

# **Report to the Local Government Board on proposed changes in hours and ages of employment in textile factories / by J.H. Bridges and T. Holmes.**

## **Contributors**

Bridges, John Henry, 1832-1906.  
Holmes, Timothy.  
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Wellcome Collection  
183 Euston Road  
London NW1 2BE UK  
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TEXTILE MANUFACTURES.

# REPORT

TO

THE LOCAL GOVERNMENT BOARD

ON

PROPOSED CHANGES IN HOURS AND AGES OF  
EMPLOYMENT IN TEXTILE FACTORIES.

BY

J. H. BRIDGES, M.D., AND T. HOLMES.

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Presented to both Houses of Parliament by Command of Her Majesty.

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LONDON:

PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,  
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IN THE CITY OF CHICAGO

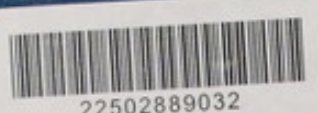
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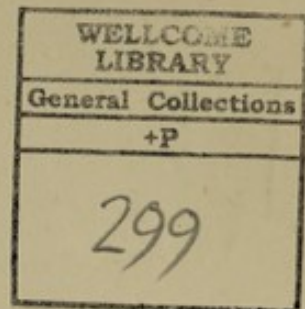


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TEXTILE MANUFACTURES.

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## R E P O R T.

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MY LORDS AND GENTLEMEN,

IN conformity with your instructions we beg to present the following Report on the health of women, children, and young persons engaged in textile manufactures, with special reference to the hours and ages of employment.

The materials on which our conclusions are founded have been brought together by the following methods:—

- I. Conferences with employers and workpeople.
- II. Inspections of a considerable number of factories.
- III. Reception of written evidence from medical men practising in textile districts.
- IV. Examination and measurement of a large number of children, with the view of comparing those employed in factories (*a*) with those not so employed, but living in the same district; (*b*) with those living away from factories altogether.
- V. Statistical information supplied from the Registrar General's Office, and from other sources.

Under each of these heads we propose to offer some observations.

### I.—CONFERENCES WITH EMPLOYERS AND OPERATIVES.

We were directed to put ourselves in communication with associations of employers and of workmen that might have been formed with reference to this subject, with the view of ascertaining the views held on either side. Our first steps therefore were directed to this object.

We found Manchester to be the centre of two important associations, the one of masters or factory occupiers, the other of workmen, both interested in the question of the maintenance or reduction of the present hours of labour, and both in relations with various local societies in other towns of Lancashire and Yorkshire.

The secretaries of these societies displayed the greatest readiness to offer us information, and to bring us into contact with the bodies whom they represented.

The result was that we held five conferences with associations of employers, viz., at Manchester, Leeds, Bradford, Belfast, and Dewsbury; and ten with associations of workmen, viz., at Manchester, Blackburn, Burnley, Stalybridge, Oldham, Leeds, Bradford, Belfast, and Dundee. It will appear that the conferences with workmen were the more numerous. But those with the Masters Associations were supplemented by interviews with individual employers at the time of our visit to their mills.

Much of the information supplied to us in these conferences will find its place under other heads of our Report. To us their most immediate and direct result was to place in a clearer and more definite form the various issues raised.

We must not, however, be understood as implying that all employers are on one side in this question, and all their workpeople on the other. In two of the deputations advocating a reduction of hours employers were represented; and among the Masters Associations we found both collective and individual opinions, favourable to modifications, more or less extensive, of the existing law. On the other hand, we have reason to believe that the workpeople are by no means unanimous on the other side of the question; and that among the women especially there is a considerable amount of apathy, and possibly in some cases of positive opposition to the proposed changes.

The claim advanced by the advocates of legislative interference with the existing hours of labour rested upon alleged evils, some of which were common to all branches



of textile manufacture, some were peculiar to certain fabrics. The former are as follows:—

- I. Ten hours and a half of monotonous unceasing labour, even under the most healthy conditions, are said to be a longer time than is consistent with the health of young persons between the ages of 13 and 18, and of women generally of whatever age. And this grievance has become especially prominent since the adoption of the nine hours system in so many occupations in which men are engaged.
- II. Since the Factory Act of 1847 was passed greater pressure has, it is said, been put upon the workpeople. This increased strain is stated to occur in three ways:
  - (a) Each operative attends to a larger quantity of machinery.
  - (b) The machinery is driven at a greater speed.
  - (c) The practice of giving overlookers and foremen a premium on the amount of work done leads them to exact steadier and harder work than formerly.
- III. An excess of infant mortality results, it is thought, from neglect of infants by mothers who work in factories.

In addition to these general grievances applicable to all classes of factory labour, special evils were alleged to exist in the manufacture of flax and of cotton. In the former it was complained that women and children worked in cold draughty rooms, in an atmosphere loaded with dust; or else in rooms stiflingly hot, and saturated with steam. In the cotton manufacture the evils of heat, dust, and want of ventilation were strongly urged against certain processes, especially spinning and carding. Various evils of recent growth were also strongly insisted upon. It was stated that, owing to the pressure caused by the high prices of raw material prevailing since the American war, very inferior qualities of cotton have been largely used; that cotton waste of the lowest kind formerly used for paper-making is now used for spinning purposes; that an increased quantity of dust is generated by the use of this low material; and that the labour of the spinner is increased by the more frequent breakage of threads. The over-sizing of cotton warps, whether for the purpose of increasing their weight or of giving very poor yarn sufficient cohesion to hold together in the loom, was also loudly complained of; and this too was said to be an evil of recent introduction. It was asserted to affect the health of the workpeople in three ways: first, by the amount of dust given off in weaving; secondly, by the alleged practice of saturating the atmosphere of the weaving shed with moisture, to soften the over-sized warps; thirdly, by the increased brittleness of the threads of the warp and consequent increase of labour to the weaver. To this, as well as to all the other points mentioned, we shall afterwards recur.

