M.R.O. 14—10,000—21-4-22

MADRAS RECORD OFFICE.

Government of Madras.

Revenue **DEPARTMENT.**

G.O. No. 977 — Press / Mis.

95. 96

Dated 5. 5. 1862

Not to be folded or roughly handled

Read the following letter :—

No. 95. From Captain J. MITCHELL, Officer in charge of the Government Central Museum, to J. W. BREEKS, Esq., Private Secretary to His Excellency the Governor, dated Madras, 21st April 1862.

My dear Sir,

1. On the 4th instant I had the honor to acknowledge the receipt of certain samples of Cotton that were forwarded with your letter of the 3rd April 1862.

2. The examination of these samples has occupied all the time I could command since that date, and it is now my duty to report the result. I fear His Excellency Sir W. Denison will consider it a very inadequate return for the time devoted to it. It certainly appears so to me.

3. I have considered it advisable to send *in full* all the measurements that I have made of the *diameter* of the fibre, because it seems to me that a mere average is calculated to give a very erroneous idea of Cotton as it really is. With the whole of the measurements before him His Excellency will be able to see the data on which the averages are founded.

4. The measurements were made with a Cobweb Micrometer, the divisions of which (with the object glass used), have a value of $\frac{1}{133833}$ of an inch; this quantity, 133,833, therefore, is the common denominator of fractions, of which the Micrometer readings entered in the several columns of the table, are the numerators.

5. As it would have been obviously unsatisfactory to select any particular kind of fibres for measurement, the plan I adopted was to tease out a pinch of the Cotton until it lay pretty smooth, from this I detached as thin a stratum as possible of about half an inch in width, which was placed on the compressorium in water. Then, commencing at one end, I passed the different parts in succession across the field of the microscope and measured those that lay flattest and best situated for that purpose, without reference to their size or form. I did not at first note in the table the form of the fibres, but after a time it occurred me to do so, as it is evident that the diameter of a flat thin fibre will, as a rule, be greater than a cylindrical one; indeed, it follows as a matter of course that if one portion of a hollow cylinder be pressed flat, it must measure half as much more than the cylindrical portion, *i. e.*, in the ratio of the semi-circumference to the diameter.

6. You will observe that I have used the terms round, roundish, flat, and flattish, in the table. I appl, the term "round" to a fibre that is *apparently* round and solid, with considerable opacity, somewhat like a stout hair; but I do not mean to assert that such are in reality solid cylinders, they are possibly flattish fibres rolled up in such a way as to appear solid, and I reserve that point for further examination.

7. Those termed "roundish" have a light line along their axis when seen at the upper focus, an effect often seen with hairs, and which led to the idea of hairs being tubular.

8. The "flattish" fibres have this line wider, and, a more or less, broad, opaque margin, which is rounded off so as to give the idea that a transverse section would be an ellipse of greater or less excentricity.

9. The "flat thin" fibres are exceedingly thin, flattened tubes, like pieces of ribbon, and without any appearance of internal thickening from secondary deposits.

10. You will see by the following quotations that the use of some terms to describe the nature of the fibre was a necessity. Whether there be any kind of Cotton in which a riband-like band is the common form I have yet to learn, but in the samples that I have examined, a flat riband-like fibre is *not* the rule, and in some varieties it is *almost a rare* exception;— to proceed.

11. The late Professor John Quekett in the 1st volume of his Lectures on Histology, speaking of Cotton fibres, says they "are recognized as flattened and more or less twisted bands," and his figure represents, as well as a wood engraving can be expected to do, what I call "thin flat fibres." The writer of the article "Cotton" in the English Cyclopædia (A. D. 1854), says, "They (*i. e.* the fibres) are long, weak, tubes, which, when immersed in water and examined under the microscope by transmitted light, look like flat, narrow, transparent ribands, all entirely distinct from each other and with a perfectly even surface and uniform breadth. Professor Henfrey, "Micrographical Dictionary" is nearly as bad, he says, "From the absence of the regular thick-

ening layers the cells of the Cotton hairs become collapsed when dry, appearing like a thin band with thickened borders."

12. I have said that I have not found the above descriptions to apply otherwise than exceptionally, but I should mention here, that in some of the samples small knots remained after the cotton was teased out with the fingers, and that I examined several of these knots and found them composed (almost entirely) of very thin, weak, flat fibres, much entangled.

