantities. The finer descriptions of flowered or Jamdanee muslins are made of country thread, but a large proportion is also manufactured of No. 200 of English twist. They are sent to Oude, and the different native courts of Hindostan, but the whole quantity annually manufactured does not exceed one lac of rupees in value. This manufacture appears to have been introduced by the Mussulmans, and is still chiefly in their hands. During the Moghul Government, (p.173) the weavers of Jamdanee muslins paid a tax, and were prohibited from selling cloths above a stated value to foreign merchants. A large proportion of the cloths, manufactured of English thread, are plain fabrics, which are embroidered in the city, and exported annually to the Persian Gulf and the Red Sea. Cloths are also made of cotton and tussur silk, and of plain and coloured thread mixed, and constitute about one-eighth of the manufactures of the district. All these different kinds of cloth are distinguished by names denoting the fineness of their texture, their pattern, the origin of their manufacture, or the uses to which they are applied as "Abroan running water, and Shubnem, or night dew," as being when wet not discernible from either; "Doorea or double threads," "Charkonna or chequered," "Circar Ali or the Newaub's household," &c.

The mode of weaving is much the same as that practised in other parts of the country. The process is rude enough, though, it may be observed, it is not quite so simply conducted as European travellers have described it to be. The weaver, instead of erecting his loom under the shade of the nearest tree, as he is generally represented to do, always plies his business under the roof of his own dwelling, or under a shed raised for the purpose. To admit sufficient light, the hut is open on all sides: a pit is dug in the floor, to afford room for the lower part of the gear, and (p.174) for the weaver's legs as he sits at work, and above the loom he erects a sort of canopy, consisting of a mat or two supported on four bamboos to protect the web, from dust and rain dropping from the roof. The total number of implements used in converting the raw material into thread, and weaving the latter into the finest muslin is said to amount to 126. They are all made of small pieces of bamboo or reed tied together with twine or thread, and are of a style of workmanship so rude and simple that almost every weaver can make them himself, although to save time and trouble they are usually sold ready made in the bazars. The thread is

dressed with starch made of parched rice, and after exposure to the sun for some time wound off upon two small wheels, which are held by the weaver, one in each hand, as he forms the warp. This latter operation is done between four bamboo stakes driven into the ground. An instrument like a comb is used to separate the threads of the warp, every alternate thread of which passes through a corresponding loop or ring of a thread chain which is connected with the gear above and the treadles below. There are two of these chains of thread loops which are attached, one to each treadle, and by means of which the threads of the warp are alternately raised and depressed, to allow the shuttle to pass between them. This latter implement it may be mentioned, is not so sharp pointed as the English shuttle, and instead of having a fixed (p.175) robbin inside, the thread of the woof is wound upon a small piece of reed which revolves upon an iron pin or wire. The most favourable time for weaving the fine muslins, is during the rains, at which season the moisture in the atmosphere prevents the thread from breaking. In dry hot weather, it is requisite, while weaving the finest fabrics, to have beneath the web shallow vessels of water, the evaporation from which keeps the warp moist, and it appears to have been from this circumstance, that the idea of the Dacca muslins being fabricated in water, originated[20]. Most of the weavers are Hindoos. They weave the plain muslins in Dacca, Dumroy, Teethbadhee, Junglebaree and Sunurgong. At the latter place the Mussulmans who form the principal body of weavers there, are engaged in making the jamdanee muslins, Coarser cloths are made by the lower castes of Hindoos and Mussulmans called Joogees and Joolahs.

There is never more than two or three yards of the web uncovered, during the process of weaving. The starch used for the Shenen muslins is mixed with a small quantity of lamp black, and hence the name Sibnem signifying "half dark" or twilight according to the weaver's interpretation.

[20] On viewing the Indian yarn, it is easy to see how from the want of cohesion it should require to be woven on some occasions under water in order to give it support as the anatomist developes filmy textures which float in the same medium. Ure on the "Cotton Manufacture of Hindostan".

## 10. DACCA MUSLINS

WATSON, J.F.(BL 1803.C 33). The Textile Manufactures and the Costumes of the people of India, London 1867.

(p.59)

As under this head we shall have occasion to notice the famed and still valued productions of the Dacca loom, we shall here take the opportunity of making some general remarks regarding their *fineness*. It has long been a subject of interest and doubt whether the finest Dacca muslins have ever been equalled or surpassed by the machine-made muslins of Europe.

As answer has been given to the question by the British manufacturer, who alleges that the hand-spinner of Dacca has produced nothing so fine as some of the examples produced by his machinery. It was asserted, and it has been generally accepted as true, that in the Exhibitions of 1851 and 1862 there were muslins of European make which were finer than anything shown there from India.

Whatever be the state of the case, however, as regards the contest between Dacca and European muslins, *quoad actual* fineness, this at least seems clear - and it is admitted, we believe, by all that as regards *apparent* fineness India bears the palm. It is said that this is explained by a greater compression of the thread, depending on the peculiar mode of spinning, and by a consequent lessening of its diameter.

We do not think that this fact should be lost sight of. *Apparent* fineness, of course, it not *actual* fineness; but *actual* fineness loses much of its value by seeming coarse. Whether the muslins which disputed with Dacca for the prize were or were not really the finer, it was admitted by our best judges in such matters that they *seemed* not to be so. In dealing with a vexed question of this kind the first thing to be done is to examine the way in which the relative fineness of the different muslins is practically determined and stated. We cannot show this better than by quoting from a letter which we received from Mr. H. Houldsworth, in February 1864:- "It may be useful to repeat here the formula for ascertaining the fineness of yarn when woven. In English it is designated *by the number of hanks in one pound weight of 7,000 grs*. A hank is 840 yards, or 30,240 inches. The first step is to count the number of threads of warp and weft in one square inch. This is usually done by the weaver's magnifying glass, which, through an opening of ½ inch, brings the threads in that space distinctly into view. Thus the specimen A B (muslin from Arnee, Madras) counts 40 threads each way in ½ inch, or 80 threads in 1 inch of warp, and 80 of weft, showing that each square inch contains 160 inches of yarn.

$$\frac{\text{Thus the sq.ins. in the piece} \times 160}{30{,}240} = \text{the hanks in the piece;}$$

and,

as the wt, of the piece in grains:the hanks::7,000: No.of the yarn.

Then for A B (the length of which is 15 yds. 18 inches, the width 1 yd. 16 inches, and the weight 6891 grs.),

$$\frac{\text{sq. ins. piece.} \quad \text{Thds.p.inch.} \quad \text{inch.}}{30240 \times 6891 \text{ grs.}} = \frac{29016 \times 160 \times 7000}{30240 \times 6891 \text{ grs.}} = \text{No.156s."}$$

Nothing can be more clear or simple than the process here described, but it is, at the same time, very evidently one into which error may easily creep. For instance, if we take two specimens of the same muslin - having a piece, for example - and if we starch and dress the one half, and leave the other unstarched, by following the manufacturer's method of determining fineness, we shall arrive at the startling conclusion that it is two thing at (p.60) once - that the yarn of which it is *all* made is of *two* distinct qualities. It will be seen that the whole process depends on the determination of the length of yarn in a given weight of cloth; but it is clear that this length will be the same before starching as after, while the weight, on the other hand, will be very different; and this will, of course, affect the estimate of the fineness, and it may do so to a very serious extent.

In the case of the Arnee muslin, which formed the subject of the above calculation, we found the loss in weight, after careful washing, to be 23 per cent, and it would in consequence have the No. of its yarn raised from 156 before washing to 203 after washing.

In ascertaining the comparative fineness, therefore, of different woven yarns, this process cannot be safely employed, unless the sizing or starching has been carefully removed from all the specimens examined and compared.

So also it will almost certainly lead to erroneous conclusions if in one muslin the fineness is estimated before, and in another after the yarn is woven. In the first case we find how many hanks or lengths of 840 yards there are in 7,000 grains of yarn, and in the other how many like lengths there are in 7,000 grains of the fabric. But this last will not, or may not, represent 7,000 grain of yarn, *but that weight of a mixture of yarn and size*.

Now it so happens that in assigning those numbers to European muslins which represent their fineness, they have been computed from the yarns before weaving, but the numbers for the Dacca muslins, on the other hand, have always been computed from the fabrics. These last are not nearly so heavily starched as fine European muslins generally are, but still a certain proportion of their weight does consist of size. And this fact has only to be stated to show that the two sets of estimates, when used for purposes of comparison, cannot tell the truth of the matter. If the numbers assigned to Dacca muslins be computed from the examination of the finished fabric, so ought also those for the European - and even then we must take the further and absolutely necessary precaution of having both sets of specimens carefully washed.

Feeling that this dispute as to superiority was really an unsettled thing, we resolved to try to throw some light on it by another mode of inquiry. It was thought this might be done *by a series of determinations of the diameter of the thread, the number of filaments in it, and the diameter of the filaments themselves*. Such measurements could only be ascertained by the aid of the

microscope in the hands of persons accustomed to its use, and such assistance was accordingly sought.

