

On the Workshop Organization in the Early Lancashire Cotton Mills : The Skilled Operatives and Workshop Labour Practices

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1 Mechanical production system and workshop manpower composition

First of all, I want to summarize the mechanical production system of the cotton mill at the stage that the steam power generalized in the cotton trade easily. There is not necessarily abundantly concrete historical materials about the uniting system of various machines attached to the cotton mill in this age and various machines and that depend on the power machine and the conduction machine. However, it wants to show the system of Stockport that A. Ure introduced of the installation machine system according to the production process in the Orell cotton mill (hereafter, A Mill and abbreviation) as follows, and to explain (Chart 1)⁽¹⁾.

《Building》

The character type and the length of the main building and the piece with the projection parts right and left were 280 feet, 200 story feet in width in the facility building, and the attic floor was attached.

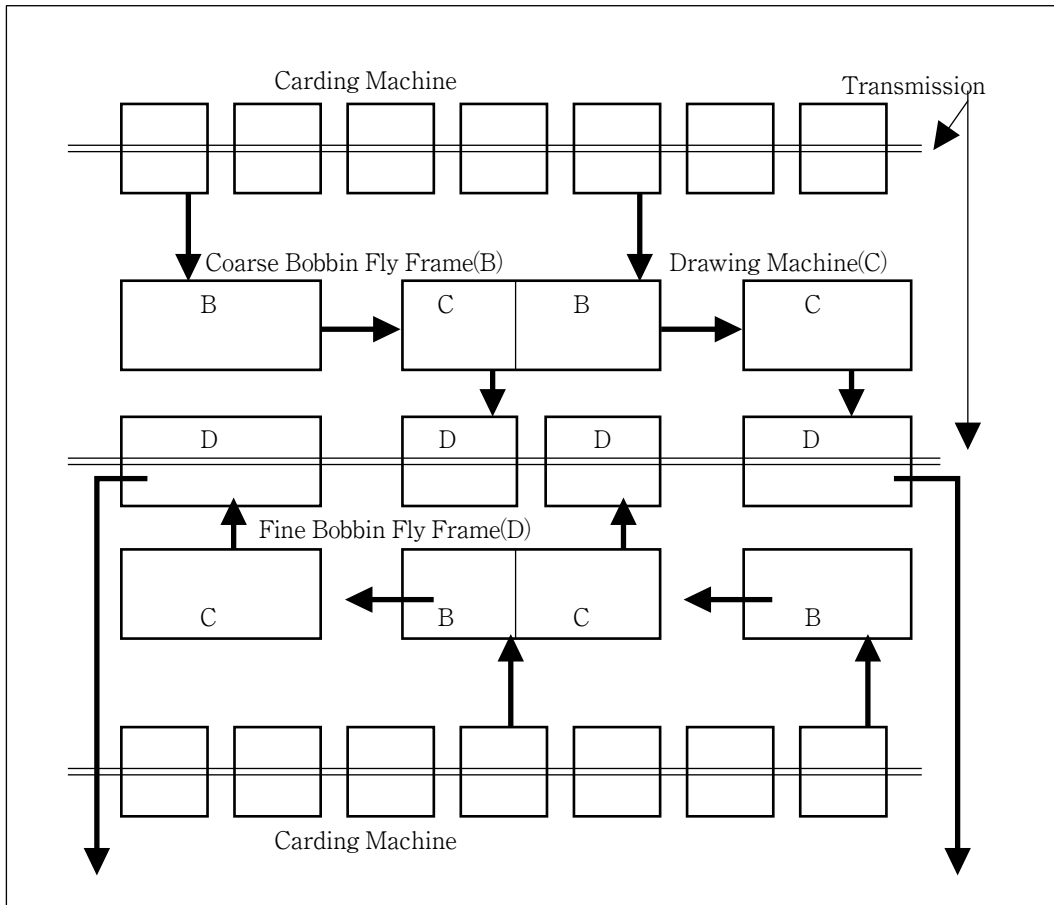
《Installation Machine System》

[Power Engine Room] : From the ground floor to second floor were separated from other rooms in a thick partition, and two 90 horsepower steam engines were set up. It was outside of the main building and was supplied steam from the boiler room.

[Blowing room] : 4th, 5th, and the sixth floor part upper the power engine room were allotted to the process of blowing cotton process. The lower cotton was sent from the 6th floor to the 4th floor one by one, put on the willow machine and the blowing and scutching machine, and processed. Finally, the lower cotton processing was completed by the lap machine connected with the carding process in the centre part of the main building of the fourth floor.

[Carding room] : The coarse bobbing fly frames and the drawing machines flow on the both sides, and the fine bobbing fly frames were set up in the centre part, and the working line flows in most order of the product processing the parallel to the open mouth window of the centre of the bookstore and the flow of the carding machine, and.

Chart 2. Carding Process Machine Arrangement in the Orell's Mill



<SOURCE> Drafted using examples from Ure, Andrew., *The Cotton Manufacture of Great Britain ; systematically investigated, and illustrated by 150 Original Figures, engraved on Wood and Steel; with an Introductory View of Its Comparative State in Foreign Countries, drawn chiefly from Personal Survey*, 2vols, London, Charles Knight, 1836, vol.1, Appendix , Plate 1.

the sixth floor upper the carding room. The spinner operated two sets of hand mules alone. Similarly, the self-actor mules were set up on the fifth and the sixth floor of the main building right edge where the warp and the weft were produced. Only the warp was transported to the finish production process.

[Finishing room]: The winding machines were put on the fifth and the sixth floor of the left end of the main building where the warp had been sent from the coarse fly-bobbin and the self-actor mules were winded up. The warp, that were winded up were finished up and processed by the warping machines and the dressing machine set up in the garret.

[Weaving room] : The power looms were put on the first floor in the centre part of the main

building, and the processed passing string was mixed weaved the warp manufactured by the dressing machines and weft spun by the hand mules.

If it was assumed that this mill was the one of the Ralph Orell's ownership of the No.44 Factory that was one of Lancashire 151 cotton mills for the Factory Investigation by S.Stanway submitted to 'Factory Commission' in 1834, we could suppose that 194 labourers were employed in the spinning or spinning preparation processes, 190 labourers in the weaving and 4 labourers in other processes then total 388 labourers were employed in this mill⁽²⁾. It can be said that the mill as the spinning & weaving cotton mill at that time was the factory of the mainstay scale.

The Table 1 was drawn up by compared the production facilities in the mechanical production system of the mainstay mill serve both as spinning and weaving (B Mill and henceforth abbreviation) that assumed, "Modern factory most compactly maintained⁽³⁾" at that time was introduced by A.Ure similarly with the mechanical plants in the previous Orell's mill. As a result to observe this table, let's be able not to know the outline of the installation equipments and the machines in each of a large factories and the middle-scale mills at that time.

The amount of the fixed assets investment of the mill installed 75 mules scale (A Mill) can be presumed that it reached about as much as 85,000 pounds excluding land, and about 32,500 the considerable pound capital investment was necessary only even for the spinning.

Especially, it is estimated that about 186 pounds each of the self-actor mule were invested in plant and equipment high as for the price of the mule. Therefore, it can be said that the considerable capital was indispensable for the establishment of mule type cotton mill. Moreover, willow machines, blowing and scutching machines, lap machines, carding machines, drawing machines, coarse bobbing & fly frames, fine bobbing & fly frames, and so on in spinning preparation equipment such were also necessary for spinning, therefore the investment in these preparation process reached to the level similar for the spinning process or any more.

《Remarks》

- The average rotational speed of the willow machine, the blowing machine, and the lap machined of the A Mill was respectively 350,1600,1600 rotations.
- Those of the B Mill were good at the blowing of the lower cotton of 9,000 pound-forces by 69 hour operation during the week.
- The carding machine of the B Mill were good at the carding of 5,000 pound-forces by 69 hour operation during the week.
- The drawing machine of the B Mill operated one by three operatives.
- The three species of spinning machines of the A Mill could good respectively spin at 9000, 18000 and 7000 pounds of No. 36-40 count string of by 69 hour operation during the week.
- The power looms of the A Mill were a speed of 120 picks per minute, and these weaved 5.75 yards per one loom were operation for 69 hours operation during the week.