13. Although it seems probable that the quality of cloth produced, and the facility of working must depend materially upon the *form* of the fibre, yet great stress is laid upon its length. It is therefore with much regret that I am obliged to say I have not been able to devise any easy and practical method of measuring *single* fibres. The exceeding tenuity of the fibre, say, as a mean, $\frac{1}{1700}$th of an inch in diameter, renders it impossible to apply it to an ordinary scale, and the only method I can see is to cement them to a glass slide, which can then be applied to a scale ruled on glass for the purpose. This is exceedingly tedious and very trying to both eyes and head from the impossibility of seeing the fibres without a lens, I therefore abandoned it for the method adopted (I believe) by the Broker and Manufacturer, of repeatedly drawing a small portion through the fingers until it appears to be nearly all in line, and then measuring these small tufts.

14. It is necessary also to observe that there is no equality of form or diameter in the individual fibres, which are in one part round, in another flattish and twisted, appearing varicose; spreading out into a flat, thin fibre for some distance, to become again contracted, &c. This variation of form seems to render anything like a standard of measurement next to impossible.

15. I have sent herewith the small tufts of Cotton from which the lengths entered in the table were obtained. His Excellency's proposition to draw lines on paper exhibiting the average length of the several staples is, I think, a very good one. I would, however, suggest that a broad black line on white paper, while quite as well seen as a white line on black paper, would be more readily executed, the latter method, I fear, would require wooden blocks engraved for the purpose. It should be accompanied by a short description of the way in which a small tuft is to be prepared for measurement. The Photo-lithograph sent by the Cotton Supply Association is not very plain, and unaccompanied by any explanation it seems likely to be misunderstood; for a friend of mine who has taken some interest in Cotton cultivation told me he thought it was intended to represent seeds with the adhering fibres simply stretched out. If an educated man could fall into this error, it would not be strange if the Native cultivator should find it hard to understand.

16. I will not detain this report longer, but will endeavour to prepare a Memorandum on the subject of measurement, to be forwarded hereafter.

P. S.—1. In a note dated 22nd instant, with which I was favored, His Excellency Sir W. Denison was good enough to suggest the possibility of obtaining a better knowledge of the structure of Cotton fibres by means of transverse sections.

2. The subject is a very difficult one, as the sections require to be so exceedingly thin, less than one-thousandth of an inch. I am not, therefore, surprised that I did not succeed. But my failure to obtain transverse sections, properly so called, led me to cut as obliquely as possible through the fibres, and this method has revealed all I wanted to know, for the sloping extremities of the fibres thus obtained show beyond a doubt that in all, except the very thinnest, there is a greater or less amount of secondary deposit, which in the round, roundish, and flattish ones is carried to such an extent as to form a (?) homogeneous solid body, instead of a hollow cell or tube, but in the flattish fibres the deposit appears thickest at the margins. The same result was subsequently arrived at by examining the cut extremities of other portions with a half inch object glass and Lieberkuhus' reflector. This method of examination not only confirmed the results of the other, but exhibited also the very irregular form of the transverse section.

3. I have also examined the fibres by polarised light, upon which I find the thin flat fibres have little or no action, being nearly, sometimes altogether, invisible when the axes of the Nicol's prisms are crossed. But they become visible when a film of selenite is interposed between them and the polarising prism.

25th April 1862.

Proceedings of the Madras Government, Revenue Department, 5th May 1862.

Progressive numbers.	Form and character of the fibre in the several samples.
No. 1	The majority of the fibres flattish with thickened walls, a few flat and very thin, still fewer round and solid looking.
,, 2	The flat thin fibres and those with thickened walls in about equal proportions, a few round solid looking.
,, 3	Fibres chiefly flattish with thickened walls, some round and roundish solid looking; but very few of the very thin kind.
,, 4	Many flat and very thin fibres: others flattish with the walls but moderately thickened, a few round solid looking ones.
,, 5	The thin flat fibres present in considerable number, fibres generally but little thickened and having a delicate appearance.
,, 6	Much like No. 5. The thickness of the wall of a fibre that measured $\frac{1}{1408}$'' was $\frac{1}{13786}$th of an inch.
,, 7	The flat thin fibres were the predominating character of this sample.
,, 8	Some flat thin fibres, but not in great numbers, the roundish and flattish predominating.
,, 9	The flat thin fibres formed about (?) ⅓rd; the remainder chiefly flattish with thickened walls.
,, 11	Thin flat fibres in considerable number, perhaps one-half.
,, 10	Consists chiefly of flattish and roundish fibres, the very thin flat ones being proportionately few.
,, 12	Fibres roundish and flattish with thick walls; very few of the thin flat kind.
,, 13	A few thin flat fibres: some of the fibres have a ragged or torn appearance.
,, 14	Chiefly round, roundish and flattish fibres with thick walls; but few of the thin flat kind.
,, 15	Flat fibres present but not in great number; chiefly flattish hairs with thick walls.
,, 16	Flat fibres in moderate quantity; the remainder roundish and flattish fibres with thickened walls, but somewhat uneven.
,, 17	Like No. 16. This is marked "saw ginned." I have not seen any indications of the injury said to be done by the saw gin to Indian cottons, the fibre is as sound as any I have looked at.
,, 18	Consists of roundish, flattish, and round fibres; the broad, thin, and flat kind being very rare. This seems a very even cotton.