Four muslins were selected - two of Europeans and two of Dacca make. Of the European one was the best exhibited in 1851, [21] and the other the best exhibited in 1862.[22] Of those from Dacca, one was the best exhibited in 1862, and the other a still finer one from the India Museum.[23]

Each specimen was divided into several portions - and these were given to two skilled observers, who were not told that among the samples sent for examination there were any duplicates. This course was adopted in order to have a thorough test of accuracy in a large comparison of results. Ten sets of measurements for each portion of each specimen were made. In only one case was the discrepancy such as to lead us to conclude that the (p.61) observer had made a mistake, probably by an accidental change of sample at one stage of the measurements. The general results bear intrinsic evidence of substantial accuracy - a conclusion which we think a careful examination of the following table will bear out:-

| Description, &c. | | Diameter of Threads (Parts of an inch) | | | Number of Filaments in Thread | | | Diameter of Filaments in Thread in parts of an inch[24] | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mini-mum | Maxi-mum | Mean | Mini-mum | Maxi-mum | Mean | Mini-mum | Maxi-mum | Mean |
| French muslin, manufactured by M. Thibel Michon, of Lavare, from thread of 440's, spun by Thomas Houldsworth & co. Shown at the International Exhibition of 1862 | 1st sample | .0020 | .0040 | .003000* | 5 | 12 | 8.5* | .00036 | .00100 | .00068* |
| | 2nd ditto | .0015 | .003 | .002200 | 8 | 21 | 12.7 | .00050 | .00075 | .000618 |
| | 3rd ditto | .00125 | .003 | .002025 | 7 | 18 | 11.7 | .00050 | .00087 | .000637 |
| | 4th ditto | .0015 | .003 | .002350 | 10 | 20 | 15.5 | .00037 | .00087 | .000625 |
| | 5th ditto | .0015 | .003 | .002225 | 9 | 26 | 15.8 | .00050 | .00087 | .000687 |
| | **Mean** | - | - | **.002220** | - | - | **13.8** | - | - | **.0006427** |
| English Muslin, stated to be of 540's yarn. Exhibited in International Exhibition of 1851. | 1st sample | .0018 | .0032 | .0025* | 7 | 14 | 10.5* | .00030 | .00084 | .00057* |
| | 2nd ditto | .00175 | .003 | .00215 | 9 | 23 | 16.7 | .00050 | .00075 | .000575 |
| | 3rd ditto | .00125 | .00325 | .00215 | 7 | 22 | 13.6 | .00037 | .00075 | .000500 |
| | **Mean** | - | - | **.002167** | - | - | **14.9** | - | - | **.000539** |
| Dacca muslin, *Mulmul Khas* from India Museum. Length, 4 yards[25]. Width 1 yard. Warp threads per square inch, 100. Weft threads in square inch, 92. Weight of piece, 566.8 grs. Computed No. of yearn in piece, 406's. | 1st sample | .0014 | .0032 | .0023* | 5 | 12 | 8.5* | .00030 | .00102 | .00066* |
| | 2nd ditto | .001 | .0025 | .001625 | 5 | 14 | 9.2 | .00062 | .00125 | .00080 |
| | 3rd ditto | .00075 | .002 | .00135 | 4 | 18 | 8.9 | .00062 | .00112 | .00082 |
| | **Mean** | - | - | **.001526** | - | - | **9.0** | - | - | **.000803** |

[21] Numbered in the Catalogue of the Exhibition as 540 s. Of the accuracy of this No. however, there is good reason for doubt.

[22] Numbered in Catalogue of the Exhibition, 440 s. Muslin, manufactured by M. Thivel Michon, of Tavare from yarn made by H. Houldsworth and Co of Manchester.

[23] As calculated from the piece these gave 380 and 406 as the Nos. of their yarn.

[24] To ascertain this, the size was in each case removed before the separation into filaments was attempted.

[25] This applies to the portion used for experiment; the original length of the piece was 10 yards.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Dacca muslin, *Mulmul Khas*. Exhibited in Indian section of the International Exhibition of 1862. Length, 10 yds.12 ins. Width, 1 yard. Warp threads in square inch, 104. Weft threads in square inch, 100. Weight of piece, 1565 grains. Computed No. of yarn in piece, 380's. | 1st sample | .0015 | .0035 | .0025* | 4 | 10 | 7* | .00038 | .00098 | .00068* |
| | 2nd ditto | .00125 | .00375 | .002175 | 5 | 15 | 9 | .00050 | .00075 | .000681 |
| | 3rd ditto | .00125 | .00225 | .001825 | 4 | 12 | 8.1 | .00062 | .00087 | .00095 |
| | 4th ditto | .001 | .0025 | .0017 | 5 | 16 | 8.9 | .00062 | .00100 | .000725 |
| | 5th ditto | .001 | .0025 | .001825 | 4 | 17 | 8.8 | .000375 | .00100 | .000725 |
| | Mean | - | - | .001896 | - | - | 8.6 | - | - | .000719 |

* *Those marked thus are the means of the highest and lowest of all the measurements made. The means without the asterisk are calculated from the sum of ten separate measurements. The general means are calculated by using the means marked by the asterisks as one observation, the others being multiplied by ten, and so giving the sum of all the observations from which they are drawn.*

These measurements, so far as they go, lead to the following conclusions:-

1. *That the diameter of the Dacca yarn is less than that of the finest European.* The two finest specimens of the last ever known to have been exhibited, gave .00222 and .002167 of an inch, while the two specimens from India gave .001526 and .001896 respectively. At first sight this does not appear a great difference, but it is in reality a very appreciable one, and so far as it goes it is distinctly in favour of the Indian fabrics.

2. *That the number of filaments in each thread is considerably smaller in the Dacca than in the European yarns.* The two later gave 13.8 and 14.9, and the two former 9.0 and 8.6. We were scarcely prepared to find this point of difference so decidedly marked, but no result of the investigation may be more safely accepted as correct.

3. *That the diameter of the ultimate filaments or fibres, or which the cotton of the Dacca yarn consists, is larger than that of the European.* The two last gave .0006427 inch and .000539 inch; and the two former .000803 inch and .000719 inch. Here again the difference is quite decided, and is only in accordance with the results of other investigations into the comparative size of the filaments of Indian and American cotton.

(p.62)

4. *That it appears from the investigation that the superior fineness of Dacca yarn depends chiefly on the fact that it contains a smaller number of filaments.* The mode of spinning - as we shall afterwards find makes it more compressed, but it is not probable that this greatly affects the result. Even after taking into account the greater thickness of the filaments of the cotton used in Dacca, it is clear, however, that their number, which is so much smaller, must give a finer thread. In other words the eight to nine (8.9 & 9.0) filaments of a diameter of .000803 and .000719 as in the best of the two Dacca muslins, must give a thread smaller in size or finer, than the 14 or 15 (13.8 and 14.9) filaments of a diameter of.0006427 and .000539 as in the best of the two muslins from Europe.

The measurements of the diameter of the thread were taken from specimens of muslin which were sized, that is in the condition in which they are offered for sale as finished goods. But as it was possible that the sizing might influence these, it was carefully removed from all of them and the measurement repeated.

The results of this part of the investigation are given in the following table:-

| Description | | Diameter of threads. (parts of an inch) | | |
|---|---|---|---|---|
| | | Minimum | Maximum | Mean* |
| French muslin (International Exhibition of 1862) | 1st sample | .001 | .00325 | .001875 |
| | 2nd ditto | .00125 | .00325 | .001925 |
| | **Mean** | - | - | **.0019** |
| English muslin (International Exhibition of 1851) | 1st sample | .001 | .00275 | .00180 |
| | 2nd ditto | .00125 | .0025 | .00180 |
| | **Mean** | - | - | **.0018** |
| Dacca muslin (India Museum) | 1st sample | .00075 | .002 | .00130 |
| | 2nd ditto | .001 | .0025 | .001375 |
| | **Mean** | - | - | **.0013375** |
| Dacca muslin (International Exhibition of 1862) | 1st sample | .001 | .00225 | .00155 |
| | 2nd ditto | .001 | .00225 | .001575 |
| | **Mean** | - | - | **.0015625** |

* *Calculated from ten separate measurements*

This table shows that it was proper to extend and complete the investigation, and that sizing does really affect the diameter of the thread; but it also shows that the Indian maker is still able to claim the palm -*his yarn being finer than anything yet known to have been produced in Europe.*[26]

[26] In the Internal Exhibition of 1862, a few yards of muslin, stated to be of No. 700s yarn, spun by Thomas Houldsworth & Co., of manchester, were shown. Regarding this specimen, Mr. Houldsworth himself remarked that it was too imperfect for any purpose, except to fix the limits of fineness at which cotton yarn can be woven at all. Regarding the specimens of muslin of 440s yarn, exhibited on the same occasion, and a portion from which formed one of the subjects of the investigation here detailed, Mr. Houldworth states that he considers these a great advance on any muslin exhibited in 1851, chiefly, he adds, "Owing to the introduction" since then of Neilman's combing machine for cotton, by which the quality of fine yarns has been vastly improved, "and made nearly as perfect as the fibre will admit. (Catalogue of the Indian Department of the International Exhibition of 1862, p. 206) Mr. Houldworth's further remarks, on this subject, have such an immediate bearing on what has preceded, that we repeat them here. Referring to the muslin (440s) before named, he continues, " A comparison, however, of this muslins with the Dacca piece, as tested by the eye and feel would lead "to the opinion that the Indian piece was the finer. This arises from the difference in the finishing or getting" (p.63) up of the two muslins - the French pieces being got up hard and wiry by means of starch, which coats the threads and makes them appear coarser than they are; while the Dacca muslin is soft, and appears perfectly free from all starch or other dressing. It may also be that the India threads, spun by hand, are more condensed in their substance by the compression of the fingers in the act of spinning than the machine-spun 440s of the Manchester "yarn."