Then, what manpower how arranged according to the process, and organized as corresponded to such a mechanical production system? The investigation of 'Factory Commission' that

Table 1. Plants by Manufacturing Processes in the Standard Cotton Mill (X ca. 1835)

machine	Per Cost ⁽⁴⁾			A Mill ⁽²⁾			B Mill ⁽³⁾		
	L.	s.	d.	sets	spindles	Total Cost ⁽⁷⁾	sets	spindles	Total Cost
willow	70			2		140	1		70
blowing machine	70			5		350	1		70
lap machine	70			5		350	1		70
carding engine	42			168		7,056	21		882
drawing frame	37	10		24		900	3		112 10
coarse bobbin & fly frame	2	6	0	24	1,152	2,649 12	3	144 ⁽⁸⁾	331 4
fine bobbin & fly frame	1	11	0	50	3,204	5,099 14	7	449 ⁽⁸⁾	714 3 2
throstle frame	0	10	6	78	12,948	6,797 14	10	2,360	1,239
hand mule	0	4	9	56	24,928	5,920 8			
self-acting mule	0	8	0	19	7,984	3,193 12	12	4,848	1,939 4
winding machine				5	1,200		2	300	
warping machine	14	1	2 ⁽⁶⁾				2		
power loom				1,100		15,984 6 6	236		3,472 8 2
dressing machine				32			7		
Total machine cost				1,568		48,441 6 6	306	8,101	8,901 9 4
Total (inc. steam engine & building)						85,000(ca.)			15,600(ca.) ⁽⁹⁾

<SOURCE> My original produced table referred to Ure, Andrew., *The Cotton Manufacture of Great Britain*, systematically investigated, and illustrated by 150 Original Figures engraved on Wood and Steel; with an Introductory View of its Comparative State in Foreign Countries, drawn chiefly from Personal Survey. 2 vols, London, Charles Knight, 1836, vol.1, pp.304-313.

- (1) Pro. Ei-ichi Horie produced similar table quoted from Ure's book 'Ei-ich Horie' "On the Formation of British Factory System", Tokyo, Minerva Pub, 1971, p.4., but his table were different from mine. Several blunders and transcription errors were funded in his table.
- (2) This mill was 'the factory' was taken up by A. Ure.
- (3) 'a mill is most compact and be maintained in a good condition'(A. Ure)
- (4) This per cost was the ordinary market price in Manchester(1835), therefore was not actual purchase price in these mills.
- (5) The price of a carding machine was excluded machine cover price.
- (6) This price was based on the price of a power loom (inc. accessories) produced by Bailey Co. in Staly Bridge.
- (7) This total costs are calculated by the per cost, then don't mean actual purchase bill.
- (8) These numbers of spindles are estimated by A mill's average spindles times B mill's machine.
- (9) This total cost are estimated from the ratio of A mill's total cost to B mill's total machines cost.

Table 2 Work Shop Organization in the Lancashire 151 Factories(1833)

Work Shop	Adult Labourer(A)			Non-Adult Male Labourer(D)								Total	D/L	D/M		
	Male(B)	B/M	Female(C)	C/M	E	E/D	E/L	E/M	F	F/D	F/L				F/M	G
Cleaning & spreading	272	21.22	689	53.74	212	95.50	66.04	16.54	1	0.45	0.31	0.07	9	222	69.16	17.32
Carding	2,350	25.01	3,501	37.26	1,229	92.55	34.66	13.08	81	6.10	2.28	0.86	18	1,328	37.45	14.13
Mule Spinning	5,163	33.09	1,189	7.62	697	10.56	7.53	4.47	5,852	88.68	63.24	37.50	50	6,599	71.32	42.29
Throstle Spinning	194	10.51	688	37.27	373	91.20	38.69	20.21	4	0.98	0.41	0.22	32	409	42.43	22.16
Reeling	146	4.40	2,552	76.96	40	88.89	6.47	1.21	5	11.11	0.81	0.15	-	45	7.28	1.36
Weaving	4,627	28.85	6,108	38.08	986	60.45	18.59	6.15	610	37.40	11.50	3.80	35	1,631	30.74	10.17
Roller covering	61	35.88	87	51.18	5	83.33	22.73	2.94	1	16.67	4.55	0.59	-	6	27.27	3.53
Mechanics & Engineer	927	93.73	7	0.71	43	79.63	78.18	4.35	3	5.56	5.45	0.30	8	54	98.18	5.46
Total	13,740	28.25	14,821	30.47	3,595	34.83	17.85	7.37	6,557	63.70	32.65	13.48	152	10,294	51.25	21.16

Work Shop	Non-Adult Female Labourer(H)			Total	H/L	H/M	K	Total	L/M	(M)			
	I	I/H	I/L								I/M	J	J/H
Cleaning & spreading	94	94.95	29.28	7.33	2	2.02	0.62	99	30.84	7.72	321	25.04	1,282
Carding	2,061	92.92	58.12	21.93	117	5.28	3.30	2,218	62.55	23.60	3,546	37.74	9,397
Mule Spinning	346	13.04	3.74	2.22	2,284	86.06	24.68	2,654	28.68	17.01	9,253	59.30	15,605
Throstle Spinning	500	90.09	51.86	27.09	4	0.72	0.41	555	57.57	30.07	964	52.22	1,864
Reeling	542	94.59	87.70	16.34	23	4.01	3.72	573	92.72	17.28	618	18.64	3,316
Weaving	2,538	69.08	47.84	15.82	1,104	30.04	20.81	3,674	69.26	22.91	5,305	33.07	16,040
Roller covering	9	56.25	40.91	5.29	7	47.75	31.82	16	72.73	9.41	22	12.94	170
Mechanics & Engineer	1	100.0	1.81	0.10	-	0	0	1	1.81	0.10	55	5.56	989
Total	6,091	62.22	30.33	12.52	3,541	36.17	17.63	9,790	48.75	20.13	20,084	41.29	48,645

E, I: directly employed by mill owners. F, J: employed by adult labourers(sub-contracting system). G, K: unidentified who employed.
 L: Total numbers of Non-Adult Labourer.
 <SOURCE> Reproduced and supplemented from P.P., Factory Inquiry Commission. Supplementary Report of the Central Board of His Majesty's Commissioners appointed to collect Information in the Manufacturing Districts as to the Employment of Children in Factories, and as to the Propriety and Means of Curtailing the Hours of their Labour with Minutes of Evidence, and Reports by District Commissioners. P1, Parliamentary Papers, Sess.1834, vol. XIX, 1833, Part 1, D.1, Lancashire District, Tables Extracted by S. Stanway, Supplement (B), p.124.

submitted the report to the House of Common in 1834 offered historical documents with the highest elaborateness and reliability about the workshop manpower organization in the cotton mill in the first half of the 19th century. (Table 3,4,5) Moreover, it can guess some tendency of the composition of manpower according to the age in the whole cotton industry if it refers to Table 6 and Chart 3.

In addition, for the workshop manpower composition in the fine spinning section, A.Ure presented the shape case (C Mill and henceforth abbreviation) (Table 7). Besides, about a typical large cotton mill at that time, I want to illustrate the workshop manpower composition of the mill of M 'Connel & Kennedy that has been taken up several times in my research papers (D Mill and henceforth abbreviation)(Table 8).

It should be analyze in relation to my research subject from the above-mentioned historical materials might be the manpower composition mainly consisted of adult operatives in the fine cotton spinning process. In the mule type factory, the spinning process was only workshop for adult labourers = ' skilled labourers' excluding some machines maintenance operatives and the supervisors or overlookers, etc. It was also the reflection of the technical and economical restriction of the mule.