Against all these assertions counter statements were made by the Employers Associations, and by individual employers with whom we conversed. With reference to the contrast between the ten hours and a half of the factory worker and the nine hours of the mason, the miner, or the iron worker, it was pointed out (1) that the reduction of hours had been obtained without the aid of the Legislature; (2) that factory labour was very much lighter than mining, iron working, or building; and (3) that as a matter of fact the women and children in factories did not suffer from their employment: "their bright and healthy appearance is patent to all. Thousands of women are now earning upwards of twenty shillings per week; and those of mature age whose employment is suited to their strength supply no evidence that they cannot with comfort and health work as long hours as men."\*

With regard to the increased speed of machinery and the increased amount of machinery entrusted to each operative, these things were not denied, though it was asserted that they had been much exaggerated. But it was strongly urged that the improvements in machinery in recent years "had relieved the workers from much of the labour, care, and attention required of them formerly;" that they had tended "not only to make the machine run with fewer calls for exertion on the part of the worker, but still more to make the exertions when called for less severe; to make the motive power, with the minimum of intelligent direction, do what formerly called for muscular exertion."

With regard to the sanitary arrangements of mills it was urged that "in the construction of modern mills a vast improvement had been made in the last twenty years, many of the workers performing their day's labour in rooms which are lofty, airy, better ventilated, and more light, cheerful, and wholesome than the generality of their own homes."

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\* Extract from a printed statement circulated by Employers Association.



With reference to infant mortality doubts were expressed by some how far this was attributable to factory labour, but there was on the whole a disposition to allow that the employment of married women, especially of pregnant women or women recently delivered, might have this result. "Infant mortality," it was said, "is caused by ignorance as to proper treatment of children." "Another cause is that women work immediately before and after their confinement, and this is most frequently necessitated by drunken or lazy husbands. Would the burden on women be less if the earnings of husbands were lessened by shorter hours? If it be true that an unusually large proportion of the infants born die during infancy, and if it were demonstrable that this was caused by their mothers working in factories, the remedy would be to discharge young married women from working there at all, not merely to reduce their hours, still less to reduce the hours of the unmarried or the aged." With regard to the special evils alleged to be caused in the cotton trade by over-sizing and the use of bad material, it was stated that these evils were of partial and exceptional character, and were not likely to be of long duration. The bulk of the material used in the trade was asserted to be of the usual kind. And the prosperity of Bolton, where none but the finest material was used, was pointed to as a proof of this assertion.

Into those arguments of the employers which deal with the economical mischief that would accrue from any further legislative interference with the hours of labour we do not of course enter, as they are foreign to the clearly defined purpose of our inquiry. If we allude at all to the question of wages, we do so solely, so far as it might seem to affect the question of a food supply. With this view we frequently asked the question of those manufacturers who had already acceded to a certain reduction of the hours of labour on Saturday, as in the Oldham and in some districts of Yorkshire and Scotland, whether the amount of production, and therefore, in case of piece work, the amount of wages, had been lessened in proportion to the diminution of time. The general reply was that it had been so lessened. In the flax and jute districts of Scotland, however, where the number of hours has been lately reduced from 60 to 58, or even to 57 hours per week, the reply was less unanimous. Some manufacturers admitted that in the weaving department the amount of production had not lessened in consequence of the reduction of working time.

From this general view of the arguments advanced for and against legislative interference we pass to the statement of our own investigations.

## II.—INSPECTION OF FACTORIES.

The time allotted to our inquiry was limited. It was, therefore, the more important that the factories selected for inspection should fairly represent, as far as practicable, the various features of each manufacture from a sanitary point of view, so as to enable us to form in our own minds a conception of the average standard. We were guided in our selection by the information derived from employers, from operatives, and from the factory inspectors and certifying surgeons. Our object was to see some of the best and some of the worst factories in each district, as well as those of an intermediate character, and we believe that this object has been fairly attained.

The time spent on each branch of manufacture was regulated partly by the number of operatives engaged in it, partly by the sanitary evils alleged to be attendant upon it.

In 1867 the number of operatives employed in textile manufacture were distributed as follows :—\*

	Total Operatives employed.	Under Factory Act.
Cotton - - - - -	401,064	296,603
Worsted - - - - -	131,896	107,184
Flax - - - - -	118,929	96,750
Wool and Shoddy - - - - -	121,191	76,896
Silk - - - - -	41,017	32,643
Jute - - - - -	14,170	12,016
Hosiery - - - - -	6,580	4,174
Lace - - - - -	6,755	3,619

\* Parliamentary Return, 22d July 1868 (453).



In 1870 the distribution was as follows :—

	Total employed.	Under Factory Acts.
Cotton - - - - -	450,087	333,041
Flax - - - - -	124,037	100,037
Worsted - - - - -	109,557	84,607
Wool and Shoddy - - - - -	128,946	47,302
Silk - - - - -	48,124	39,071
Jute - - - - -	17,570	14,943
Print Works - - - - -	29,576	13,181
Bleaching and Dye Works - - - - -	31,427	11,393
Hosiery - - - - -	9,692	6,020
Lace Works - - - - -	8,370	4,217
Total in the above Trades - - -	957,386	653,812

We inspected 53 cotton mills, 6 silk mills, 28 flax and jute mills, 12 worsted mills, 15 woollen and shoddy mills, and 6 lace mills. The time required for determining with accuracy the temperature in the various rooms of a mill rendered the work of inspection necessarily slow.