The condition of the fibre with reference to the amount of twisting which it receives in the process of spinning, constitutes another element of advantages in favour of the Dacca muslins. The subjoined Table[27] shows the difference between the two in this respect :-

| Description | | Number of twists in thread per inch | | |
|---|---|---|---|---|
| | | Minimum | Maximum | Mean* |
| French muslin (International Exhibition, 1862) | 1st sample | 32 | 172 | 73.2 |
| | 2nd ditto | 46 | 166 | 64.4 |
| | **Mean** | - | - | **68.3** |
| English muslin (International Exhibition, 1851) | 1st sample | 26 | 114 | 55.6 |
| | 2nd ditto | 28 | 146 | 57.6 |
| | **Mean** | - | - | **56.6** |
| Dacca muslin (India Museum) | 1st sample | 64 | 260 | 121.8 |
| | 2nd ditto | 46 | 190 | 98.4 |
| | **Mean** | - | - | **110.1** |
| Dacca muslin (International Exhibition, 1862) | 1st sample | 48 | 196 | 82.8 |
| | 2nd ditto | 38 | 144 | 78.6 |
| | **Mean** | - | - | **80.7** |

* *Calculated from the sum of ten separate determinations*

In the case of the two first - the European - we find that the number of twists or turns which each inch of the yarn has received in the process of spinning amounts on the average to only 68.8 and 56.6 as compared with 110.1 and 80.7 in the Indian. This is a most important difference, and one which in all probability affords the key to the very superior *durability* of the *hand -made* over the *machine-made* fabric - it being well known that for *wear* these very fine machine-made muslins of Europe are practically useless, whereas the very finest of the hand-made ones from India are proverbially lasting, and bear frequent washing, which the finest English or European muslins do not.[28]

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[27] These calculations were made by Mr. W.T.Suffolk, to whose care and skill I am indebted for the results in the last Table, as well as for the majority of those in the one preceding it. The determination of the number of twists per inch was effected without taking the fabric to pieces, on order to avoid the chance of untwisting. The muslin was placed in a compressorium, gently drawn straight, and then fixed. the twists were counted in a length of half-an-inch, determined by means of a carefully cut aperture, the figures being, of course, doubled to give the twists per inch. Power used a 2/3 yds. binocular = x 60 diameters.

[28] It might be thought that the greater length of the fibre of the Sea-island cotton, of which these European muslins are made, would neutralize the advantage arising from the superior twisting of the shorter Indian staple; the difference in favour of the Indian spinning is, however, too great for this to hold good. The shorter staple of the Indian cotton may, however, to some extent, account for machine-made fabrics of it being less durable than those composed of the longer staple cottons, - although the difference in the length between Indian cotton and that of the "Middling Orleans," which before the American civil war constituted the bulk of the cotton used in this country, only amounts of the average to 1/10 th of an inch. Another fact must be kept in mind - the filaments of the Indian cotton being thicker than that of the American (Sea Island) are perhaps individually stronger; and, therefore, although called upon to attribute the greater durability of the Dacca muslins to their better spinning it is possible that the thickness of the ultimate fibre may have something to do with the matter.

However viewed, therefore, our manufacturers have something still to do. With all our machinery and wondrous appliances, we have hitherto been unable to produce a fabric which for fineness or utility can equal the "woven air" of Dacca - the product of arrangements which appear rude and primitive, but which in reality are admirably adapted for their purpose.

These arrangements appear to us of such interest that we shall introduce here a short account of the processes of the Dacca manufactures, and for this purpose shall fully avail ourselves of the information contained in an admirable work on the Cotton Manufactures of Dacca,[29] which we are able to say was written by James Taylor, Esq. This gentleman sent to the Exhibition of 1851 a series of specimens of the Dacca fabrics, with valuable drawings, and other objects, illustrative of the process of manufacture. Soon after the Exhibition, Mr. Taylor wrote the book referred to as the one from which the following extracts are taken. Those who desire a knowledge of the subject more full and minute than the quotations afford, should consult the work itself. In order to make the description as clear as possible, we have had prepared from the drawings in the India Museum, a lithographic representation - opposite - of the chief process on a larger scale than those which Mr. Taylor used in illustration of his excellent work.

The passages which we have selected and which we here reproduce, are those which describe the process of *spinning*, *weaving*, *bleaching*, *and dressing*.

## SPINNING.

"The cotton in the state of *kapas* (i.e. seeds and wool unseparated) is cleaned and prepared by the women who spin the yarn. Fragments of the leaves, stalks, and capsules of the plant are carefully picked out with the fingers, and the wool adhering to the seeds is then carded with the jaw-bone of the *boalee* fish (*Siluris boalis*), the teeth of which, being small, recurved, and closely set, act as a fine comb in removing the loose and coarser fibres of the cotton, and all extraneous matter, such as minute particles of earthy and vegetable matter, from it. The Hindoo spinner, with that unwearied patience that characterizes her race, sits down to the laborious task of cleaning with this instrument each separate seed of cotton. Having accomplished this, she proceeds to detach the fibres from the seeds. This is done by placing a small quantity of the combed cotton upon a smooth flat board, made of the wood of the Chalta tree (*Dillenia speciosa*) and then rolling an iron pin backwards and forwards upon it with the hands, in such a manner as to separate the fibres without crushing the seeds. The cotton is next teased with a small handbow, formed of a piece of bamboo with two elastic slips of the same material inserted into it, and strung with a cord made of catgut, muga silk, or of plantain or rattan fibres, twisted together. The bamboo slips are movable within he centre piece, and in proportion to the extent they are drawn out, or pushed back, the tension of the cord is increased or diminished. the cotton having been reduced by the operation of bowing to a state of light downy fleece, is spread out and lapped round a thick wooden roller; and, on the removal of the latter instrument, it is pressed between two flat boards. It is next rolled round a piece of lacquered reed of the size of a quill; and, lastly, is enveloped in the smooth and soft skin of the

[29] A Descriptive and Historical Account of the Cotton Manufactures of Dacca in Bengal, by a former Resident of Dacca. Publisher, John Mortimer, 1851.

*cuchia* fish, which serves as a cover to preserve it from dust and from being soiled, whilst it is held in the hand, during the process of spinning."

"The finest thread is spun by women generally under thirty years of age. The spinning apparatus, which is usually contained in a small flat work-basket, not unlike a *calathus* of the (p.65) ancients, comprises the cylindrical roll of cotton(*puni*), a delicate iron spindle,[30] a piece of shell embedded in clay, and a little hollow stone containing chalk powder, to which the spinner occasionally applies her fingers. The spindle (*tukua*) is not much thicker than a stout needle. It is from ten to fourteen inches in length; and attached to it, near its lower point, is a small ball of unbaked clay, to give it sufficient weight in turning. The spinner (fig. 1, pl.A) holds it in an inclined position, with its point resting in the hollow of the piece of shell, and turns it between the thumb and the forefinger of one hand, while she, at the same time, draws out the single filament from the roll of cotton held in the other hand, and twists them into yarn upon the spindle. When a certain quantity of the yarn has been spun and collected on this instrument it is wound from it upon a reed. Dryness of the air prevents the filaments of cotton from being sufficiently attenuated or elongated, and is, therefore, unfavourable to the spinning of fine yarn. A certain degree of moisture, combined with a temperature of about 82 degrees, is the condition of the atmosphere best suited to the carrying on of this operation. The Dacca spinners generally work from soon after early dawn to nine or 10 o'clock, A.M., and from three or four in the afternoon till half an hour before sunset. The finest yarn is spun early in the morning before the rising sun dissipates the dew on the grass; or, when this is wanting and the air is unusually dry, it is not unfrequently made over a shallow vessel of water, the evaporation from which imparts the necessary degree of moisture to the filaments of cotton, and enables the spinner to from them into thread.

"The native weavers commonly judge of the fineness of yarn by sight alone. They have no rule or standard for the length of the reels, or instrument by which they can form an estimate of any given weight of thread. The only mode, therefore, of ascertaining the quality of the fine yarn is to weigh the skeins and then measure them on sticks placed in the ground, as in warping an operation which requires delicate manipulation, and which few except the spinners or weavers themselves can do. Yarn is measured by the *hath* (cubit), the length of which is stated by the Commercial Resident to be 19 3/4 inches; and is weighed by the *ruttee*, which is equal to about two grains troy. The standard quality of the yarn used in the manufacture of the muslins formerly sent to the Court of Delhi is said to have been 150 *haths* in length to one *ruttee* in weight; but was commonly used varied from 140 to 160 *haths* in length to the above weight - the yarn of 140 *haths* being employed for the warp, and that of 160 for the weft, of these fabrics. The finest yarn used in the Dacca looms, in the year 1800, did not exceed 140 cubits in length to one *ruttee* in weight. Some, however, is mentioned as having been spun at Sunargong at this time, of the quality of 175 cubits to one *ruttee*. Yarn much finer than this is made at Dacca in the present day. A skein, which a native weaver measured in my presence in 1846, and which was afterwards carefully weighted, proved to be in the proportion of upwards of 250 miles to the pound of cotton. The short fibres of the Dacca cotton, of which the fine thread is made, are not well adapted to spinning by machinery; while, on the other hand, the long, cylindrico-spiral, and more elastic fibres of the American cotton which are best suited to this process, cannot be

[30] In some of the eastern districts of Bengal, and in Assam, the spindle is frequently made of a slender piece of bamboo instead of iron.

made into fine yarn with the primitive spindle of the Hindoo. In 1811, a quantity of Sea Island cotton was sent by the Commercial Resident to the different manufacturing stations connected with the Dacca factory for trial, but the spinners were unable to work it into thread, and it was pronounced to be an article unfit for the manufactures of the native looms. The Dacca yarn is said to be softer than mule twist; and I believe it is generally admitted that the fabrics made of it are more durable than muslins manufactured by machinery. The tendency of the fibres to expand from moisture is the criterion by which the native weavers judge of the quality of cotton; and it is mentioned by Mr. Bebb, the Commercial Resident in 1789, as the test which then determined the value of this article as raised in different parts of the district. The cotton which swells the least on bleaching is considered by the weavers as the best, or at least, as the material best suited to the manufacture of fine thread. A common remark among them is, that English yarn swells on bleaching, while Dacca spun thread shrinks and becomes stronger the more frequently it is subjected to that process."