(Signed) J. MITCHELL, Captain.

No. 96. ORDER THEREON, 5th May 1862, No. 977.

1. Resolved that Captain Mitchell's report of his microscopical examination of various specimens of Cotton be printed and circulated. The samples numbered 10 to 18 were received from the Manchester Cotton Association.

2. Captain Mitchell is requested to prepare the drawings and descriptions referred to in paragraph 15.

(Signed) J. D. SIM,
Secretary to Government.

Result of the measurement of Eighteen Samples of Cotton.

Progressive Number.		Description of Cotton.	Length in inches.		Readings of Micrometer head.												Sum of Micrometer Readings.	Mean of all the Readings.	Mean Diameter of Fibres in fractions of an inch.
			1st Tuft.	2nd Tuft.	1	2	3	4	5	6	7	8	9	10	11	12			
			Inches.	Inches.															
Quality most in request.	1	American Medium ...	1·25	1·4	110	131	138	108	124	119	146	117	111	121	110	81	1,416	118	1/134
	1	Do. do. ...	.....	.....	137	126	117	117	114	114	125	127	155	136	133	136	1,537	128	1/145
	1	Do. do. ...	.....	.....	139	120	139	147	140	131	117	147	131	145	118	94	1,568	130⅔	1/124
C.	2	A. H. Society's New Orleans.	1·25	1·25	88	114 Round.	85 The same flat.	119	106	121	112	115	101	112	129	109	1,311	109¼	1/123
	2	Do. do. ...	.....	.....	27	49	79 Round.	73	98 Round.	114	82	102	101	125 Thin flat.	108	92	1,050	87½	1/139
	3	A. H. Society's, Egyptian ...	1·53	1·5	102	91	24	46	53	88	127	84	94	103	101	102	1,015	84·6	1/102
	4	Do. do. Brazilian ...	1·5	1·65	85	139	133	121	156 Round.	130 Roundish.	133 Round.	78 Round.	154 Flat thin.	123 Round.	103 Round.	74 Flat.	1,429	119	1/125
A.	5	People's Park, Egyptian ...	1·5	1·5	135 Roundish.	81	103	173	119 Round.	113	53	109 Roundish.	169	86 Roundish.	51	142 Round.	1,334	111	1/106
	6	Do. do. Bourbon ...	1·2	1·25	93	110	119	112	92	126	94	89	119	116	101	51	1,222	102	1/132
	7	Do. do. Brazilian ...	1·3	1·45	117	116	135	137	106	158	160	151	109	126	105	78	1,498	125	1/107
	8	Do. do. Egyptian, 2nd Sample	1·3	1·42	99	97	91	134	88 Round.	106 Round.	105 Round.	118	103 Roundish.	94	97	107	1,239	103¼	1/129
B.	9	B. Nellore	1·23	1·27	136 Round.	64 Round.	134 Flat thin.	108 Roundish.	171 Flat.	61 Flattish.	51 Round.	170 Round.	136 Roundish.	119 Flattish.	151 Flattish.	1[illegible] Round.	1,428	119	1/125
English Samples.	10	No. 1, Sea Island... ...	1·65	1·65	55	107	100	135	124	110	71	100	96	132	102	67	1,199	100	1/136
		Continued	.....	.....	105 Flattish.	75 Roundish.	91 Flattish.	50 Flat & very thin.	102 Flat & very thin.	129 Flattish.	115 Flat & very thin.	102 Round.	81 Round.	96 Roundish.	116 Flattish.	133 Roundish.	1,195	99·6	1/134
	11	No. 2, Ditto stained ...	1·6	1·7	87 Round.	63 Flattish.	105 Flat.	154 Roundish.	110 Round.	120	109 Flattish.	49 Flatish.	41 Flattish.	97 Roundish.	85 Flattish.	57 Round.	1,077	89¾	1/148
	12	No. 3, Egyptian	1·55	1·6	94 Flat.	82 Flattish.	111 Flattish.	83 Flattish.	100 Flattish.	117 Flat.	117 Flattish.	91 Round.	86 Flat thin.	104 Round.	107 Round.	95 Flat thi[illegible]	1,187	99	1/138
	13	No. 4, Pernambuco ...	1·4	1·45	110 Flattish.	159 Flattish.	149 Round.	134 Roundish.	74 Round.	153 Round.	140 Flat thin.	95 Thick twisted.	171 Flattish.	86 Thick flatish.	70 Flattish.	16[illegible] Flattish.	1,504	125⅓	1/106
	14	No. 5, Fair Orleans ...	1·35	1·23	110 Flattish.	116 Round.	85 Flattish.	107 Flattish.	83 Flat.	81 Round.	148 Round.	136 Round.	140 Flattish.	189 Roundish.	129 Flattish.	143 Round.	1,467	122¼	1/109
	15	No. 6, Middling do. ...	1·33	1·25	154 Roundish.	111 Roundish.	116 Flat thick.	128 Flat thin.	137 Flattish.	85 Roundish.	80 Flattish.	97 Flattish.	122 Round.	140 Flattish.	112 Round.	106 Roundish.	1,388	115⅔	1/116
	16	No. 7, Broach, Surat ...	1·15	1·25	129 Roundish.	84 Round.	106 Flattish.	175 Round.	130 Flattish.	62 Round.	94 Flattish.	120 Flat thick.	67 Flat & very thin.	137 Flat & very thin.	63 Round.	110	1,277	106·4	1/128
	17	No. 8, Saw ginned, Surat ...	1·1	1·2	109 Roundish.	93 Flattish.	142 Round.	96 Flat thick.	127 Round.	93 Round.	85 Flat and thick.	115 Round.	225 Roundish.	212 Round.	89 Roundish.	133 Round	1,519	126·6	1/105
	18	Havannah	1·45	1·44	100	109	81	147	89	88	118	89	119	62	111	8[illegible]	1,196	99⅔	1/134