#### *Cotton Manufacture.*

It will be observed that of textile operatives protected by the factory laws, 46 per cent., or nearly half, are employed in the manufacture of cotton. In 1870 the proportion is above one half. And, apart from this numerical preponderance, the complaints urged against the processes of this manufacture are more loud and also more varied than against those of any other.

In addition to the general grievances of increased speed of machinery, &c. &c. applicable to all trades, it was stated that the health of cotton operatives suffered (a) from high temperature; (b) from want of ventilation; (c) from dust; (d) from badly arranged privies; (e) in the weaving department, from the effects of over-sized yarn.

It was incumbent upon us to form a judgment, not merely whether these evils were real in two or three instances pointed out to us, but how far they were characteristic of the manufacture generally. We examined, therefore, cotton mills in the following localities:—Ashton, Blackburn, Bolton, Burnley, Darwen, Haslingden, Manchester, Oldham, Preston, Stockport, and Todmorden.

It will not be necessary for the purpose of the report to enter upon any detailed description of the manufacture of cotton yarn and cloth.

The various processes may be summed up under three heads :—

1. Preparation of cotton for spinning.
2. Spinning, by mule, or throstle frame.
3. Weaving.

I. For the purpose of this report, it is enough to say that the preparation of cotton for spinning consists (a) in mixing various sorts together; (b) in freeing it from dirt, and opening out the fibres by a system of willowing machines; (c) in laying the fibres parallel to each other, and forming them into a soft spongy elongated mass, called a sliver, by the carding engine; (d) in laying together several slivers, and increasing their length by "drawing" machines; (e) in still increasing the length of sliver, diminishing its diameter, and giving it just sufficient twist to secure its coherence, in a series of "slubbing" and "roving" machines. The soft, slightly twisted, slightly coherent, roving is then handed over to the spinner.

Of these various processes (a) the mixing and (b) the willowing are carried on in distinct rooms.

Mixing. In the mixing room we found little cause for remark. Women and children are employed to some extent in the mixing of cotton; but in the willowing rooms the work is done almost exclusively by men. In the willowing room, which it might be supposed would have been found specially liable to dust, the construction of the machine is such as to obviate this evil almost entirely: the fans placed in the machines cause a powerful in-draught; the movement of air in these rooms is extremely rapid, and the temperature was in no instance found excessive.

Willowing. Processes (c), (d), and (e), i.e., the carding, drawing, slubbing, and roving, in mills of small or moderate size, are carried on in the same room. This room is commonly spoken of as the carding room, or preparing room. In large mills some or all of the "slubbing frames" and "roving frames" are placed in distinct rooms. And this is

Carding.



especially the case in fine spinning mills, where much of the space in the card-rooms not occupied by carding engines is filled by combing machines, which, like the wool-combing machines in the worsted trade, separate the long fibres from the short.

The persons most commonly employed in the card-room are as follows :—

Lap-carriers, commonly lads from 13 to 16.

Strippers and grinders, adult males.

Can minders, usually young full-timers.

Drawing-frame minders, always women.

Slubbing-frame minders, and sometimes roving-frame minders, women.

Sweepers, usually young lads, half-timers.

The lap-carriers carry the rolls of willowed cotton from the finishing machine in the blow-room, and place them on the carding machines. The rolls or "laps" weigh about 28 lbs., and one lad will feed from 15 to 20 carding engines.

The distance the laps are carried depends entirely on the arrangement of the machinery, *i.e.*, on the relative positions of the carding engine and the finisher in the blow-room. It will vary from 10 to 30 paces. The work is carried on steadily and continuously, but without any appearance of hurry.

The operations of the carding machine fill the air of the room with fine light fibrous dust; the heavier inorganic dust having been almost entirely beaten and sifted out by the willowing machines. The particles which throng the air of the card-room consist mainly of very minute fibres, varying in length from a line to a very minute fraction of it. In the mills where the cotton used is of a very low quality there is in addition to this fine dust much "flying," "fluff," or "flue," consisting of longer fibres. In the finer spinning mills where the staple used is long, and especially those of them that are lofty and not overcrowded with machinery, the air on a first inspection might seem tolerably clear. But the first sunbeam revealed the dense and universal dissemination of dusty particles, and the clothes and hair of the workpeople were in a state that showed how rapid was their accumulation. A rough test of this which we often used was to clean a smooth metal surface, and note the time within which sufficient dust had collected to make distinct marks upon it. Five minutes were frequently sufficient for this purpose.

Part of this dust is caused by the ordinary action of the revolving cylinder and rollers of the carding engine upon the cotton which passes through them; for although these parts are enclosed in a wooden casing to the utmost extent, probably, which is practicable, yet a certain amount of fine fibre escapes through the various joinings of this casing. This is, however, a very small proportion of the whole. By far the larger part is caused by the two operations of "stripping" and "grinding."