According to the reports to the 'Factory Commission', the relative ratio of the adult male labourers (33.09%) was considerably high level in the spinning process, contrary to the relative ratio of the adult female labourers (7.62%) was overwhelming low compared with other processes. Moreover, it is not also possible to overlook that 88.68 percent of minor male labourers and 86.06 percent of minor female labourers, the composition ratios were high, to some extent compared with other workshops, were employed directly by not the factory owner but the adult labourers. That is, we can conjecture that sub-contracting system to have been adopted almost completely in this workshop.

It can confirm such a tendency if it sees the case of the fine count superior quality cotton string spinning mill (Table 7). In the fine cotton spinning process of this mill, 70 percent or more of the adult labourers concentrated to this section, it is suggested that fine cotton spinning operations deeply depended to the 'skill' of spinners. 70 percent or more of the adult labourers were engaged in the fine cotton spinning process though it saw the case with D Mill that was the typical large cotton mill. Besides, it cannot find the workshop of such an adult mail labourers concentrated on.

Hereafter, I want to point out the features easily about the production technology, the contents of operation, and the workshop manpower composition, etc. according to the processes.

《Blowing Process》

The blowing process had almost been carried out by the manual operation until the

Table 3 Manpower Component by districts in the 151 Lancashire Cotton Mills(1833)

											total
A		10,152	4,489	2,507	4,387	1,403	2,142	2,722	442	317	28,561
B		4,421	2,314	1,251	1,936	728	1,318	1,443	207	122	13,740
	B/M	25.42	30.89	35.58	26.71	29.33	34.91	26.38	28.91	21.90	28.25
	B/A	43.55	51.55	49.90	44.13	51.89	61.53	53.01	46.83	38.49	48.11
C		5,731	2,175	1,256	2,451	675	824	1,279	235	195	14,821
	C/M	32.96	29.03	35.72	33.81	27.19	21.83	23.39	32.82	35.01	30.47
	C/A	56.45	48.45	50.01	55.87	48.11	38.47	46.99	53.17	61.51	51.89
	A/M	58.38	59.92	71.30	60.52	56.53	56.74	49.78	61.73	56.91	58.71
D		7,238	3,002	1,009	2,862	1,079	1,633	2,743	274	240	20,084
E		3,801	1,556	552	1,323	572	813	1,425	143	109	10,294
G		1,423	609	87	698	108	198	356	38	68	3,585
	G/M	8.18	8.12	2.47	9.63	4.35	5.25	6.51	5.31	12.20	7.37
	G/D	19.66	20.29	8.62	24.39	10.01	12.12	12.96	13.87	28.33	17.85
	G/E	37.44	39.14	15.76	52.76	18.11	24.35	24.98	26.57	62.39	34.83
H		2,349	917	458	598	445	575	1,069	105	41	6,557
	H/M	13.51	12.24	13.03	8.25	17.93	15.23	19.55	14.66	7.36	13.48
	H/D	32.45	30.55	45.39	20.89	41.24	35.21	38.32	38.32	17.08	32.65
	H/E	61.80	58.93	82.97	45.20	77.80	70.72	75.02	23.43	37.61	63.70
unclear		29	30	7	27	19	40	-	-	-	152
F		3,473	1,446	457	1,539	507	820	1,322	131	131	9,790
J		1,957	883	240	1,402	262	506	657	63	121	6,091
	J/M	11.25	11.79	6.83	19.34	10.56	13.40	11.99	8.80	21.72	12.52
	J/D	27.04	29.41	23.79	48.99	24.28	30.99	23.92	22.99	50.42	30.32
	J/F	56.94	61.07	52.52	91.10	51.68	61.71	49.70	48.09	92.37	62.22
K		1,451	525	192	127	227	276	665	68	10	3,541
	K/M	8.34	7.01	5.46	1.75	9.15	7.31	12.16	9.50	1.80	7.28
	K/D	20.05	17.49	19.03	4.44	21.04	16.90	24.21	24.82	4.17	17.62
	K/F	42.22	36.31	42.01	8.25	44.77	33.66	50.30	51.91	7.63	36.17
unclear		29	38	25	10	18	38	-	-	-	158
Total (M)		17,390	7,491	3,516	7,249	2,482	3,775	5,469	716	557	48,645
	E/M	21.86	20.77	15.70	18.25	23.05	21.54	20.06	19.97	19.57	21.16
	F/M	19.76	19.30	13.00	21.23	20.43	21.72	24.17	18.30	23.52	20.13

Manchester & its' environs, Stockport, Heaton Norris, Duckenfield, Staley Bridge, Brinnington, Hyde, Tintwistle, Glossop Oldham, Bolton, Warrington, Bury

A : Adult labourers B : Adult male labourers C : Adult female labourers D : Under 18 labourers

E : Under 18 male labourers F : Under 18 female labourers G : Direct employed under 18 male labourers

H : Indirect employed under 18 male labourers J : Direct employed under 18 female labourers

K : Indirect employed under 18 female labourers M : Ground total employed labourers

<SOURCE> Calculated and Reproduced from P.P., *Factory Inquiry Commission, Supplementary Report of the Central Board of His Majesty's Commissioners appointed to collect Information in the Manufacturing Districts, as to the Employment of Children in Factories, and as to the Propriety and Means of Curtailing the Hours of thier Labour:with Minutes of Evidence, and Reports by District Commissioners*, P1, Parliamentary Papers, Sess.1834,vol.XIX,1833, Part 1, D.1, Lancashire District, Tables Extracted by S. Stanway, Supplement (A) p.123.

Table 4 Weekly Wage by workshops and districts in Lancashire 151 Cotton Mills 1833 X 69 weekly working hours, pence)

	labourers	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	average	index for mule spinner
Carder/Overlookers	376	314.46 (111.49)	283.65 (100.56)	249.60 (88.49)	245.73 (87.12)	258.11 (91.51)	304.19 (107.85)	256.94 (91.09)	209.87 (74.41)	282.06	91.60
Jack-frame tenters	696	103.26 (107.58)	111.64 (116.32)	102.01 (106.32)	100.92 (105.15)	95.21 (99.20)	91.01 (94.82)	62.54 (65.16)	69.52 (72.43)	95.98	31.17
Bobbin-frame tenters	945	103.92 (116.11)	95.76 (106.99)	95.52 (106.73)	101.96 (113.92)	92.78 (103.66)	76.26 (85.21)	67.94 (75.91)	73.79 (82.45)	89.50	29.07
Drawing tenters	1,93	101.73 (113.34)	92.38 (102.92)	92.57 (103.13)	76.48 (85.20)	87.78 (97.79)	95.31 (106.18)	70.82 (78.90)	72.91 (81.23)	89.76	29.15
《 mule spinning 》 Overlookers	145	392.55 (111.85)	314.69 (89.67)	311.25 (88.69)	363.54 (103.59)	364.90 (103.97)	277.30 (79.01)	303.43 (86.46)	345.60 (98.48)	350.95	113.98
Spinners	3,797	325.64 (105.76)	291.46 (94.66)	247.96 (80.53)	284.78 (92.49)	274.80 (89.25)	312.68 (101.55)	341.71 (110.98)	287.75 (93.45)	307.91	100
Piecers	7,157	70.73 (109.27)	70.41 (108.77)	66.34 (102.49)	55.28 (85.40)	58.96 (91.09)	74.03 (114.37)	56.10 (86.67)	59.82 (92.41)	64.73	21.02
Scavengers	1,247	33.15 (95.59)	39.87 (114.97)	43.05 (124.13)	42.65 (122.98)	41.49 (119.64)	30.92 (89.16)	33.38 (96.25)	29.86 (86.10)	34.68	11.26
《 throstle spinning 》 Overlookers	82	281.10 (104.69)	284.40 (105.92)	275.50 (101.86)	226.64 (84.41)	296.28 (110.34)	270.68 (100.81)	217.41 (80.97)	-	268.51	87.20
Spinners	1,123	91.85 (98.76)	100.03 (107.56)	102.40 (110.11)	102.88 (110.62)	104.23 (112.08)	79.37 (85.34)	90.21 (97.00)	56.01 (60.23)	93.00	30.20
《 weaving 》 Overlookers	400	293.86 (93.12)	354.81 (112.44)	271.76 (86.12)	308.14 (97.65)	373.44 (118.34)	295.81 (93.74)	282.56 (89.54)	270.72 (85.79)	315.56	102.48
Warpers	332	142.35 (96.78)	147.86 (100.53)	121.76 (82.78)	150.52 (102.34)	215.55 (146.55)	150.50 (102.33)	152.87 (103.94)	131.05 (89.10)	147.08	47.77
Weavers	10,171	129.93 (100.05)	128.25 (98.75)	135.47 (104.31)	132.50 (102.03)	137.60 (105.95)	128.51 (98.95)	111.19 (85.62)	141.65 (109.07)	129.87	42.18
Dressers	836	323.70 (97.01)	349.36 (104.70)	290.78 (87.14)	344.89 (103.36)	345.63 (103.58)	353.48 (105.93)	286.03 (85.72)	369.04 (110.59)	333.69	108.37

The numerical value in parentheses are the relative index each district's wage to the total average wage.