15 printers copies
of
Mr Mitchells
letter to be
sent to the
Wheelwrights

Dear Sir -

I enclosed the remitted
Engage D.S. & Mitchells
Report on Cotton which I
have you on Thursday -

Yours

Wm B.

26 of '62
Sunday

Broadrae 25th April 1862

Dr Sir

In a note dated 22nd Inst. with which I was favoured, Mr Spelling for Mr Denison was good enough to suggest the possibility of obtaining a better knowledge of the structure of cotton fibres by means of transverse sections

The subject is a very difficult one, as the sections require to be so exceedingly thin - less than one thousandth of an inch. I am not therefore surprised that I did not succeed. But my failure to obtain transverse sections, properly so called, led me to cut as obliquely as possible through

the fibres, and this method has revealed all I wanted to know. For the closing ephemeris of the fibres I had obtained shew beyond a doubt - that, in all except the very thinnest - there is a greater or less amount - of secondary deposit which in the Round, Roundish and flattish ones is carried to such an extent as to form a ? homogeneous solid body, instead of a hollow cell or tube, but in the flattish fibres the deposit appears thicked at the margins

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the axes of the two principal are crossed. But they become visible when a film of Selenite is interposed between them and the Polarising prism

I am Dr Sir
Yours faithfully
J Watson Captain

To
J. W. Burke Esqr
Town Secretary &
Secretary the
Exhibition
Sydney

Revenue 1862 Depositt

No 1204.

From
Captain L. Mitchell

Dated 25th } Aug 1862.
Received 26th }

Regarding the examination of Cotton Fibers

Transferred to the Revenue Secretary & Genl Superr

WBP.
24 Sept. 62
Genl Supt

Instructions will be printed & circulated WBP

Send me one dozen copies WBP

Re 977. WBP.

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To Capt Mitchell & the Officer in charge of the Central Museum Kew &c &c

Revenue 1862 Vol 5th
Pkt: of Govt for May.

No. 1189

From the Officer in
charge of the Govt.
Museum -

Dated 21st }
Received 25th } Apl.
1862.

Reports his micros
copical examination of
the various specimens of
cotton forwarded to
him -

No 95 & 96.

26-4-62

No. 977 - 5th May

With an order