The cylinder and rollers of the machine, armed with the fine metal teeth by which the cotton is carded, tend continually to become clogged with refuse fibres. The teeth also become very speedily blunted. Hence the necessity for stripping and grinding. The stripper, in every case an adult male, stops the machine, removes its wooden cover, reverses the action of the rollers, and thus, much in the same way as hairs are removed from a pair of brushes by rubbing them together, the waste fibres lying between the teeth of the machine are brought to the surface and easily removed. This is called "stripping." A dense cloud of very irritating dust is given off in the process. The number of carding engines in the card-room of an ordinary mill is considerable, varying from three or four in very small mills to more than a hundred in the largest. Each machine is stripped at least once or twice, often three times, and in some cases five times a day. The process is therefore continually going on, and a supply of dust sufficient to fill the largest room is easily accounted for. Some of the carding engines have the rollers stripped by a continuously self-acting process, but we could not discover that the dust generated was either less or more than by those in more ordinary use.

The operation of "grinding," *i.e.*, sharpening the teeth of the cards, is performed less frequently than stripping. In some cases it is done daily, in others three times a week, in a few only twice. The large cylinder against which the smaller toothed rollers revolve is too weighty to remove, and must be ground where it stands. The rollers can be easily moved and ground in a separate workshop, where a fan may be specially arranged to carry off the metallic particles. And this is sometimes done, but, so far as our experience goes, is not done in the majority of instances. The cylinders in the smaller and more antiquated mills are ground by hand, an emery surface being pressed against them. In the newer mills a small emery roller travels laterally by a self-acting process, to and fro, along the surface of the cylinder.

The dust given out in this operation is universally admitted by employers as well as workmen to be highly injurious to health. It must be observed, however, with special



reference to the purport of this inquiry, that grown men, and not women or children, are employed in the process. Some complaints are made by women in the slubbing frames that happened to be placed very near a carding engine, that they suffered from the dust given off during the grinding, but the specific gravity of the iron particles prevents, as it seemed to us, their dissemination over a very extended portion of the space of the room. This is of course not the case with the dust caused by "stripping." The grinders themselves often mitigate the danger by a plug of cotton wool held between the teeth. As a class these men are pale and worn in appearance.

The dustiness of the card-room may no doubt be very greatly mitigated by a system of flues, connected with exhausting fans. One very elaborate example of this arrangement was shown to us at Blackburn. In a large room 16 feet 6 inches high, to each one of 84 carding engines a separate underground flue was connected, and at the meeting point of these flues a powerful fan was placed, which we found by personal inspection to extract an enormous quantity of cotton dust. Of course it also conferred the additional advantage of effecting a constant, though gradual change in the atmosphere of the room. Yet even in this room our notes record "no coarse dust, but fine dust evenly distributed through the air of the room." In another instance we found one of the oldest, darkest, and dingiest carding rooms in Manchester rendered comparatively habitable by a much simpler arrangement. A fan was connected with each of two large pipes running along the ceiling of the room parallel to its length, with openings about one foot square on the lower surface at distances of about two feet. The draught into these pipes was considerable, and the effect on the atmosphere of the room very plainly perceptible.

We must observe, however, that the use of fans in carding rooms, so far from being universal or generally employed, is on the contrary quite exceptional. Even of those mills which were pointed out to us as the best, the large majority were without them.

Nor did we find their absence often compensated by resort to natural ventilation. In the greater number of card-rooms visited by us the atmosphere was not only dusty, but it was hot, stuffy, and oppressive. Artificial heat is supplied through the winter, and kept up at night, by steam pipes. We were told that no greater degree of heat was needed than was necessary to "keep the hands comfortable." We were also told that the opening or closing of the windows "was left to the hands." Statements of a different kind were frequently made to us by the hands themselves. By them it was stated that the opening of windows depended on the wishes of the managers or foremen. Partly perhaps this diversity is accounted for by the different exigencies of fine and coarse spinning. Be this as it may, the result of twenty-nine careful thermometrical observations taken by us in card-rooms at various times in the day, and with an external temperature varying from 30° to 46°, was that the average temperature of card-rooms stands at 74·8 degrees of Fahrenheit. The variations from this standard were not considerable. In three instances we found the temperature above 80°, rising in one instance to 85°, in four instances below 70°, the lowest being 65°.

As to natural ventilation there was in the majority of instances none at all. Most of the windows admitted of being opened to a greater or less degree; sometimes by a small wicket pane of nine inches square, sometimes by a larger opening of the same kind, and in the newer and larger mills the upper part of the windows turned upon a swivel, and when opened would admit a large quantity of air. But in the winter time the use of these openings appears quite exceptional. Many complaints were made to us both by men and women as to the stifling feeling produced by the air of the card-rooms. And our own experience would incline us to corroborate their complaints, and to express an opinion that, especially for persons with any tendency to pulmonary complaints, long continuance in this atmosphere is attended with considerable danger.

The following extract from a recent German writer may illustrate the medical results of the dust generated in a cotton factory:—

"Soon after the entrance into the workshop the workman perceives it in a most unpleasant way. In those who are unaccustomed to it, it causes continual tickling in the throat, which incites hard coughing and occasionally whitish expectoration.

"In the first year of his work the operative suffers constantly from bronchial catarrh, and a considerable proportion of those who come to this occupation from rural districts abandon it, even though they may be only sufferers from constant catarrh without other worse symptoms. If, however, they persevere in this occupation, more important symptoms supervene, sometimes soon; often after a year of work, such as cough with pectoral pain, marked anæmia, obstinate debility, and loss of appetite. White viscid sputa is now expectorated with difficulty, and shows under the microscope cotton fibres for several hours after quitting the factory. Marked emaciation, sometimes but rarely caused by profuse diarrhœa, deprives the operator



" of his strength, and compels him to leave his work and betake himself to his home or to the hospital.