(1) Manchester (2) Stockport, Heaton Norris (3) Duckenfield, Staley-Bridge (4) Hyde, Brinnington (5) Urmastwistle, Glossop (6) Oldham (7) Bolton (8) Warrington
 adult male labourer adult female labourer adult male & female labourer (chiefly adult male) adult male & female and minor labourer (chiefly minor
 labourer non-adult male & female labourer adult female and minor female labourer adult male & female labourer adult male & female, minor
 male & female labourer

<SOURCE> Recalculated and synthesized from P.P., Factory Inquiry Commission, Supplementary Report of the Central Board of His Majesty's Commissioners appointed to collect
 Information in the Manufacturing Districts, as to the Employment of Children in Factories, and as to the Property and Means of Curtailling the Hours of their Labour, with
 Minutes of Evidence, and Reports by District Commissioners, P.1, Parliamentary Papers, Sess. 1834, vol. XIX, 1833, Part 1, D.1, Lancashire District, Tables Extracted by S. Stanway,
 Supplement (E X C) p.125.

Table 5 Manpower Components by Age in the 43 Cotton Mills in Manchester District (1835)

		9 ~ 10	10 ~ 12	12 ~ 14	14 ~ 16	16 ~ 18	18 ~ 21	21 ~	Total
M	Number	498	819	1,021	853	708	758	3,632	8,289
	Weekly Wage (d)	33.8	44	60.3	77.5	98.5	124	264.8	
	Composion Ratio	2.89	4.75	5.92	4.95	4.11	4.40	21.07	48.09
F	Number	290	538	761	797	1,068	1,582	3,910	8,946
	Weekly Wage (d)	35.5	45.5	58.5	76.8	96.5	107	114.5	
	Composion Ratio	1.68	3.12	4.42	4.62	6.20	9.18	22.69	51.91
T	Number	788	1,357	1,782	1,650	1,776	2,340	7,542	17,235
	Composion Ratio	4.75	7.87	10.34	9.57	10.30	13.58	43.76	

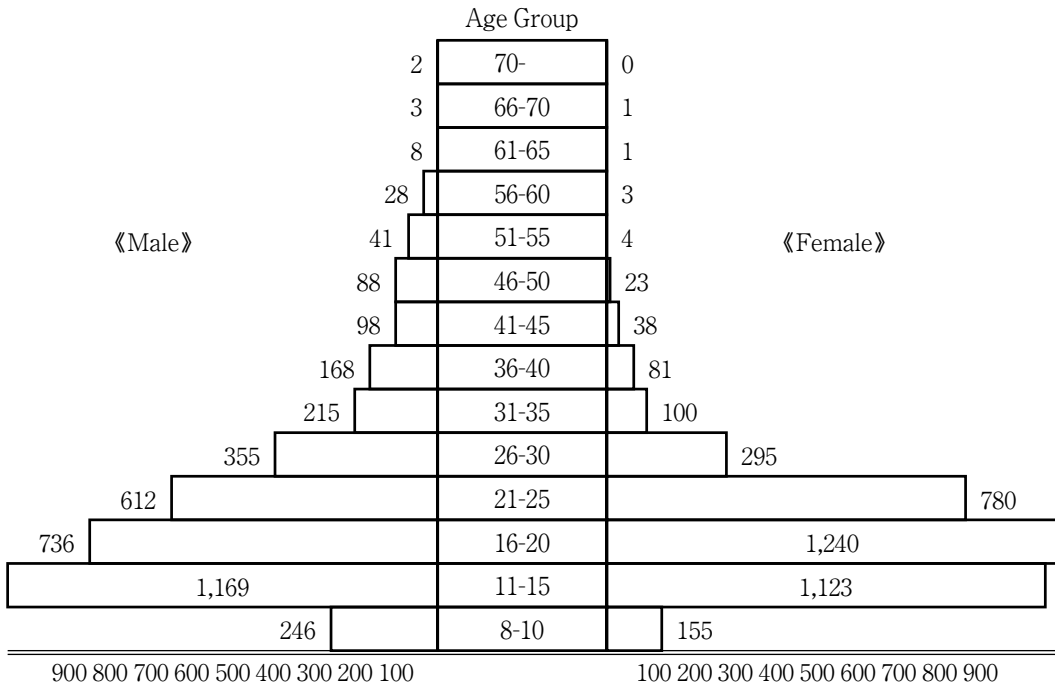
M: male F: female T: total

The composition ratio in the original table had several inaccuracies, therefore recalculate anew.

It's not known exactly when the research year, I estimated at 1835.

<SOURCE> Calculated and Reproduced from Ure, Andrew., *The Philosophy of Manufactures : or An Position of the Scientific, Moral, and Commercial Economy of the Factory System of Great Britain*, London, Charles Knight,1835.

Chart 3. Cotton Mill's Labourer Structure by Age Group (Lancashire, 1833)



<SOURCE> Drafted from P.P., *Factory Inquiry Commission, Supplementary Report of the Central Board of His Majesty's Commissioners appointed to collect Information in the Manufacturing Districts, as to the Employment of Children in Factories, and as to the Propriety and Means of Curtailing the Hours of their Labour : with Minutes of Evidence, and Reports by District Commissioners*, P1, Parliamentary Papers, Sess.1834, vol.XIX, 1833, Part 1, Mitchell's Report, p,21.

mechanization been done in around 1810, had operated by the domestic operation of the hand loom weaver's family, chiefly the women and children or by un-skilled labourers in cotton mills. As for semi-independent hand weaving business before the specialization in the industrial organization, the weaving preparation processes so cleaning, blowing, drying, carding, and spinning, etc. were done by hand loom weaver family's women and children been directed by the master weaver if it excluded the case that depended on the supply of the yarn by manufacturing distributors⁽⁴⁾.

For example, Samuel Crompton, who was the inventor of the mule spinning machine, also before though it was such a hand loom weaver. Geroge, his son recollected his family's domestic work as following⁽⁵⁾.

" I was made to be engaged in the cotton manufacturing at once when came to being able to walk. My mother was beating the lower cotton well on the container of steel. Next, it was put in a deep brown container that soapsuds had entered enough. And, mother rolled up my petticoat to the waist, put me in the container, and made mark time on the lower cotton in the bottom. When the container became full, soapy water was thrown away, and the mass of each lower cotton were squeezed enough to exclude the water. And, after the multiplication of bread that existed under the beam on the kitchen, they were put for the drying. Since it multiplied one mass by easy hand cards at a time, it combed it by the hand with my mother and the grandmother. "

When blowing and scutching machine was put to practical use in 1810's, the blowing process was separated from other spinning preparation processes, and became the operation of an independent workshop. Here, it opened the packing of the lower cotton that had been transported, the various lower cottons supplied to the blowing and scutching machinery according to the regulated ratio of cotton. The lower cotton been unravelled, and dusts and sundries various in the lower cotton were automatically removed in the machine, the mixed and uniformed cotton lap as a straw mat been produced⁽⁶⁾.