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"A spinner devoting the whole morning to the spindle can make about a half-sicca or tola weight (ninety grain troy) of fine thread in a month. This is considerable the maximum quantity. But as spinning is now more a leisure occupation than a professed trade, it is calculated that the average quantity produced in that time, by each of the persons employed in the business, does not much exceed 45 grains weight. Fine thread is weight either by a small rude balance (*tula*), on the principle of the Roman steel-yard, or in jewellers' scale - the substances used as weights in the latter case being four barleycorns, or a seed of the *Abrus precatorius* (*làl kùnch*), either of which constitutes a *ruttee*. The price of the finest yarn used in the Dacca looms is eight rupees (16 s.) per tola weight (180 grains). This is at the rate of about 31 *l.* 2*s.* per pound (7,000 grains) avoirdupois."

The steps in the process of weaving "may be described according to the order in which they occur, under the following heads, viz:- winding and preparing the yarn; warping; applying the reed to the warp; beaming, or applying the warp to the end roll of the loom; preparing the heddles; and lastly, weaving.".

## WINDING AND PREPARING THE YARN

"The yarn when delivered to the weaver is wound on small pieces of reed, or made up in the form of small skeins. The first thing that is done is to steep it in this state in water. It is then reeled in the manner shown in figure 3, Pl. A. A piece of stick is passed through the hollow reed and fixed in the cleft end of a piece of bamboo. The weaver, holding the latter between his toes, draws off the yarn from the reed, which revolves upon the stick through it, and winds it upon the reel, which he holds in the other hand, and whirls round in a small cup of smooth coca-nut shell. When the yarn is in the form of a skein, it is put upon a small wheel made of fine splints of bamboo and thread. This is mounted on the end of a stick upon which it is made to revolve, and as the yarn is thus drawn off, it is wound upon the reel."

"The yarn is divided into two portions -viz., a sufficient quantity of the finest of it for the woof (*burna*), and the rest for the warp (*tana*)".

The warp thread is steeped for three days in water, which is twice changed daily. On the fourth day it is, after being rinsed, put upon a small wheel, made of splits of reed and thread, and is then reeled - the stick upon which the wheel is mounted being held between the toes, and the reel turned in the manner represented. Skeins of a convenient size having been wound off, are steeped in water, and tightly twisted between two sticks; they are then left upon the sticks and exposed to the sun to dry. They are next untwisted and put into water mixed with fine charcoal-powder, lampblack, or soot scraped from the surface of an earthen cooking vessel. They are kept in this mixture for two days, then rinsed in clear water, wrung out, and hung upon pieces of stick placed in the shade to dry. Each skein having been again reeled, is steeped in water for one night, and is next day opened up and spread over a flat board, upon which it is smoothed with the hand, and rubbed over with a paste or size made of *koie* (paddy or rice, from which the husk has been removed by heated sand), and a small quantity of fine lime mixed with water. Rice, it may be remarked, has formed the basis of the starched used in weaving in India, from remote antiquity. `Let a weaver,' says Menu, `Who has received ten palas of cotton thread, give them back increased to eleven by the *rice water*, and the like used in weaving, & c, (Menu's `Institutes,' No. 397.') "

"The skeins after being sized are wound upon large reels, and exposed to the sun - the turns of the thread being widely spread over the surface of the reels in order that they may dry quickly. All the thread is again reeled and sorted preparatory to warping. It is generally divided into three shades of quality -viz., the finest for the right-hand side, the next finest for the left-hand side, and the coarsest for the centre, of the warp. Such is the mode of preparing the yarn for the warp of plain muslins. The yarn for the warp of striped or chequered fabrics, is prepared by twisting a certain number of threads together namely, two for each stripe of the *dooreea*,(p.67) and four for that of the *charkanu* muslin, and then sizing and reeling it in the manner above mentioned."

"The yarn for the woof is not prepared till two days previous to the commencement of weaving. A quantity sufficient for one day's work is steeped in water for twenty-four hours. Next day it is rinsed and wound on large reels, and then lightly sized with paste of the same kind as that applied to the warp. From small reels it is wound upon larger ones, and left upon these to dry in the shade. This process of preparing the yarn for the woof is continued daily until the cloth is finished."

## WARPING

"This operation is usually performed in a field or any open spot convenient for the work near the weaver's house. For this purpose, four short bamboo posts are fixed in the ground, at measured distances (varying according to the intended length of the cloth), and several pairs of rods placed between them, the whole forming two parallel rows of rods about four feet apart. The weaver holding a small wheel of warp-yarn in each hand (Fig. 2, pl. A), passes the latter over one of the posts and then walks along the rows, laying down two threads, and crossing them (by crossing his hands between each pair of rods) until he arrives at the post at the

opposite extremity. He retraces his steps from this point, and thus continues to traverse backwards and forwards as many times as there are threads of the warp to be laid down. The small wheels or bobbins on which the warp yarn is wound are made of fine splits of bamboo and thread, and are each attached at a right angle to a short handle, at the end of which there is a *kangch*[31] ring, through which the yarn runs. Two pairs of hand-wheels, one with single, and another with twisted yarn, are used alternately for the warps of striped and chequered muslins."

## APPLYING THE REED TO THE WARP

"The reed is generally applied to the warp after the preceding operation; but sometimes it is not attached until the warp has been fastened to the end roll of the loom. It is made of fine splits of bamboo firmly fixed between ribs of split cane. The finest reed used in the Dacca looms contains only 2,800 dents in a space of 40 inches in length. In order to apply it to the warp, the latter is folded up in the form of a roll or bundle, and suspended from the roof of the weaver's hut, with one end of it unfolded, spread out, and hanging down to within a foot or two from the ground. The reed is then fastened with two slight cords to the bundle and lease rods, and hangs in front of the unfolded portion of the warp. Two workmen seat themselves (Fig. 4, Pl.A), one on each side of the warp. Having cut with a knife a portion of its end loops, the man in front passes an iron wire or sley hook through the first division of the reed to the other workman; and the ends of the two outermost threads being twisted upon it by him, it is drawn back, and the thread thus brought through. In this manner the wire is introduced through all the divisions of the reed in succession, and two threads are drawn through each of them at a time. The ends of the threads are gathered in bunches of five or six, and knotted; and through the loops formed by these knots a small bamboo rod is passed."



18. In conclusion, I have now to suggest that the authorities in the selected districts should, previously to the actual presentation of the work, undertake as follows:-

1st. To provide for the permanent protection of the work by placing it in the charge of a proper and responsible person, or persons, in a suitable building.

2nd. To afford the requisite facilities for consulting the work; subject, however, to the condition that under no circumstances shall any of the volumes be removed for purposes of exhibition or reference.

3rd. That access to the work be given to any person bearing an order to that effect signed by the President, Vice-President, or Secretary of the Society of Arts; the Presidents, Vice-President, or Secretary of the Society of Arts; the Presidents, Vice-Presidents, or Secretaries of the Chambers of Commerce; the Chairman or Secretary of the Association of Chamber of Commerce; the President, Vice-President, or Secretary of the Cotton Supply Association; the Chairman, Vice-

[31] A kind of coarse glass

Chairman, or Secretary of the Cotton Brokers Association ; the Chairman, Vice-Chairman, or Secretary of the Liverpool East India and China Association; by the Presidents, Vice-Presidents, Chairmen, Vice-Chairmen, or Secretaries of such other Associations for the promotion of Commerce as now exist, or may hereafter be formed; and by the Reporter on the Products of India.

(Signed ) J. FORBES WATSON,
Reporter on the Products of India
to the Secretary of State for
India in Council.

INDIA MUSEUM, July 1866.

NOTE :- The foregoing conditions having been agreed to by the Chambers of Commerce of Belfast, Bradford, Glasgow, Halifax, Liverpool, and Manchester; by the Industrial Museum of Scotland in Edinburgh; by the Industrial Museum of Ireland in Dublin; by the Huddersfield Mechanics' Institution; by the Towns of Macclesfield and Preston; and by the Borough of Salford for the Royal Peel Park Museum,- a Set of the Volumes in question has been presented to each of these places, making, in addition to the India Museum, attached to the Department of the Reporter on the Products of India, thirteen places in this country where the Work can be consulted by persons practically interested in the matter. With respect to the seven Sets for India: These, under the instructions of the Secretary of State for India in Council, have been forwarded for deposition in Calcutta, Madras, Bombay, and Kurrachee, and in such places in the North - Western Provinces, in the Punjab, and in Berar, as the respective Governments of the Divisions in question may decide upon. As soon as the exact localities have been determined by the authorities in India, intimation thereof will be made both in this country and in India.