" These, of course, are the most unfavourable, and, happily, not the most frequent cases. But people very often go on coughing their whole life long, and die at a comparatively advanced age of some intercurrent disease. So far as we have observed, they never remain entirely free from cough, or in perfect health; although of course this may be the case with individuals of perfectly sound chests who observe requisite precautions. Sickly people, especially those liable to pulmonary affections, do not bear up long.

" The most unfavourable cases are usually found amongst women; and in a factory of 300 or 400 operatives, there will generally be found two or three cases of this kind every year. Other diseases of not infrequent occurrence, are phthisis, acute pneumonia, and, as has been already remarked, chronic catarrh. It is especially in connection with certain processes of cotton manufacture that these evils arise; scutching, willowing, and above all, carding."\*

The labour performed by the women and children in the card-room did not seem to us to require great muscular effort. With respect to one part of it, indeed, the work at the drawing frames, a complaint was put forward by the delegates of the workpeople, which may be stated in their own words. "The drawing process . . . is one of the most laborious departments in a cotton mill, yet the work is performed by women, the principal part of their duty being the removal of the cans to and fro from the machines, which weigh, when full, from 16 to 18 pounds; upwards of 900 cans passing through the hands of each female in one day."

Drawing.

We examined this complaint with some attention. In the drawing process, as already explained, the contents of several cans, often six cans, containing the slivers (or untwisted soft ropes) given out by the carding engine, are run together into a single sliver and drawn out by rollers to six times the original length. This process may be repeated three times, in which case the cotton will have been doubled, and also lengthened 216 times. The sliver issuing on one side of the drawing-frame or box, from the six slivers on the other side, is called a delivery; and one woman may attend 12 to 18 of such deliveries.

When a can on the delivery side is full, the sliver is broken off, and the can is at once moved to the machine which performs the second drawing. The same thing takes place on the delivery side of the second series of drawing boxes. From the delivery side of the third series of drawing boxes, the cans, when full, are taken to the slubbing frames.

In one case that we watched, nine boxes were arranged in three rows of three each, for first, second, and third drawing. Each box had four deliveries, and the slivers were sextupled, *i.e.*, 24 cans on one side discharged their slivers into four cans on the other. These nine frames were minded by two women. The cans were constantly filling, and had constantly to be shifted from the delivery side of one box to the feeding side of the other, *i.e.*, a distance of about two or three feet. Their weight when full was about 15 lbs. Some, in other places, were rather heavier. Occasionally it would happen that the woman when short of cans would be obliged to fetch one from the distance of a few paces; but as their shape was cylindrical, it was easy to roll them in a slanting position without lifting them from the ground. On the whole, the exertion required at any particular moment by the drawing-frame tenders did not appear to us to be great. But it was unremitting; and did not admit of sitting down for half a minute, even had seats been provided.

It must be observed, that the machine stops itself should any of the slivers accidentally break in drawing, an arrangement which has saved much labour; though whether to the labourer by making work more light, or to the employer by diminishing the number of his hands, is another question. The wages of the drawing-frame tenders are about 11s. a week.

The work of women at the slubbing-frames and roving-frames appeared to us slightly less laborious than that at the drawing-frames. In these frames the elongated sliver from the last drawing box is further drawn out by rollers, and wound by the revolution of a large spindle and flyer upon a bobbin. The skill and attention required in minding these frames, piecing broken ends, replacing empty bobbins by full ones, &c., appears to be greater than in the drawing frames. The work is piece-work.

Slubbing and roving.

\* Krankheiten der Arbeiter, von Dr. Ludwig Hirt. Breslau, 1871.



We were informed that the wages commonly paid in the card-room are as follows:—

	s.	d.
Strippers and grinders, about	21	0
Lap-carriers	13	0
Can-minders	6	3
Sweepers, half-timers	3	0
Drawing-frame minders	11	0
Slubbing-frame minders, 13s., 14s., 15s., or 16s., according to work done.		

Cotton  
spinning.

We pass now to the spinning department.

Cotton is spun by two kinds of machine, the mule and the throstle. The fundamental principle is the same in either case. In both cases the loose soft slightly twisted roving is drawn out by rollers, and the elongated thread is twisted rapidly by revolving spindles, and converted into yarn. In the throstle-frame a row of spindles armed with flyers (metal tubes carrying the thread joined to the spindle at a right angle, and at the distance of an inch bent parallel to it) pass through bobbins. The spindle with its flyer revolves with great rapidity, twists the thread delivered by the rollers, and winds it upon the bobbin, which is carried round with the spindle, but is prevented, by a certain degree of friction, purposely given to it, from revolving with the same velocity. In the mule the row of spindles is mounted on a carriage which recedes from the rollers, to a distance of about five feet, at a somewhat greater speed than that at which they deliver the roving, the spindles at the same time revolving rapidly, and thus converting the stretched roving into yarn. The return motion of the carriage to the rollers winds upon the spindles the yarn that has been spun. This to and fro movement is commonly called a "stretch" or "draw." At the time of the Factory Commission of 1833 the great majority of mules were worked by hand, and required considerable physical exertion on the part of the spinner. But even then the self-acting mule was in course of introduction,\* and its employment is now all but universal, except for the finest kind of spinning. Even for counts so high as 120\* (a hundred and twenty hanks, of 840 yards each, to the pound of cotton) we found it in some instances, though rarely, employed.

Another change of great importance has taken place in the mule, whether worked by hand or self-acting. The number of spindles placed in the mule carriage has enormously increased. As used by its inventor, Crompton, in 1786, the mule had at first no more than 30 spindles. At the beginning of the present century mules of 200 spindles were common. In 1833 it would appear from the reports of the Factory Commission of that date, that the numbers most frequently found were from 300 to 350, though mules of 500 and 600 spindles were gradually coming into use.†

We took notes of the number of spindles in several of the mule spinning rooms that we visited, and the average of 24 such observations, ranging from mules with 400 to mules with 1,284 spindles, gives 738 spindles to each mule, a number at least double that which prevailed in 1833.