Blowing and scutching machine was operated by one adult labourer and young labourer as the assistant, and women and children took charge of the supply of the lower cotton to the machine and taking out the lap. It is obvious by the Chart 1 and Table 2, blowing and scutching machine in the first half of the century respectively separated to willow blowing machine lap machine and accomplished the above-mentioned operations one by one.

The operation did not need a high level of 'skill' and was comparatively easily. It will be able to be guessed that women and children who did not have 'skill', accounted for the majority in most processes, lower cotton supply, blowing and scutching machine operation, and lap processing in this workshop.

According to the investigation of S.Stanway (Table 3), 272 adult male labourers, 222 young male labourers, and 99 young female labourers were engaged in the blowing process. It seems that adult male labourers operated the blowing and scutching machine with young helper, and women and

children took charge with the selection, the supply, and the lap processing of the lower cotton.

However, there was not an adult male labourer in this process of C Mill that was a modern factory where mechanization progressed more (Table 7) and either all were occupied by women and children.

We can easily presume by this conversion that the mechanization and the automation of production in the blowing process had progressed in the half stage of 30's, and the substitution = the dilution from the adult male labourers to the women and children manpower had been progressing. Moreover, almost all labourers directly employed by the mill owner when it refers to the employment system for the young labourers employed there process (Table 3), then it can be said that the generalization of the direct workshop labour control of the master cotton mill through the work supervisor in the production processes had infiltrated the end of the workshop.

This respect was different from the fine cotton spinning process to be seen back remarkably, therefore it can fully recognize that the workshop manpower composition and the workshop labour management were not uniformly in the mule type cotton mill.

《Carding and Roving Process》

The carding process was combined process where carding process, drawing tenters process and roving process closely united with the direction of the product maturity technically and as indicated in the example of A Mill that had indicated previously. In the carding process, the laps processed with blowing and scutching machine were sent to, and the laps were combed by rotating the cylinder (cylinder and top) planted iron needles of the digit carding machine. In addition, these enlarged them and these were processed to the sliver one string.

After these had enlarged them to 6-8 times of the combination of several slivers, these were made to the sliver with high density in the drawing tenters process. In addition, several sliver tied to one string, and repeating the enlargement similarly, strings of almost the same thickness as the first sliver were produced. The fibre of cotton became parallel through this process, and a homogeneous string was made. The slivers were placed in the case were sent continuously to the roving process, and enlarged further, loosely twisted, be done to the thin strings like a knitting needle, and that winded up the bobbin⁽⁷⁾.

Overall, the carding workshop was a workshop for which the adult male labourers 25.01%, the adult female labourers 37.26%, the minor male labourers 14.13%, the minor female labourers 23.6%, then un-skilled women and children manpower accounted for 75 percent after all(See Table 3). The number of adult male labourers to be engaged in these processes was relatively little for D Mill, and only it was little and was 21.97% in the roving processes, and also in 2.7% in the carding

process (Table 8). Moreover, in C Mill, almost all of 175 labourers assigned to the carding process were occupied by women and children without a few overlooker and operatives who were grinders, cylinder strippers, and top-card-strippers, etc. for instance were stated to this process (Table 7).

Their wage earnings were almost in the level of 90-100 pence, too, on the week if it excluded the adult male labourers, so it can be said that the cheap labourers, whose wage didn't come up to as much as 30 percent of the pay of the mule spinner, were the mainly consistent of this workshop (Table 5). In addition, even if it observes minor labourer's employment system, direct employed labourers by the mill owner were the general tendency as well as a previous blowing process, so the male and female labourers were exceeding both of the 90 percent that. We can conclude that direct management of individual chief executives through the overlookers or the foremen on the shop actually functioned here.

On the contrary to this, carders, to which the adult male operatives were allotted from of old, were the occupational category with a relatively high 'skill' degree that obtained the pay twice no previous un-skilled labourers⁽⁸⁾. They were taking charge of some compound duties of work to remove waste cotton from the iron needles of the cylinder and the card of the top etc. while driving the carding machine and to grind the iron needles.

However, the carding machine operatives fell to un-skilled occupational category as for driving the carding machine after 1850's that had come to be comparatively easy, and for the division of labour to be shown in the machine operations, the stripping and grinding, etc.⁽⁹⁾. In the C Mill that was a modern factory where "Rationalization" has progressed, such a division of labour has already been seen, so non-adult labourers were assigned by the carding machine driving operatives, and other work had been resolved to the grinders and the card-strippers, etc.. However, they remained still as the adult male vocational category (Table 7).

《Fine Spinning Process》

It explains in detail in the next paragraph.

《Warp Finishing Process》

The finishing process was divided into some processes according to the product goods. First of all, the yarns processed by the fine cotton spinning process rolled in prescribed wood bobbins according to regulated length and weight, these were returned, and the yarns were offered for marketing. When it manufactured twine, it suited several yarns to a necessary thickness, and moreover, it gave the thread plying machine twisted corresponding to the count, it rolled up in the wood bobbins set in the weight. In addition, the yarn (twin string) with the fine spinning and the

yarn (single yarn) with thread plying machine were arranged in regulated yarn sheaf, and it were made to the product.

In the dressing of the warp, it originally multiplied the warp to the loom , and the hand loom weaver had gone between woven cloth by the hand one by one. Therefore, the hand loom weaver had often to interrupt the woven cloth operation, to do the dressing, and the chain of operations have lacked consistency and continuance remarkably. However, the dressing process came to be mechanized by the early stage in the 19th century, then it separated from the weaving process, it was assumed an independent process, and the warpers or the dressers came to take charge.

The patent of the automatic dressing machine that pasted all woven cloths at a time was acquired by Johnson of Stockport, and the improvements were added to the machine of Jhonson by Mac Adam in 1806. It was put to practical use in the weaving mill of Monteith that existed in Pollockshaws nearby Glasgow. As well-known, afterwards, Ross of Stockport and Radcliffe developed warp-dressing machine that improved this⁽¹⁰⁾. Developments and the improvements of such a series of dressing machine became an important one step for the mechanization of the power loom mill that had lagged behind relatively compared with the spinning section⁽¹¹⁾.

The winding machine, the warping machine, and the dressing machine, etc. were arranged in this weaving preparation processes in the standard large mill (A Mill) and the mainstay modern factory (B Mill) which A.Ure showed, the amount of fixed investments reached considerable amount. That is, it dropped 51 percent or more of the machinery investment total in A Mill and about 40 percent in B Mill had been dropped to the weaving preparation process and the weaving process if it added up these finishing various machines and the power looms (Table 2). This workshop was composed of the overlookers (chiefly adult male), the warpers (chiefly adult male and female labourers), and dressers (chiefly adult male) according to the investigation of S.Stanway (Table 3).

First of all remarkable when it observed prevailing wages by vocational trades that wage earnings of the warpers and the dressers were especially high (Table 5). The dressers chiefly had everyone from the adult male labourers. Besides, there was no such vocational category except the spinner if it excluded the overlookers on the shop for the cotton mill.

The average wage earnings of the dressers were high with 333.69 pence, and the fine spinners pay index was 108.37, and it existed in a high level that exceeded even the average wage of the overlookers. Thus, the dressers had high payment and the privileged position in the background of the special skill, and had the original traditional workshop practice.

They had formed the trade union so far, "enjoyed the privileged position after considerably. They possessed own devices voluntarily, and became to independent master operatives contracted

commission at times as occasionally. They were more than the mule spinner to have obtained the twice the average wage of the power loom weaver even until 1890's⁽¹²⁾.

As for the warpers and reelers, etc. the most were occupied by women and children with this by symmetric, and for instance, the adult male labourers of 3,316 for the investigation were only 4.4 percent slightly reelers. The level of the unskilled labourers of their wage payments moreover was equal to it. The average wage payments was 147.08 pence for the warpers during the week, and it came up only to 44 percent every of the spinner's earnings and 48 percent of the dresser's wage. If the skilled worker named the dressers with low component percentages is done as the exception, it can be easily recognized that the women and children labourers of the low wage were almost main manpower in case of this workshop.