## MUSLINS, PLAIN AND EMBROIDERED

| No. | DESCRIPTION | | | Length | | Width | | Weight | | Price | | | Whence procured, Place of Manufacture, &c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Name and Use | Material | Quality, &c. | yds. | ins. | yds. | ins. | lbs. | ozs. | □ | s. | d. | |
| 241 | "Abrawan" or "Running Water", for dresses | Muslin | Plain | 20 | 0 | 1 | 0 | 0 | 7 ½ | 6 | 4 | 0 | Dacca, Bengal |
| 242 | "Circar Ali", for dresses, &c. | Ditto | Ditto. Fine quality | 20 | 0 | 1 | 0 | 0 | 6 ¾ | - | - | - | Ditto |
| 243 | "Shabnam" or 'Evening Dew" for dresses | Ditto | Ditto. Fine material | 19 | 14 | 0 | 34 | 0 | 6 ½ | 3 | 4 | 0 | Ditto |
| 244 | "Tunzeb" for dresses | Ditto | Ditto. Fine quality | 21 | 5 | 1 | 0 | 0 | 12¼ | 5 | 0 | 0 | Ditto |
| 245 | "Nyansook", for neckerchiefs, &c. | Ditto | Ditto. Good quality | 19 | 18 | 1 | 7 | 1 | 2 ¼ | 4 | 0 | 0 | Ditto. |
| 246 | "Jungle Khassa", for dresses, &c. | Ditto. | Ditto. Ditto. | 21 | 6 | 1 | 5 | 1 | 9 ¼ | 5 | 2 | 0 | Ditto. |
| 247 | "Dooreea", for children's dresses, &c. | Ditto. | Striped | 13 | 14 | 0 | 28 | 0 | 10½ | - | - | - | Gwalior |
| 248 | "Dooreea", chiefly for children's dresses. | Ditto. | Ditto. | 10 | 6 | 1 | 0 | 0 | 12½ | - | - | - | Radnagore |
| 249 | "Dooreea", chiefly for children's dresses. | Ditto. | Ditto. Fine | 10 | 0 | 1 | 0 | 0 | 13¾ | 1 | 4 | 0 | Dacca, Bengal |
| 250 | "Charkanu", for dresses, &c. | Ditto. | Check. Good quality. | 9 | 26 | 0 | 35½ | 0 | 15 | 1 | 0 | 0 | Ditto. |
| 251 | Ditto. | Ditto. | Ditto. | 9 | 29 | 1 | 0 | 0 | 10½ | 1 | 0 | 0 | Ditto. |
| 252 | "Phoolkary", for dresses, &c. | Ditto. | Stripes and Flowers | 13 | 13 | 0 | 28 | 0 | 14¼ | - | - | - | Gwalior |
| 253 | "Jamdanee", for dresses, &c. | Ditto. | Figured in the loom. Very fine quality | 11 | 20 | 1 | 0 | 0 | 13¾ | 3 | 18 | 0 | Dacca, Bengal |
| 254 | "Jamdanee", for dresses, &c. | Ditto. | Ditto. | 10 | 0 | 0 | 31 | 0 | 11 | 3 | 18 | 0 | Ditto. |
| 255 | "Chikan work", for dresses | Ditto. | Embroidered in diagonal stripes of flowers | 10 | 0 | 0 | 34 | 1 | 0 ¾ | 4 | 0 | 0 | Ditto. |
| 256 | Ditto. | Ditto. | Embriodered flower pattern. Good quality. | 10 | 0 | 0 | 35 | 0 | 13¼ | 3 | 18 | 0 | Ditto. |
| 257 | Ditto. | Ditto. | Embriodered. Diagonal stripes and flowers. A fine example. | 10 | 0 | 1 | 0 | 1 | 5 | 4 | 0 | 0 | Ditto. |
| 258 | Ditto. | Ditto. | Embriodered. Of fine quality. | 10 | 0 | 1 | 0 | 0 | 9½ | 3 | 18 | 0 | Ditto. |
| 259 | Ditto. | Ditto. | Ditto. Ditto. | 9 | 14 | 0 | 33 | 0 | 11 1/5 | 3 | 18 | 0 | Ditto. |
| 260 | "Bootee", for dresses | Ditto. | Ditto, with crimson spots | 10 | 0 | 1 | 0 | 0 | 13¼ | 1 | 10 | 0 | Ditto. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 261 | - | Good cloth | Plain | 2 | 31 | 0 | 24 | 0 | 5 | 1 | 16 | 0 | Hyderabad, Deccan |
| 262 | - | Silver cloth | Ditto. | 2 | 32 | 0 | 23½ | 0 | 5 ¼ | - | - | - | Ditto. |
| 263 | - | Good cloth | With red silk stripes | 2 | 33 | 0 | 26½ | 0 | 5 ¾ | - | - | - | Ditto. |
| 264 | - | Silver cloth | Plain | 1 | 0 | 0 | 22½ | 0 | 1 ¾ | - | - | - | Ditto. |
| 265 | - | Good cloth | With green silk stripes | 2 | 0 | 0 | 25 | 0 | 4 | (About) 1 | 16 | 0 | Ditto. |
| 266 | - | Silver cloth | With crimson silk stripes | 2 | 33 | 0 | 24 | 0 | 5¼ | - | - | - | Ditto. |
| 267 | - | Ditto. | Plain | 1 | 4 | 0 | 33½ | 0 | 4 ¼ | - | - | - | Moorshedabad, Bengal |
| 268 | - | Good cloth | Figured. | 1 | 9 | 0 | 28 | 0 | 5 ¼ | - | - | - | Ditto. |
| 269 | - | Silver cloth | Ditto. | 1 | 8 | 0 | 31 | 0 | 5 ¼ | - | - | - | Ditto. |
| 270 | - | Good cloth | With gold and beetle wing embroidery. | 2 | 22 | 0 | 20 | 0 | 6 ¼ | - | - | - | Madras |
| 271 | - | Muslin | Printed with gold flowers | 9 | 27 | 1 | 25 | 1 | 0 | - | - | - | Jeypore, Rajpootana states. |
| 272 | For small scarfs | Ditto. | Printed with silver. Piece incomplete | 0 | 33 | 1 | 5 | 0 | 3 | 0 | 4 | 6 | Hyderabad, Deccan |
| 273 | - | Ditto. | Ditto. Ditto. | 0 | 33 | 1 | 7 | 0 | 3 | 0 | 4 | 6 | Ditto. |
| 274 | For making women's bodices | Ditto. | Worked in gold figures | 1 | 4 | 1 | 0 | 0 | 3 | - | - | - | Madras |
| 275 | "Kincob" | Silk gauze and gold | Diagonal stripes and flowers of gold on a mauve ground | 4 | 20 | 0 | 34 | 2 | 4 ½ | - | - | - | Benares |
| 276 | To make up into scarfs | Muslin | Embroidered. Diagonal stripes and flowers in gold and beetle wing. | 9 | 22 | 1 | 3 | 1 | 11½ | - | - | - | Madras |
| 277 | - | Ditto. | Embroidered in gold, &c. | 1 | 29 | 1 | 13 | 0 | 12 | - | - | - | Ditto. |
| 278 | For scarfs and head coverings | Ditto. | Embroidered in gold stars and flowers | 2 | 2 | 1 | 8 | 0 | 6 ½ | 5 | 0 | 0 | Ditto. |
| 279 | - | Ditto. | Embroidered in gold &c. Pine pattern. Very rich | 3 | 7 | 1 | 12 | 0 | 8 ¼ | 7 | 10 | 0 | Ditto. |
| 280 | - | Ditto. | Leaf pattern, embroidered in gold. | 3 | 3 | 1 | 8 | 0 | 9 ½ | - | - | - | Ditto. |