The self-acting mule is managed by a spinner or minder who directs the operations of the machine and "pieces" the broken threads of a certain number of the spindles; the rest being looked after by full-time lads called piecers, usually from 14 to 17 years of age. The employment of young women as piecers, though not unfrequent in Manchester, Bolton, Ashton, Staleybridge, and some other places, appeared to us to be exceptional in the northern and eastern parts of the cotton district. The members of a deputation of Burnley mill workers whom we questioned on the subject, while observing that no female piecers were employed in that district, remarked that strong objections would be entertained to their employment on the ground of decency, owing to the postures frequently rendered necessary by the work, and the scanty clothing commonly worn in consequence of the high temperature.

The number of hands employed in piecing threads at the mule has not increased in proportion to the number of spindles.

On this point the records of the Factory Commission of 1833 supply information as to the prevailing practice at that period. Mr. Cowell (D. 1., pp. 119, i., j., and k.) gives details of three fine-spinning mills, in which the aggregate number

Of spindles was	-	-	-	94,032
Of spinners	-	-	-	148
Of piecers	-	-	-	595

\* In 1836 the self-acting mule was already used in more than 100 factories.

† [See on this subject the very interesting remarks of Mr. Cowell (one of the Factory Commissioners), 1833, Supplementary Report, D. 1, p. 119 i.]



This gives, counting spinners and piecers together, 112 spindles to each hand. At the time when Mr. Cowell wrote, these three mills were about to undergo improvements in the mule spinning machinery, the mules being lengthened, and the number, therefore, of spinners diminished, and of piecers increased. The result would then stand thus—

Spindles	-	-	-	-	94,296
Spinners	-	-	-	-	73
Piecers	-	-	-	-	545

This, counting spinners and piecers together, gives 152 spindles to each hand. This we may fairly take as a specimen of the practice in the most improved cotton mills forty years ago.

The result of our own experience was as follows :—

We noted 26 pairs of mules, spinning fine and coarse counts, in 26 separate mills. In them the number of

Spindles was	-	-	-	-	45,516	} In all 88 hands.
Spinners	-	-	-	-	26	
Piecers	-	-	-	-	50	
Scavengers, creelers, or bobbins	-	-	-	-	12*	

This gives 517 spindles to each hand in the spinning room.

Of these mules, six were spinning fine counts, *i.e.*, counts from 80<sup>s</sup> to 250<sup>s</sup>. In these the number

Of spindles was	-	-	-	-	14,056	} in all 32,
Spinners	-	-	-	-	6	
Piecers	-	-	-	-	21	
Scavengers	-	-	-	-	5	

or 439 spindles for each hand employed. For the remaining mules, spinning coarse or medium counts, the average number of spindles to each hand was 562.

On the whole, therefore, it appears to us to be safe to say that the number of spindles to each hand in the mule spinning room has increased between threefold and fourfold during the last forty years. We should have been glad to have traced this increase through an intermediate period of twenty years ago. But the evidence upon this point, derived as it was from the impressions and memories of the employers and workmen with whom we conversed, do not admit of being stated in so precise a form as that derived from parliamentary records.

It will be, of course, obvious that an increase in the number of spindles, supposing *that all other conditions remain the same*, entails additional work on the piecer. His eye has a greater number of threads to watch, his hands have a greater number of broken ends to piece, his feet have a greater distance to walk. The spinner and his piecers stand in the passage between two mules, attending alternately to either; with 150 spindles, 75 on either side, the piecer has to walk through a space of about nine feet; with 500 spindles, the length of his beat is increased to thirty.

Further, it is alleged, and it is one of the points upon which the workmen with whom we conversed most strongly insisted, that the speed of the spinning machinery has been increased of late years. Now, in the speed of the mule, two things have to be considered, (*a*) the velocity of rotation of the spindle; (*b*) the rapidity with which the mule carriage bearing the spindles passes to and fro from the fixed portion of the machine, *i.e.*, the rollers. With a given quality of the material, one of these velocities is an index to the other. If it be desired to use an inferior staple it may then be necessary to increase the revolutions of the spindle without increasing the rapidity of the carriage, so as to give that greater amount of twist, without which the loose material could not be made into yarn at all. And this, according to the statements of many, both employers and workmen, is what especially of late years is frequently done.

But the matter which most concerns the labour of the workman is the rapidity with which the carriage moves; in other words, the numbers of "draws" or "stretches" (to and fro movements) per minute. To this point we directed much attention.

From the statements made before the Factory Commissioners of 1833, and from their own observations, it would appear that the speed of the mule at that period was, for fine spinning, one stretch per minute or per three-quarters of a minute, and for coarse spinning from two to three stretches per minute.

\* These are half-timers, who have nothing to do with piecing the threads, but who help to clean the machinery, and do many odd jobs. In many mills, as, *e.g.*, in those spoken of by Mr. Cowell, their work has to be done by the piecers.



"The mule," says Mr. Redman (D. 1., p. 43), "for numbers of 100 to 200 hanks in the pound will perform about 800 to 900 stretches in the day, (of 12 hours)."

"A spinner spinning number 'thirty' (a witness states, D. 1., p. 65) "will perform on an average from 1,700 to 1,800 stretches a day (of 12 hours) on each mule."