Moreover, the gang system, so co-operation of the women and children labourers of un-skilled and the low wage was adopted in most the processes under the overlooker's control. That is, indirect employment (sub-contracting system) ratio in this workshop, for instance minor male labourer was 0.15% and minor female labourer was 0.69% that hardly been disregarded low level, then universal direct control generalized to the whole of this workshop.

《Weaving Process》

The yarns manufactured from fine spinning process and the finishing process were carried to the weaving process that was the final process of the mill of the spinning and weaving, and woven by the cotton cloth. Here, the yarn was not put directly on the power loom, and some preparations were necessary. That is, the processing of the number of production processes were still added to the warp though the fine spinning weft was used for weaving as it was. The warps, that had been sent, were made the cheese of prescribed length by winding machine while removing the faulty points. The cheese was rolled up the acute angle of the warp in the wood bobbins, and the string did not collapse by the digit one with even if both ends of the wood bobbins were rimless.

Next, it displayed cheeses of a prescribed number, multiplied by the warping machine to arrange the warp, drew out, and it rolled only regulated length in the warp beam. In addition, warp beams of a prescribed number were taken by the dressing machine, the string was drawn out, and pasting was erased. Afterwards, it was dried and rolled up in the dressing beam. The warp and the weft processed thus were collected in the weaving workshop and it was woven⁽¹³⁾.

There were some differences in the employment system though the manpower composition in the weaving process showed a tendency almost similar to the weaving preparation processes. The manpower composition of these processes, adult male labourers 28, 55%, the adult female labourers 38.08%, the minor male labourers 10.17%, and the minor female labourers 22.91% in this process

Table 6 Manpower Composition of the Fine Count Spinning Mill (1830')

department	adult male	adult female	minor male	minor female
clerkship				
cash-keeper	1(0.1)			
clerk / book-keeper	2(0.3)			
spreading process				
spreader			14(1.8)	
batter & picker		9(11.9)		
carding process				
head carder	2(0.3)			
assistant	1(0.1)			
cotton taker-in	1(0.1)			
assistant	1(0.1)			
grinder	4(0.5)			
cylinder-stripper	2(0.3)			
top-card-stripper	12(1.6)			
brusher	3(0.4)			
card-tenter			13(1.7)	
drawing process				
drawing-frame-tenter		28(3.7)		
roving process				
jack tenter		13(1.7)		
strecher		14(1.8)		
back-tenter				14(1.8)
roving-sorter		3(0.4)		
spinning process				
spinner	103(13.6)			
piecer			306(40.4)	97(12.8)
yarn-examiner	1(0.1)			
finishing process				
reeler		15(2.0)		
cop-racker			3(0.4)	
overlooker	2(0.3)			
wrapper		1(0.1)		
maintenance department				
roller-conveyer	2(0.3)			
ledge-tenter	1(0.1)			
mechanics	6(0.8)			
engineer	2(0.3)			
watchman	1(0.1)			
Total	147(19.4)	164(21.6)	336(44.3)	111(14.6)

<SOURCE> Calculated and Reproduced from Ure, Andrew., *The Cotton Manufacture of Great Britain ; systematically investigated, and illustrated by 150 Original Figures, engraved on Wood and Steel; with an Introductory View of Its Comparative State in Foreign Countries, drawn chiefly from Personal Survey*, 2vols, London, Charles Knight, 1836, p.449.

Table 7 Manpower Component in the Mill of M'Connel & Kennedy(1836)

	(A)	(B)	(C)	(D)	(E)	(F)	Total
~13							
male	0	2(0.76) (1.49)	129(15.64) (96.27)	0	0	3(5.77) (2.24)	134 (8.42)
female	0	1(0.38) (1.28)	74(8.97) (94.87)	1(1.33) (1.28)	0	2(3.85) (2.56)	78 (4.91)
total	0	3(1.14) (1.42)	203(24.61) (95.75)	1(1.33) (0.47)	0	5(9.62) (2.36)	212 (13.33)
13~14							
male	0	1(0.38) (0.90)	110(13.33) (99.10)	0	0	0	111 (6.98)
female	2(1.35) (3.17)	9(3.41) (14.29)	49(5.94) (77.78)	3(4.00) (4.76)	0	0	63 (3.96)
total	2(1.35) (1.15)	10(3.79) (5.75)	159(19.27) (91.38)	3(4.00) (1.72)	0	0	174 (10.94)
14~15							
male	0	3(1.14) (5.77)	49(5.94) (94.23)	0	0	0	52 (3.27)
female	1(0.68) (2.00)	15(5.68) (30.00)	26(3.15) (52.00)	6(8.00) (12.00)	2(0.88) (4.00)	0	50 (3.14)
total	1(0.68) (0.98)	18(6.82) (17.65)	75(9.09) (73.52)	6(8.00) (5.88)	2(0.88) (1.96)	0	102 (6.42)
15~16							
male	0	14(5.30) (19.18)	58(7.03) (79.45)	0	0	1(1.92) (1.37)	73 (4.59)
female	5(3.38) (5.62)	43(16.29) (48.31)	34(4.12) (38.20)	1(1.33) (1.12)	6(2.65) (6.74)	0	89 (5.60)
total	5(3.38) (3.09)	57(21.59) (35.19)	92(11.15) (56.79)	1(1.33) (0.62)	6(2.65) (3.70)	1(1.92) (0.62)	162 (10.19)
18~							
male	4(2.70) (1.13)	58(21.97) (16.43)	243(29.45) (68.84)	4(5.33) (1.13)	0	44(84.62) (12.46)	353 (22.20)
female	136(91.89) (23.17)	118(44.70) (20.10)	53(6.42) (9.03)	60(80.00) (10.22)	218(96.46) (37.14)	2(3.85) (0.34)	587 (36.92)
total	140(94.59) (14.89)	176(66.67) (18.72)	296(35.88) (31.48)	64(85.33) (6.81)	218(96.46) (23.19)	46(88.46) (6.64)	940 (59.12)
Total							
male	4(2.70) (0.55)	78(29.35) (10.79)	589(71.39) (81.47)	4(5.33) (0.55)	0	48(92.31) (6.64)	723 (45.47)
female	144(97.30) (16.61)	186(70.45) (21.45)	236(28.61) (27.22)	71(94.67) (8.19)	226(100.0) (26.07)	4(7.69) (0.46)	867 (54.53)
g. total	148 (9.31)	264 (16.60)	825 (51.89)	75 (4.72)	226 (14.21)	52 (3.27)	1,590

(A)picking/carding(B)roving(C)spinning(D)doubling(E)reeling(F)mechanics/clerks/yards hands
The value in parentheses dexter real value is percentage by process and sex, at the bottom by age bracket.

<SOURCE> Calculated and Reproduced from Lee,C.H., *A Cotton Enterprise 1795-1840 ; A History of M'Connel and Kennedy Fine Cotton Spinners*, Manchester, Manchester University Press, 1972, Statistical Appendix, Table 15, p.153.

was adopted. These four attributes were almost balanced though the ratio of minor female labourers were a little high ratio. As for the employment system, 30.04% of minor male labourers and 30.04% of minor female labourers were being indirectly employed by adult operatives. It only existed very much and there was no such high, indirect employment ratio except the fine cotton spinning process if it excluded roller coverers (Table 3).

In general, since the defect might occur in weaving when the yarn was cut though the power loom weaver was taking charge of 2-4 power looms, it was necessary to stop the loom and to tie the string. It seems that non-adult, supplementary labourers under the sub-contracting system were handled for such tying work in the factory system weaving process. However, to driving the power loom since a necessary experience and the skill, etc. were comparatively low, that was, women and children labourers were able to take charge of the operation without fancy weaving. Or, even years of experience little, young labourers were able to take charge of the weaving machine enough if it decreased the number of charge.

It differed from that of the spinner, and that was, the vocational grade difference between a supplementary labourers and the power loom weaver was not the deep one too much and was fixed. Therefore, we can conclude to that supplementary labourers were able to become power loom weavers almost automatically, too, if becoming a certain age.