## MUSLINS, CALICOES, AND OTHER PIECE GOODS

| No. | DESCRIPTION | | | Length | | Width | | Weight | | Price | | | Whence procured, Place of Manufacture, &c |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Name and Use | Material | Quality, &c. | yds. | ins. | yds. | ins. | lbs. | ozs. | □ | s. | d. | |
| 281 | "Dooreea" | Striped muslin | Unbleached. Coarse. Four pieces (3 yards 22 inches each) woven in one length and connected by a fag. Plain ends. | 14 | 18 | 0 | 30½ | 2 | 2 | 0 | 3 | 6 | Nagpore, Berar |
| 282 | "Charkana" | Muslin | Check pattern. Uncleached. Coarse. Four pieces of 3 yards 22 inches each, woven in one length and connected by a fag. Plain ends. | 14 | 18 | 0 | 24½ | 2 | 0 ¾ | 0 | 3 | 6 | Ditto. |
| 283 | "Dooreea" | Ditto. | Striped. Narrow gold stripe in end | 14 | 0 | 0 | 30½ | 0 | 10¾ | 1 | 13 | 0 | Chundaree |
| 284 | "Chudder", a covering for the body | Ditto. | Plain, Fine quality. Narrow gold stripe in end. | 14 | 0 | 0 | 30½ | 0 | 10¼ | 1 | 13 | 0 | Ditto. |
| 285 | "Charkana" | Ditto. | Check pattern. Superior quality. Gold stripe in end. | 14 | 1 | 0 | 31½ | 0 | 10¼ | 0 | 13 | 0 | Ditto. |
| 286 | - | Ditto. | Plain | 15 | 30 | 1 | 2 | 1 | 2 ¾ | 0 | 4 | 3 | Shahabad, Patna |
| 287 | "Chunderkora" | Ditto. | Bordered. Coarse. | 4 | 18 | 1 | 4 ½ | 0 | 6 | 0 | 2 | 7½ | Calcutta |
| 288 | For covering the head and the neck | Ditto. | Bordered | 2 | 33 | 1 | 10 | 0 | 3 ½ | 0 | 2 | 0 | Ditto. |
| 289 | "Santipore dhootee" | Ditto. | Very light. Coloured figured borders with tussah silk worked therein. | 5 | 32 | 1 | 9 | 0 | 5 ¼ | 0 | 5 | 6 | Santipore, Bengal |
| 290 | Ditto. | Ditto. | Very light. Coloured borders and ends. | 4 | 18 | 0 | 32 | 0 | 5 ¼ | 0 | 5 | 6 | Ditto. |
| 291 | Ditto. | Ditto. | Very light. Uncommon pattern. One border orange and blue, the opposite border crimson and blue. | 5 | 20 | 1 | 10 | 0 | 6 ¼ | 0 | 5 | 6 | Ditto. |
| 292 | When ends and borders are added, used for shawls and scarfs. | Cotton and silk. | Embroidered with silk flowers. | 4 | 9 | 0 | 33½ | 0 | 10¾ | - | - | - | Dacca, Bengal |
| 293 | For scarfs and dress | Ditto. | "Moonga" silk. Embroidered. | 4 | 24 | 1 | 1 ½ | 0 | 12¾ | - | - | - | Ditto. |
| 294 | Ditto. | Ditto. | Ditto. And cotton. Striped pattern. | 4 | 16 | 1 | 0 | 0 | 8 | - | - | - | Ditto. |
| 295 | Ditto. | Ditto. | Ditto. And cotton with pattern embroidered in Moonga silk. | 4 | 17 | 0 | 33 | 0 | 13¼ | - | - | - | Ditto. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 296 | - | Ditto. | "Moonga" silk. Embroidered in coloured cotton. | 4 | 12½ | 0 | 33½ | 0 | 11¼ | - | - | - | Ditto. |
| 297 | "Gurrah" cloth | Cotton | Calico. 1st quality | 12 | 18 | 0 | 28 | 2 | 12 | 0 | 4 | 0 | Agra, N.W. Province |
| 298 | "Guzzy" cloth | Ditto. | Ditto. 2nd quality | 17 | 18 | 0 | 18 | 1 | 13 | 0 | 2 | 0 | Ditto. |
| 299 | "Gurrah" cloth | Ditto. | Ditto. 1st quality | 16 | 18 | 0 | 31 | 3 | 12 | 0 | 3 | 0 | Patna, Bengal |
| 300 | Ditto. | Ditto. | Ditto. | 12 | 0 | 0 | 34 | 3 | 0 | 0 | 4 | 0 | Agra, N.W. Province |
| 301 | "Dhootee" cloth | Ditto. | Coarse calico | 4 | 12 | 1 | 0 | 1 | 4 | - | - | - | Bhurtpore, Rajpootana states |
| 302 | - | Ditto. | Coarse brown calico. Piece incomplete. | 2 | 11½ | 0 | 28 | 0 | 8 ½ | - | - | - | Benares. |
| 303 | "Gurrah" cloth | Ditto. | Calico. Unbleached. Cut sample only. | 9 | 19 | 0 | 21 | 1 | 5 ¾ | - | - | - | Ditto. |
| 304 | - | Ditto. | Calico. Coarse. A sample only. | 2 | 14 | 1 | 0 | 0 | 12 | - | - | - | Ditto. |
| 305 | For "sarees" (women's garments) | Ditto. | Coarse gauze, light fabric. A sample only | 2 | 12 | 1 | 1 | 0 | 6 ¼ | - | - | - | Ditto. |
| 306 | "Gurrah" cloth | Ditto. | Coarse. A sample only | 2 | 12 | 0 | 27 | 0 | 3 ¾ | - | - | - | Ditto. |
| 307 | Sailcloth | Ditto. | Coloured stripes of orange, green and red, about one yard from principal end. Sample only. | 5 | 0 | 0 | 22½ | 4 | 12¼ | 0 | 2 | 6 | Cutch, Bombay |
| 308 | - | Cotton piece goods | Check, woven in colours. Sample only. | 7 | 25 | 0 | 29 | 1 | 0 ½ | - | - | - | Benares. |
| 309 | - | Ditto. | Design, Ditto. Ditto. | 8 | 0 | 1 | 1 | 1 | 10½ | - | - | - | Ditto. |
| 310 | - | Ditto. | Print. | 5 | 28½ | 1 | 1 | 1 | 4 ¾ | - | - | - | Futtygurh, N.W. Provinces |
| 311 | - | Ditto. | Ditto. | 5 | 30½ | 1 | 1 ½ | 1 | 4 ½ | - | - | - | Ditto. |
| 312 | - | Ditto. | Ditto. | 5 | 31½ | 1 | 11½ | 1 | 5 ½ | - | - | - | Ditto. |
| 313 | - | Ditto. | Woven in colours. Imitation of English. | 6 | 18 | 0 | 23 | 1 | 5 ½ | 0 | 3 | 0 | Broach, Bombay |
| 314 | - | Ditto. | Ditto. (plaid). Ditto. | 12 | 0 | 0 | 22½ | 2 | 11¼ | 0 | 6 | 0 | Ditto. |
| 315 | "Peshgeer", for petticoats of poorer classes | Ditto. | Print. Fabric of English thread. | 5 | 0 | 0 | 32 | 1 | 2 ½ | 0 | 4 | 0 | Shikarpore, Sind. |
| 316 | - | Ditto. | Plaid, woven in colours. Twilled cotton. | 8 | 15 | 0 | 25 | 1 | 12 | 0 | 6 | 0 | Loodiana, Punjab. |
| 317 | - | Ditto. | Check. Red on yellow ground. | 5 | 26 | 0 | 25 | 0 | 12½ | 0 | 3 | 0 | Ditto. |
| 318 | - | Ditto. | Check or Plaid | 8 | 33 | 0 | 26 | 1 | 1 | 0 | 3 | 0 | Ditto. |
| 319 | - | Ditto. | Print | 5 | 26 | 1 | 1 ½ | 1 | 5 ½ | - | - | - | Futtygurh, N.W. Provinces. |
| 320 | - | Ditto. | Plain cloth dyed with indigo | 8 | 6 | 0 | 34 | 3 | 1 ½ | 0 | 3 | 6 | Beejapoor, Deccan |