Our own observations lead us to the conclusion that the rate now prevailing is considerably more rapid. A comparison of a considerable number of mules spinning coarse or medium counts, and observed in different places through the cotton district, shows an average rate of 2,161 stretches for each mule in the present work day of ten hours and a half. For mules spinning fine counts, *i.e.*, from 70<sup>s</sup> to 160<sup>s</sup>, our observations give an average of 1,140 stretches per diem. More stretches are now made in ten hours and a half than formerly in twelve.

Thus the piecer of the present day superintends a larger number of spindles moving at a higher rate of speed than his predecessor of forty years ago.

But on the other side it is contended by many of the employers that the methods of preparing cotton for the spinning frame have undergone such improvements during this interval that the work, so far from being heavier for the operative, is distinctly lighter.

We quote the following from a statement submitted to us by the Masters' Association:—

*Allegation (of advocates of change in working hours.)*

That the speed of the machinery is now so great, and the energy of the operatives is so taxed, that their strength is spent before the day is over; and that, notwithstanding the aid of improved machinery, forty per cent. additional labour has been cast upon factory workers.

To this allegation we say that the contrary is the fact. During the last twenty years the improvements in machinery with a view to relieve the workers from much of the labour, care, and attention required from them in former years have been most remarkable. These improvements have tended not only to make the machine run with fewer calls for exertion on the part of the worker, but still more to make the exertion when called for less severe; to make the motive power with the minimum of intelligent direction do what formerly called for muscular exertion. The accuracy of this statement is manifest from the fact that the operatives are now the earnest advocates for improvements in machinery, whereas twenty years ago it was no uncommon thing for them to strike at the factory when improvements in machinery were introduced.

Some of the employers kindly undertook to conduct us through their works, and point out to us, in detail and on the spot, the most important of these improvements.

We do not attempt the task of describing these improvements in detail. They fall in cotton spinning as in other branches under two heads—(a) doing the work better; (b) saving labour in doing it.

With regard to the first, it is said that by greater perfection in the cleaning and willowing processes, by greater elaboration in the carding, drawing, slubbing, and roving processes, the roving is delivered over to the spinner in a better state than formerly. The modifications of machinery that have been introduced in the preparing of cotton during the last forty years are by no means of so fundamental a kind as those that have taken place in the woollen and the worsted manufacture, and without positive data as to the state of things forty years ago it is difficult to form an accurate comparison.

With regard to the saving of labour, many undoubted improvements have taken place. The mode of conveying cotton from the mixing-room to the blow-room; the coiling movement of the can that receives the sliver from the carding engine and the drawing boxes, thereby packing it in the way most economical of space and most



convenient for its exit; the self-stopping movement of the drawing-frames when the sliver or slubbing breaks; the "presser" in the slubbing-frame enabling more cotton to be wound upon the bobbin; the improvements in the differential motion of the slubbing-frames: these are some of the improvements pointed out to us, which, combined with the greater perfection in the fashioning of each machine which has probably taken place, doubtless have effected a considerable saving of labour.

But the question recurs, Is the saving one of the employer's purse, or of the workman's muscles? or has it been equally distributed on either side? Is it simply that three women or boys are doing the work formerly done by four, or is it also that to each of the three the work is easier now than it was formerly to each of the four?

Coming back to the work of the mule spinning-room, there is one class of workmen who appear to have undoubtedly profited so far as muscular effort is concerned; we refer to the spinners themselves. The substitution of the self-acting for the hand mule, which was at its commencement 40 years ago, is now, for medium counts, all but universal. The saving of muscular effort in it is obvious, and it is very considerable. But as this work is done exclusively by adult males with whom this report is not concerned, we do not further enlarge upon it.

But with regard to the boys who piece the threads, the simple question is, Do all these improvements which have taken place in the preparing of cotton result in giving them fewer broken ends to piece? Mr. Titus Rowbotham, a witness of whose intelligence Mr. Cowell, the Factory Commissioner of 1833, who examined him, thought highly, remarks of the mule-spinning of that date:—

"It is not in one stretch out of five that the piecer has any ends whatever to piece up."—*Report, 1833 (D. 1., p. 51).*

And another of the Commissioners, Mr. Tufnell, describes mule-spinning of 40 years ago in the following words:—

"Three fourths of the children employed in cotton factories are engaged in piecing at the mules, which, when they have receded a foot and a half or two feet from the frame, leave nothing to be done; not even attention is required from either spinner or piecer, but both stand idle for a time which, if the spinning is fine, lasts in general three fourths of a minute or more. Consequently, in these establishments, *i.e.* (in fine spinning mills) if a child remain during 12 hours a day, for nine hours he performs no actual labour.\* A spinner told me that during these intervals he had read through several books." (*D. 2., p. 205.*)

And again:—

"The lightness of the labour is owing to the slowness with which the machinery moves in spinning fine numbers. The mule in spinning No. 30<sup>s</sup> or 40<sup>s</sup> makes in general three stretches a minute; in the high numbers only one, and sometimes less. This fact I have ascertained with the utmost precision by frequently timing the motions of the machine, holding a watch that marked the moments in my hand. During at least three fourths of this minute the piecers, five of whom usually attend two mules, each containing 360 spindles, have literally nothing to do; they then stand listlessly by, their attention engaged by anything but their work, till the mule recedes, when they instantly proceed to piece the threads which break or are purposely broken (as in fine spinning if a knot is perceived in any part of the yarn it is instantly broken). The piecing cannot take up long, as the mule has no sooner arrived at the frame than it instantly begins to advance, and when it has got about a foot and a half or two feet from the frame it is impossible to reach over to the rollers, and the period of idleness begins." (*D. 2., p. 207.*)