2 Manpower Composition and Traditional Workshop Practices in the Mule Fine Cotton Spinning Process

The content of the main operation in the fine cotton spinning process was to lengthen and the twist corresponding to a regulated count to rovings produced by the coarse fly-bobbin, and to rolled up in the wood bobbin fixed into the weight. At the manual operation and the stage of a semiautomatic mule until 1830's 19th, the adult boy skill spinner composed the key manpower. Because considerable muscular power was necessary for mobile slider's shuttling. Moreover, considerable skill was necessary for that the adjustment of the faller for the rolling up and operating the screw to adjust the rotational speed of the spindle even if arriving at the stage where making to power progressed afterwards.

Generally, the main manpower in the factory was objectively prescribed for by the machinery system of which of each took charge. It shifted to the manpower composition that the unskilled hand becomes predominant from the vocational category composition that centred on the skilled worker if it saw for the long term. Therefore, it can be said that subdivision and making to a single ability from the trade to the job in individual work had progressed.

However, it cannot overlook not only progress of the production technology, from the water frame to the mule, dismantled of the skill but also increased the necessity of new skill in the cotton mill of this age. But, it is needless to say that it is a mistake to catch the shift from the water frame to the mule as a mere technical improvement and technological development. The mule did not appear as development and an improvement from the water frame. Both developed with an original production field as an almost distinct mechanical production system.

However, it will not be able to deny the spinning technology from the water frame to the mule to have been shifted in about the turning point in the century if it says from the viewpoint of development of the entire British cotton spinning industry. The way that the mule spread as "Leading part" in a coetaneous British cotton spinning industry expelling other spinning machines even though there were special circumstances of conversion to a high-level fine cotton spinning. Therefore, it is not a big mistake even if it is expected that it converted from the water frame to the mule if it sees from the entire spinning technology. That is, the majority of the spinners were had for the water frame by the minority male and female manpower, and the work organization of the workshop the co-operation system, so called the gang system to gather many unskilled and non-adult manpower by centring on the overlookers was taken⁽¹⁴⁾.

On the other hand, small group work organization, that assumed 'skilled' spinner that put some unskilled hands as supplementary labourers under immediate conduct of the self to be a unit, was general for mule cotton spinning mill⁽¹⁵⁾. In other words, the conversion of the leading part in the cotton spinning technology of which turning point was also the early 19th century was the change of its direction from the Arkwright type mill it's main component of labourers was un-skilled to the mule type mill that was composed with skilled labourers as shop leader. Moreover, this conversion made the conversion of the key manpower from the infant child labourers , for example, 'parish apprentice' to the skilled spinner inevitable.

After all, the impact, that the production technology reformation gave worked, was various according to each phase for the short term though it had the resolution of the skill as the long-term tendency. Therefore, it is necessary to pay attention to no one that all technical improvements compel the move to the machine and the device of skill directly.

On the other hand, in the mule cotton spinning process, it was necessary some piecer who were in charge to tie the cut strings were drawn out from the mule and to replenish the spindles besides spinners were charged to operate the mule. Moreover, it was necessary to remove and to clean the cotton crumbs of down regularly in operation of fine spinning machine, this was a role of scavengers⁽¹⁶⁾. The characteristic tendency of the manpower structure in such a fine cotton spinning process appears well in the Table 3. The ratio of the adult male labourers who were

engaged in operation of the mule was also high with 42.29%, and the ratio of the minor male labourers (the piecers and the scavengers) that relative with 33.09% was high.

On the other hand, the ratio of the adult female labourers that were the key manpower in other workshops has lowered extremely with 7.62%. In the D Mill, while the ratio of the adult males was a level of 29.45%, was highest in the main processes, the ratio of the adult female labourers was the lowest with 6.42%. Moreover, it was not able to admit the appearance of the female labourers in the fine cotton spinning process of C Mill advanced by mechanization (Table 7 and 8). And it can recognize the almost similar tendency to be about wage earnings (Table 5). Though the wages of the spinners were in 307 pence and the same levels of the overlookers as it on the week, that of the piecers and the scavengers were only the lowest level in 35-65 pence and all occupational categories and existed. After all, the manpower composition with two extreme both types, the skilled adult male spinner that obtained the highest pay and child assistance labourers very bad pay had been paid existed together in the manpower composition in the fine cotton spinning process. It was a special composition with extremely little intermediate adult female labourers.

The problem is how the peculiar manpower composition in the fine cotton spinning process not seen in other workshops was related to the various labour habitual practice, the special character of the spinners, the functions of the spinner's union, and the industrial relations in the cotton trade, etc. In general, the spinners that operated two sets of mule took the top position of the workshop organization, and the fine spinning operation was accomplished by the small group work that some piecers and scavengers shared work according to a specific job rank. The series of operations were under the conduct of the fine spinner, then it is necessary to point out that the intervention of the overlookers who connected directly with the factory owner to the small group work was hardly seen. The sub-contracting system, that fine spinners undertaken the work as one unit of this small group work, and procured and employed supplementary labourers by the spinner's own judgment and managerial ability was widely generalized in the cotton spinning mills⁽¹⁷⁾.

Spinners were paid by the piece-rate wage that prescribed in the wage list⁽¹⁸⁾ decided according to the string quality and number of the spindles, and he paid the wage (fixed time wage and extremely low level) to the supplementary labourers, in addition to paid the fuel charge, the paraffine cost, and the furnishings costs by their own earnings⁽¹⁹⁾. To maintain such their 'semi-employer' positions, the spinner's union adopted an exclusive union policy, and it is necessary to pay attention to that the spinner's union regulated the supply of the spinners by restricting the apprentice system and the internal promotion system⁽²⁰⁾.

However, in the long term viewpoint, the technical skill differential between the skilled labourers and the unskilled labourers had tended to the reduction by the gradual spread of the self-

Table 8 Manpower Component by districts in the mule spinning process weekly average wage (1833年)(in pence unit)

		overlooker a	spinner b	piecer c	scavenger d	total	b+c+d /a(3)	c+d/b (3)
Manchester & its' environs (1) (2)	real	57	1,435	2,697	884	5,073	88	2.50
	wage	392.55	325.64	70.37	33.15			
		120.54	100.00	21.61	10.18		(100.0)	(100.0)
Stockport, Heaton Norris (1) (2)	real	10	398	571	93	1,072	106.2	1.67
	wage	314.69	291.46	70.41	39.87			
		107.97	100.00	24.15	13.68		(120.7)	(66.8)
Duckenfield, Stayley Bridge (1) (2)	real	18	402	683	21	1,128	61.67	1.76
	wage	311.25	247.96	66.34	43.05			
		125.52	100.00	26.75	17.36		(70.1)	(70.4)
Brinnington, Hyde (1) (2)	real	23	380	572	80	1,055	44.87	1.72
	wage	363.54	284.78	55.28	42.56			
		127.66	100.00	19.41	14.98		(51.0)	(68.8)
Tintwistle, Glossop (1) (2)	real	5	209	481	51	746	148.2	2.55
	wage	364.90	274.80	58.96	41.49			
		132.79	100.00	21.46	15.10		(168.4)	(102.0)
Oldham (1) (2)	real	5	226	326	28	585	116.0	1.57
	wage	277.30	312.68	74.03	30.92			
		88.68	100.00	23.68	9.63		(131.8)	(62.8)
Bolton (1) (2)	real	23	675	1,688	25	2,411	103.8	2.54
	wage	303.43	341.71	56.10	33.38			
		88.80	100.00	16.42	9.77		(118.0)	(101.6)
Warrington (1) (2)	real	2	48	95	41	186	92.0	2.83
	wage	345.60	287.75	59.82	29.86			
		120.10	100.00	20.79	10.38		(104.6)	(113.2)
		88.04	88.36	85.01	80.05			

(1) Wage index by trades to spinner's wage in each district.

(2) The same trades relative wage index in which case the wage of any trade in Manchester=100.

(3) Relative index in each districts in case of the index of head count in Manchester.