## MUSLIN, SILK AND OTHER PIECE GOODS

| No. | DESCRIPTION | | | Length | | Width | | Weight | | Price | | | Whence procured, Place of Manufacture, &c |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Name and Use | Material | Quality, &c. | yds. | ins. | yds. | ins. | lbs. | ozs. | £ | s. | d. | |
| 321 | "Sullah" | Muslin | Plain. Fine quality. | 13 | 0 | 1 | 0 | 0 | 9 | 4 | 4 | 0 | Cuddapah, Madras |
| 322 | Ditto. | Ditto. | Ditto. Super fine quality. | 15 | 18 | 1 | 13 | 0 | 13 | 12 | 5 | 0 | Arnee, Madras |
| 323 | "Dooreea Sullah" | Ditto. | Striped. | 10 | 18 | 0 | 27 | 0 | 15 | 0 | 6 | 0 | Hyderabad, Deccan. Bought in Madras. |
| 324 | - | Ditto. | Ditto. Good quality | 14 | 0 | 1 | 4 | 1 | 4 | 0 | 15 | 0 | Arnee, Madras |
| 325 | "Charkana Sullah" for children's dresses | Ditto. | Check | 7 | 0 | 0 | 33 | 1 | 4 | 0 | 5 | 10 | Ditto. |
| 326 | Ditto. | Ditto. | Ditto. | 7 | 0 | 0 | 34 | 1 | 1 | 0 | 5 | 10 | Ditto. |
| 327 | Ditto. | Ditto. | Ditto. Fine quality | 10 | 0 | 1 | 4 | 0 | 9 | 1 | 4 | 6 | Ditto. |
| 328 | Ditto. | Ditto. | Ditto. | 13 | 0 | 1 | 2 | 1 | 14 | 0 | 8 | 0 | Nellore, Madras |
| 329 | Ditto. | Ditto. | Ditto. Finest quality | 15 | 18 | 1 | 4 | 1 | 2 | 4 | 11 | 0 | Arnee, Madras |
| 330 | - | Ditto. | Fine quality. Pattern worked in loom. | 15 | 0 | 0 | 32 | 1 | 0 | 1 | 8 | 0 | Chicacole, Madras |
| 331 | - | Ditto. | Good quality. Flower pattern loom wrought | 16 | 0 | 0 | 31 | 1 | 3 | 0 | 14 | 0 | Ditto. |
| 332 | - | Ditto. | Coloured check | 15 | 0 | 0 | 39 | 1 | 0 ½ | 0 | 6 | 1½ | Arnee, Madras |
| 333 | - | Ditto. | Ditto. | 10 | 0 | 0 | 32 | 0 | 12½ | 0 | 10 | 0 | Ditto. |
| 334 | - | Ditto. | Ditto. | 15 | 0 | 1 | 2 | 1 | 3 ½ | 0 | 15 | 0 | Ditto. |
| 335 | - | Ditto. | Ditto. | 7 | 0 | 0 | 30 | 1 | 0 | 0 | 4 | 0 | Chicacole, Madras |
| 336 | - | Ditto. | Ditto. | 7 | 0 | 0 | 32 | 1 | 0 | 0 | 4 | 0 | Ditto. |
| 337 | - | Ditto. | Ditto. | 7 | 0 | 0 | 32 | 0 | 9 | 0 | 3 | 0 | Arnee, Madras |
| 338 | - | Ditto. | Ditto. | 7 | 18 | 0 | 37 | 1 | 10 | 0 | 3 | 0 | Ditto. |
| 339 | - | Ditto. | Ditto. | 7 | 0 | 0 | 32 | 0 | 15 | 0 | 4 | 0 | Chicacole, Madras |
| 340 | - | Ditto. | Ditto. | 7 | 0 | 0 | 32 | 0 | 15½ | 0 | 4 | 0 | Ditto. |
| 341 | - | Ditto. | Ditto. Fine quality. | 15 | 0 | 1 | 2 | 1 | 5 | 0 | 15 | 0 | Arnee, Madras |
| 342 | - | Ditto. | Ditto. | 15 | 0 | 0 | 30 | 1 | 3 | 0 | 6 | 0 | Chicacole, Madras |
| 343 | - | Ditto. | Coloured stripes. Very light texture | 13 | 0 | 1 | 2 | 1 | 4 ¼ | 0 | 11 | 0 | Nellore, Madras |
| 344 | Scarf, worn by Hindoo women | Ditto. | Printed. | 4 | 9 | 1 | 0 | 0 | 7 | 0 | 4 | 0 | Trichinopoly, Madras |
| 345 | Ditto. | Ditto. | Ditto. | 4 | 18 | 1 | 0 | 0 | 7 | 0 | 4 | 0 | Ditto. |
| 346 | Ditto. | Ditto. | Ditto. | 4 | 18 | 1 | 0 | 0 | 7 ½ | 0 | 4 | 0 | Ditto. |
| 347 | Ditto. | Ditto. | Ditto. | 4 | 18 | 1 | 0 | 0 | 6 ½ | 0 | 4 | 0 | Madras |
| 348 | Ditto. | Ditto. | Ditto. | 4 | 18 | 1 | 0 | 0 | 7 ½ | 0 | 5 | 0 | Ditto. |
| 349 | Ditto. | Ditto. | Ditto. | 4 | 27 | 0 | 38 | 0 | 6 | 0 | 4 | 0 | Ditto. |
| 350 | Ditto. | Ditto. | Ditto. | 4 | 18 | 1 | 2 | 0 | 6 ½ | 0 | 4 | 0 | Cuddapah, Madras |
| 351 | - | Silk | Tartan | 9 | 0 | 0 | 22 | 0 | 15 | 1 | 2 | 0 | Tanjore, Madras |
| 352 | - | Silk and cotton | Check | 11 | 27 | 0 | 22 | 1 | 0 | 0 | 7 | 0 | Ditto. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 353 | Worn by women and children | Ditto. | Ditto. | 11 | 27 | 0 | 22 | 1 | 0 | 0 | 7 | 6 | Ditto. |
| 354 | - | Silk | Fine cross stripes | 9 | 0 | 0 | 30 | 0 | 10 | 0 | 18 | 0 | Ditto. |
| 355 | - | Silk and cotton | Striped | 11 | 27 | 0 | 22 | 1 | 10 | 0 | 8 | 6 | Ditto. |
| 356 | - | Ditto. | Check | 12 | 0 | 0 | 22 | 1 | 0 | 0 | 9 | 6 | Ditto. |
| 357 | - | Cotton | Dyed. Plain | 6 | 9 | 0 | 25 | 0 | 10¼ | 0 | 3 | 0 | Coonatoor, Madras |
| 358 | - | Silk and cotton | Check | 11 | 27 | 0 | 22 | 1 | 0 | 0 | 9 | 0 | Tanjore, Madras |
| 359 | - | Cotton | Plaid. Imitation of English patterns. | 6 | 0 | | 21 | 0 | 14 | 0 | 4 | 0 | Pulicat, Madras |
| 360 | - | Ditto. | Ditto. | 6 | 0 | 0 | 22 | 0 | 14 | 0 | 4 | 0 | Mylapore, Madras |

## 11. "SPECIMENS OF INDIAN TEXTILES" - WHERE ARE THEY ?

THE MODERN REVIEW 1909 pp 504 - 507

ACCORDING to Bolts, whose "Considerations on Indian Affairs" was published within ten years after the battle of Plassey:-

> "The oppressions and monopolies in trade which have been introduced of late years but particularly within the late seven, have been the principal causes of such a decrease in the real revenues of Bengal, as may shortly be most severely felt by the Company. For the Ryots, who are generally both landholders and manufacturers, by the oppressions of gomastas in harassing them for goods, are frequently rendered incapable of improving their lands and even of paying their rents; for which on the other hand they are again chastised by the officers of the revenue and not infrequently have by those harpies been necessitated to sell their children in order to pay their rents or otherwise obliged to fly the country."

Again, the same author wrote:-

> "We come to consider a monopoly the most cruel in its nature and most destructive in its consequences to the Company's affairs in Bengal of all that have of late been established there. Perhaps it stands unparalleled in the history of any government that ever existed on earth, considered as a public act, and we shall not be less astonished when we consider the men who promoted it, and the reasons given by them for the establishment of such exclusive dealing in what may there be considered as necessaries of life."

It is recorded by Bolts that the Indian weavers,

> "Upon their inability to perform such agreements as have been forced upon them by the Company's agents, universally known in Bengal by the name of *Mutchulcahs*, have had their goods seized and sold on the spot to make good the deficiency; and the winders of raw silk, called *Nagoads*, (italics) have been treated also with such injustice, that instances have been known of their cutting off their thumbs to prevent their being forced to wind silk."

It is not necessary to mention all the measures which in the early days of the East India Company led to the ruin of Indian industries. But all those measures did not bring about the total extinction of Indian manufactures and industries. For after all knowledge is power and the manufacturers of England were ignorant of many of the processes employed by Indian artisans in the manufacture of their articles and wares.[32]

[32] "We as a manufacturing people are still far behind them (the Indians)" - Sir Thomas Munro. See The Modern Review Vl II., p.541.

The holding of the first International Exhibition in 1851 was not only an incentive to the manufactures of England to produce articles for the Indian markets, but it indirectly afforded them an opportunity to learn the trade secrets of Indian craftsmen. The English manufactures left no stone unturned to wring out of the Indian artists the secret processes by which the latter succeeded in manufacturing their beautiful articles.

A couple of years after the first International Exhibition, took place the renewal of the Charter of the East India Company. Several witnesses who appeared before the Parliamentary Committees appointed to inquire into Indian affairs gave it in their evidence that English manufacturers should be afforded facilities to have an extensive market for their articles in India.

At the same time Dr. John Forbes Royle, who had been in charge of the Indian Department of the first International Exhibition, impressed upon the Court of Directors the importance of forming a Museum in London to permanently exhibit the products and manufactures of India. It is needless to say that the Court most gladly adopted his scheme, because the Museum was to be established at the expense of India and it was to afford bread and butter to a large number of the inhabitants of England. But while completing the arrangements of this Museum he died in January 1858. Dr. Forbes Watson was appointed as his successor. It was during his tenure of office that the last step leading to the destruction of Indian textile manufactures was taken.

What this step was has been very well described by Dr. Watson himself. He wrote:-

> "Specimens of all the important Textile Manufacturers of India existing in the stores of the India Museum have been collected in eighteen large volumes, of which twenty sets have been prepared, each set being as nearly as possible, an exact counterpart of all the others. The eighteen volumes, forming one set, contain 700 specimens, illustrating in a complete and convenient manner, this branch of Indian manufactures. *The twenty sets are to be distributed in Great Britain and India- thirteen in the former and seven in the latter -* so that there will be twenty places, each provided with a collection exactly like all the others, and so arranged as to admit of the interchange of references when desired."

The passage which we have italicised in the above extract shows that the authorities did not possess any sense of proportion when they distributed thirteen sets in Great Britain and seven only in India.

The distribution of the seven sets in India was an afterthought. It was not the original intention of the authorities, as is evident from what Dr. Forbes Watson wrote:-

> "The original intention was that the whole of the twenty sets should be distributed in this country (England.) Further consideration, however, points to the expediency of placing a certain number of them in India: 1st, because this course will facilitate those trade operations between the two countries which it is the object of the work to promote and encourage; and 2ndly, because it is possible that the collection may be of direct use to the Indian manufacturer.....

"It seems to be clearly for the advantage of India that every facility should be given to the introduction, from this country, of such manufactures as can be supplied to the people there more cheaply[33] than by hand labour on the spot. The many will thus be benefited, and the hardship which may possibly fall upon the *few* will not be serious or long felt, since their labour will soon be diverted into new and, in all probability, more profitable channels.

*"The chief advantage, however, which is likely to attend the distribution in India of a certain number of the sets of Textile Specimens will, it is believed, arise from the opportunity which will thereby be afforded to the agent in India of directing the attention of his correspondent here (England) to the articles suited to the requirements of his constituents."*

We have italicised the last paragraph, as in it the writer unmasks himself.