<SOURCE> Calculated and Reproduced from P.P., *Factory Inquiry Commission, Supplementary Report of the Central Board of His Majesty's Commissioners appointed to collect Information in the Manufacturing Districts, as to the Employment of Children in Factories, and as to the Propriety and Means of Curtailing the Hours of their Labour : with Minutes of Evidence, and Reports by District Commissioners, P1*, Parliamentary Papers, Sess. 1834, vol.XIX, 1833, Part 1, D.1, Lancashire District, pp.126-133.

actor mule, and the technical labour substitution of the fine spinning operation has been generalizing. However, in the realities, the privileged position of the fine cotton spinners and manpower composition in the fine cotton spinning process, furthermore the exclusive character of the spinner's union were not necessarily compelled to restructure by such technical improvements

in mule type cotton mill of this age. The problem is the factors to make them remain. It's the important problem, whether those factors had any close relations with the labour management or the industrial relations in the mule type cotton mills or not. If those factors had, what kind of one. It will have to investigate such doubt points again.

I want to analyze the workshop manpower composition in the fine cotton spinning process basing the above-mentioned point here a little in detail now. Especially, I want to search for the actual conditions of the component percentages of the spinner and the piecers. The quantitative ratio of the spinner and piecers & scavengers that clearly showed in Table 8, had considerably regional differences to observe only Lancashire district. If it saw roughly, 1.5 to 3 supplementary labourers for one spinner were necessary. The regions where this ratio had risen relatively were in districts such as Manchester, Bolton, Warrington, and Tinwistle was a level of generally 2.5-2.8.

On the other hand, it stayed in the level of 1.5-1.8 in other regions, and it can be said that the difference was large. The difference between such regions was thought to be the one by the difference of the yarn count in each region and the difference of the specializing quality of the spinning cotton yarn therefore. That is, the difference in the number of supplementary labourers who assisted the spinners was caused by the species of the spinning yarns whether the high count of yarn or a low count of yarn. It is thought that it was necessary to pay close attention by cutting strings, so that a lot of piecers were needed in the case of the fine count spinning, besides the quintessence the spinner's skill. The ratio of supplementary workers rose therefore by the regional difference's spinning article in the regions specializing high count spinning more relatively than other low count of yarn spinning regions. Moreover, because the number of spindles had increased along with the lengthen and the automation, etc. of the mule that much, too the staff increase of the piecer was needed.

Certainly, the enlargement of mule has progressed from early time in Manchester and Bolton compared with other regions. On the other hand, the machine operation became more easily and the number of spindles became more remarkable by the lengthen and automating of the mule. However, an increase in the number of the fine spinner of the charge mule needed and the staff increase of the piecer was needed⁽²¹⁾.

According to one theory, it is pointed out that as many as nine supplementary labourers also even needed who had been enough only 1-2 people per one fine spinner before because of an increase in the number of the fine spinner of the mule charge by the introduction of the self-actor mule⁽²²⁾. However, it can be said that the doubt remains a little in the question point that the ratio to supplementary labourers and the picers per one fine spinner becomes 1:9.

However, there was an example. Those John Redman who testified had entered to the cotton

mill for a piecer at the age of 8, and had learned the spinning work as an apprentice at the factory of A. & G. Murray at the age of 17, and had become a fine spinner at the age of 22, were visiting overseer of Manchester at that time in 1833, he was answering the question how many piecers the fine spinner employed in 'Factory Commission' in 1833 as follows⁽²³⁾.

"The numbers of piecers who employed by the one spinner are from 2 to 8 or 9, according to the machine size and the count of yarn he spin. When the width of length the mule or the number of spindles is a large squid or high count of yarns, the spinner needs more piecers."

However, wasn't this numerical value of 8 or 9 people a little exaggerated or exceptional? Oppositely, the staff increase of the piecer was not necessary according to the point of A.Ure well because of one scavenger person one spinner in case of the self-actor mule⁽²⁴⁾. This he might say only in those days, and considerable undervaluation, too. The needed number of piecers was answered according to the testimony in the Parliamentary Commission in the latter half of 30's as three for one fine spinner⁽²⁵⁾. According to another research, though it was enough in the 2 piecers (the wife, and the child) and one fine spinner to operate 540 spindles with two mules in 1819 of Manchester, the ratio became three piecers in 1832, and became couple 4 at a standard factory in next year⁽²⁶⁾.

The fine spinner's union had especially limited the adoption of a supplementary labourers as the piecer etc. only to the spinner's family, especially his children before. Of course, all of the spinning assistance labourers in a cotton mill at that time were not being supplied by the family of the fine spinner alone, but it seems that it was considerably general that the fine spinner procured supplementary labourers from his children under the sub-contracting system⁽²⁷⁾. When maintaining such labour habitual practice became difficult a little⁽²⁸⁾ and procurement excluding the fine spinner's family became inevitable, then "exclusive practice" of the fine spinner's union to which a very thing base was given by monopolizing the adoption of the piecer came to slacken somewhat, too. For instance, Andrew Gemmill to be the Legal Adviser of the fine spinner's union at that time had made the evidence in the 'Select Committee on Combination of Worker' 1837-1838 years of the Parliament to answer the question that the fine spinner has boycotted becoming closely related of the piecer as follows⁽²⁹⁾.

"Though there were such union articles before, it become ineffective now. he [fine spinner] knows doing so to be impossible well. Now, children of the hand loom weaver of at least 1,305 person are employed as a piecer by the 950 fine spinners in Glasgow and the outskirts, then this spinners' union have no any exclusive character that the Magistrate pointed out."

Of course, such the evidence of person's related to the trade union was a reflection of the

apprehensions that the 'exclusive character of the spinner's union was not desirable for the Nation or Parliamentary statesmen, therefore, it is dangerous to receive the evidence at face value. However, it might be true that the supplementary labourers demand increased still even so by enlargement and the improvement of the mule, the supplementary labourers restriction through relate about the fine spinner between kin became difficult gradually, and a large amount of spinning assistance labourers advanced excluding the fine spinner family.

At any rate, it can be confirmed that the ratio of the fine spinner and the supplementary labourers was related to the cotton yarn articles and the enlargement and the improvement of the mule. Here, in the relation to the subject of this research, I want to analyze the correlation of the cotton yarn article and the ratio of the fine spinner and supplementary labourers. If it was the one that high-level spinning demanded the complexity more than usually from the fine spinning work that much, needed the more high level skill of the spinners and increase of the supplementary labourers, the correlation that there was some, significant differences between the fine spinner's wage earnings and the ratio of supplementary labourers should be able to be found.

In Manchester, Bolton, Tintwistle, and Warrington where the ratio of spinner to supplementary labourer was relatively high, the wage index of the fine spinner in each district where Manchester was assumed to be 100 were 100, 104.93, 84.39, 88.36, the former two were high, and the latter two were low. On the other hand, in Stockport, Duckenfield, Hyde, and Oldham where the ratio of spinner to supplementary labourer were relatively low, the wage index were 89.5, 76.15, 87.45, 96.02, and in any case, the fine spinner pay index such as low had fallen below that of Manchester relatively.

To consider the region both previous Tintwistle and Warrington where the number of samples were little, it is likely not to come to violate a big mistake too much even if it is expected that there was a correlation between the cotton yarn articles and the ratio of spinners to supplementary labourers. For instance, the ratio of the number of spinners to the supplementary labourers in 19 fine cotton spinning factories in Manchester were said becoming couple 3.85(30), from this respect any relations of the cotton yarn articles and the ratio of supplementary labourer can be confirmed. Moreover, except to both Stockport and Oldham, the ratio of the labourers in the fine spinning process to the overlookers were low in the any regions where the ratio of supplementary labourer was low. Therefore, it can be assumed that the direct management by the Mill owners through the overlooker more progressed in these regions.

In other words, in the region where specialized in the coarse count or the rough quality cotton spinning as the ratio of supplementary labourers was low, the dependency to the skill of the fine spinner was low, the workshop control of the fine spinner in the background of skill didn't infiltrate,

and therefore it can say that the direct management by the mill owners was comparatively accomplished easily. Of course, the difference of both was not necessarily too large, but we would rather pay attention to the difference of both and the relation of the labour practice and the skill.

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