The places to which the thirteen sets were alloted in Great Britain and Ireland were as follows:- Belfast; Bradford; Dublin: Edinburgh; Glasgow; Halifax; Huddersfield; Liverpool; Macclesfield; Manchester; Preston; Salford and the India Museum, London. Dr. John Forbes Watson was sorry that this distribution still left "some important places unsupplied. These are , however, in almost every instance situated near to one or other of the selected localities."

Regarding the distribution of the seven sets in India, Dr. Watson recommended" that a set be placed in each of the following places, viz.: Calcutta, Madras, Bombay, Kurrachee, the North - Western Provinces, the Punjab, and lastly in Berar.

"With respect to the three last-named divisions either Allahabad, Mirzapore, or Agra in the North-Western Provinces, Umritsur or Lahore in the Punjab, and Oomrawattee or Nagpore in Berar, will probably be found the most suitable, but it may be left to the respective Governments of the divisions in question to decide on the exact locality."

The set for the North-Western (now the United) Provinces is not kept in any one of the cities recommended by Dr. Watson. It is kept in the Provincial Museum, Lucknow, to which place it was transferred from the Allahabad Museum in September, 1878. Lucknow is not a centre of any textile industry and therefore the set is kept there !

Dr. Watson proceeded-

"Regarding the condition on which the gift should be presented, - the first should be that due provision should be made for its permanent protection, and that freedom of access be afforded to all properly recommended and practically interested persons.

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[33] As to this cheapness it should be borne in mind that the poorer classes in India for whose benefit cloth was sought to be made cheap have always used the coarser fabrics. These products, of the handlooms, are even now cheaper than Manchester goods considering that the former last much longer. But our fabrics were formerly actually cheaper in price than English textiles, as Mr. Robert Brown said before the Lords' Committee which sat before the renewal of the E.I .Company's Charter in 1813. See the January (1908) number of this review, p. 28, and the December (1907) number. p.545.

"The sets should be assigned in trust to the chief commercial authorities in the selected places, for the use not only of those connected with the district in which they are deposited, but of non-residents also, who can show a practical interest in Textile manufactures. The proposed plan of sending seven of the sets to India, diminishes the number of commercial centres in this country which will receive a copy, and it therefore becomes more necessary that those which do get one should be required to make it easy of access to agents, merchants, and manufacturers who reside in those which do not."

It was made a condition that the authorities in the selected districts should undertake:-

"That access to the work be given to any person bearing an order to that effect signed by the President, Vice-President, or Secretary of the Society of Arts; the Presidents, Vice-Presidents, or Secretaries of the Chamber of Commerce; the Chairman or Secretary of the Association of the Chambers of Commerce; the Chairman or Secretary of the Association of the Chamber of Commerce; the President, Vice-President or Secretary of the Cotton Supply Association, the Chairman, Vice-Chairman or Secretary of the Cotton-Brokers' Association; the Chairman, Vice-Chairman or Secretary of the Liverpool East India and China Association; by the Presidents, Vice-Presidents, Chairmen, Vice-Chairmen, or Secretaries of such other Associations for the promotion of Commerce as now exist or may hereafter be formed; and by the Reporter on the products of India."

So it was not difficult for any one to consult the work in Great Britain. But in India the existence of this work is hardly known to 999 out of 1000 educated persons - much less to the weavers and other un-educated artisans. It would be interesting to know if the sets deposited in India have ever been consulted by even any educated Indian. These might have been consulted by some interested Anglo-Indians but not, we think, by any educated native of this country.

Since these sets were prepared at the cost of India and now, thanks to the Swadeshi movement, an impetus has been given to the textile industry in this country, is it not time and is it not fair and just that all the thirteen sets which are in Great Britain should be brought to India and kept in important centres of commerce and industry in this country? As a first step, may we not demand that the existence of the seven sets in India should be made widely known? They should be made easily accessible to all Indians actually engaged in manufacturing textile fabrics.

These twenty sets of 18 volumes each were to be "regarded as *Twenty Industrial Museums*, illustrating the Textile Manufactures of India, and promoting trade operations between the East and West, in so far as these are concerned."

Of course, it was meant more to benefit the West than the East and this Dr. Watson himself admitted, for he wrote:-

"The interests of the people in India, as well as those of the people at Home, are concerned in this matter, and *both interests must be considered*. Our remarks in the first instance, however, will apply more particularly to the latter.

"About two hundred millions of souls from the population of what we commonly speak of as India ; and, scant though the garments of the vast majority may be, an order to clothe them all would try the resources of the greatest manufacturing nation on Earth. It is clear, therefore, that India is in a position to become a magnificent customer.

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"If we attempt to induce an individual or a nation to become a customer, we endeavour to make the articles which we know to be liked and needed, and these we offer for sale. We do not make an effort to impose on others *our own tastes and needs*, but we produce what will please the customer and what he wants. The British manufacturer follows this rule generally; but he seems to have failed to do so in the case of India, or to have done it with so little success, that it would almost appear as if he were incapable of *appreciating* Oriental tastes and habits.

"There are probably few things beyond the understanding of our manufacturers, but it will be admitted that some education in the matter is necessary, and that without it the value of certain characteristics of India ornament and form will not be properly realized. This supposes the means of such education to be readily accessible, which hitherto has not been the case, simply because manufacturers have not known with any certainty what goods were suitable. To attain to skill in meeting Eastern tastes and Eastern wants will require study and much consideration even when the means of study are supplied; but up to the present time the manufacturer has had no *ready opportunity* of acquiring a full and correct knowledge of what was wanted.

"The deficiency here alluded to, will, we believe, be supplied by these local Museums,

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"The 700 Specimens (and we again point out that they are all what is called working *samples* show what the people of India affect and deem suitable in the way of textile fabrics, and if the supply of these is to come from Britain, they must be *imitated* there. *What is wanted, and what is to be copied to meet that want*, is thus accessible for study in these Museums."

Thus it was all from motives of philanthrophy that specimens of India textile fabrics were made accessible to the manufacturers of England.

But even up to the year 1866, the Indian weaving industry had not totally ceased to exist. For Dr. Forbes Watson wrote:-

"** The British manufacturer must not look for his customers to the upper ten millions of India, but to the hundreds of millions in the lower grades. The plainer and cheaper stuffs of cotton, or of cotton and wool together, are those which he has the best chance of selling, and those which he would be able to sell largely, if in their manufacture he would keep well in view the requirements and tastes of the people to whom he offers them.

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"We know India now-a -days as a country whose Raw Products we largely receive. We pay for these partly in *kind* and partly in *money*; but India never buys from us what

will repay our purchases from her, and the consequence is that we have always to send out the large difference in bullion, which never comes back to us, disappearing these as if it had been dropped into the ocean. We buy her Cotton, Indigo, Coffee, and Spices; and we sell her what we can in the shape of Textile and other Manufactures. It must not be forgotten, however, that there was a time when India supplied us largely with Textiles. It was she who sent us the famous Longcloths, and the very term *Calico* is derived from *Calicut* where they were made. She may never resume her position as an exporting manufacturer of goods of this sort,*** This is clear, however, that it will be a benefit to the masses of the people of India to be supplied with their clothing at the cheapest possible rate - let this be done by whom it may. If Great Britain can give Loongees, Dhotees, Sarees, and Calicoes to India which cost less than those made by her own weavers, *both* countries will be benefitted.**

"The machinery and skill of Britain may thus do a present service to India, by supplying her with material for clothing her people at a cheap rate, an end to which these *collections* must certainly lead by showing the home manufacturer what it is that the natives require."[34]

Regarding this act of philanthrophy, one Christian officer wrote:-

"Every one knows how jealously trade secrets are guarded. If you went over to Messrs. Doulton's pottery works, you would be politely overlooked. Yet under the force of compulsion the Indian workman had to divulge the manner of his bleaching and other trade secrets to Manchester. A costly work was prepared by the India House Department to enable Manchester to take 20 millions a year from the poor of India: copies

[Major J. B. Keith in the *Pioneer* September 7, 1898]

It is much to be regretted that no writer on Indian economics has so far referred to the part which the holding of Exhibitions and the distribution of specimens of the textile manufactures of India have played in ruining the weaving industry of India. Perhaps the imposition of the tariff and the transit duties would not and could not have so effectually destroyed Indian industries had not the authorities made the Indian artisans betray under compulsion their trade secrets to the manufacturers of England.

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[34] In this connection it is necessary to remind our readers what Mr. Tierney, a member of the House of Commons , said in a speech delivered in that House as far back as 1813:-

"The general principle was to be that England was to force all her manufactures upon India, and not to take a single manufacture of India in return It was true they would allow cotton to be brought; but then, having found out that they could weave, by means of machinery, cheaper than the people of India, they would say, `Leave off ' weaving; supply us with the raw material, and we will weave for you.' This might be a very natural principle for merchants and manufacturers to go upon, but it was rather too much to talk of the philosophy of it, or to rank the supporters of it as in a peculiar degree the friends of India. If, instead of calling themselves the friends of India , they had professed themselves its enemies, what more could they do than advice the destruction of all Indian manufactures?"] were gratuitously presented to Chambers of Commerce, and the Indian ryot had to pay for them. This may be political economy, but it is marvellously like something else."

Owners of cotton mills and hand-loom factories all over India should move in the matter in order that (1) the seven sets of Indian textile manufactures already in India may be made easily accessible to Indian manufacturers and (2) the thirteen sets in Great Britain may be restored to India and placed in suitable centres here. This will help greatly in the revival of genuine Indian patterns and colours.