Our own experience does not enable us to record any such "period of idleness." We found not only a more swiftly moving mule and a larger number of spindles to each hand than Mr. Tufnell saw, but a considerably greater number of threads breaking than would seem to have been the case in Mr. Rowbotham's experience. There was indeed in this respect a very great difference between different mills. Those in which the newest machinery was used, and in which the quality of the cotton spun was the highest, showed, as might be expected, far better spinning (*i.e.*, far fewer threads broken) than those where the machinery was old and the quality of the raw material inferior. When poor stuff and poor tools were brought into rivalry with good stuff and tools of the best make the worker had to suffer for it. In one mill of a high class our notes

\* "A piecer, however, generally attends two mules whose motion is alternate, and thus his leisure is six hours instead of nine." Note by Mr. Tufnell.



record "some draws without any break-down." In another "the ends seldom break, perhaps once or twice a minute in each mule." But such instances as these were in our experience exceptional. In one mill (and this was a mill indicated to us by the Masters' Association) our note is, "Movements of piecer incessant." In another, mentioned to us by the Inspector as a mill of average quality, we note, "Threads continually breaking down; piecers in constant motion." In another, a large new mill, "Sixteen threads down at once out of 840;" and in other older mills we found the average number of broken threads falling to the share of one piecer to rise sometimes to 17 per minute, and frequently to stand at 10 or 12. All these remarks apply to mills where coarse or medium counts were spun. In fine-spinning mills the breaks are less numerous and the motions of the spinner less rapid, but nowhere did we see an example of the listless repose or of the opportunity for pursuing literary studies described in Mr. Tufnell's picture 40 years ago.

The heat of the mule-spinning room we found higher than that of the card-rooms, and the ventilation even worse. Of 25 observations taken with a wet-and-dry-bulb thermometer in mills spinning ordinary numbers, the average temperature was 78·2 (Fahrenheit) with 13·7 degrees of evaporation. In 14 fine-spinning rooms, including in this category counts 70 and upwards, the average was 84·92, with 13·72 degrees of evaporation; and a temperature register was shown to us, from which it appeared that while the heat was never allowed to fall below 92° it sometimes rose to 105°. It will be remembered that our observations were made in winter with an external temperature of from 30° to 44°.

As to ventilation, in almost all cases it was extremely bad, and in a large number of instances there was none whatever. It appears to be the general opinion both of employers and workpeople that, for ordinary spinning, it is not desirable that the temperature should fall below 75° or 70°. It is necessary that this degree of warmth should be kept up during the night, otherwise the cotton would spin badly during the early working hours. The heat is kept up by steam pipes, and obvious motives of economy dictate that as little as possible of it shall be lost by open windows. It was also stated that when the wind was blowing high a strong current might break the soft stretched out threads. And a third reason for keeping the windows shut, explained to us by the workmen, and endorsed by some of the masters, is to prevent the soot, with which the outer air in large factory towns is laden, from entering and sully the whiteness of the yarn. In most of the spinning rooms there are one or more privies, usually of very rude construction, and almost always opening directly into the room, with very inadequate apertures to the outside air. The soil usually falls down a large untrapped pipe, which is flushed often or seldom according to the varying attention given to it, and empties itself below into a cesspool, cleared out at such intervals as the local authorities may direct. There are of course many variations from this procedure. We inspected a large and well-appointed mill at Ashton, in which the privies were well ventilated by opposite external apertures, and where the removal of the soil took place daily. Again, in some of the older mills the privies are altogether separated from the mill building, a precedent which we regret to see is not followed in those of recent construction. But in the majority of instances the condition is as we have described it, and the combined influence of high temperature, of windows closed in winter from one week's end to another, of gas jets burning some hours of the day, and of frequent faecal exhalations, renders the atmosphere of the mule-room in many cases extremely oppressive. From the evil of overcrowding it is, from the nature of the machinery, entirely exempt.

Throstle  
spinning.

We have said that some of the spinning is by throstle, not by mule. Here girls of 16 and upwards are employed to attend to a certain number of spindles, and a large number of young children are engaged in removing the bobbins when they are full, and replacing them by empty ones. These children are called doffers, and they vary in age from 8 to 14; some of them therefore working full time, others half time. These children are by no means constantly employed. Their services are only required when the bobbins require changing. The time needed for the bobbins to fill varies with the quality of the yarn, from four to six hours. The process of doffing a set of frames may, perhaps, last four or five hours. The doffer is then free till he is wanted for a new set. The result in several cases which we examined was that out of the ten and a half hours the doffer (regarding two half-timers as one) does not work on the average more than eight. During the intervals he may be found sitting in some hole or corner, sometimes lying down fast asleep. It was said by some of the Burnley workmen that in former times the doffers were allowed to stroll out into the air during these intervals. This, however, is not now permitted.



The women who mind the frames superintend from 400 to 600 spindles. We were informed by some of the workpeople and by some of the employers, that this number is greater than in former years, but the records of the Factory Commission of 1833 do not; so far as we are acquainted with them, supply us with the means of verifying the statement. The work appeared to us, like most of the labour in a cotton mill, to require very little muscular effort beyond that of standing or walking. The attention required here and elsewhere was constant. No seats were provided, as is the case in the throstle-rooms of many of the flax mills and in some of the worsted mills. With regard to the atmosphere of the throstle-room, our language must be nearly the same as in the case of the mule-room. The temperature in the average of those we examined was not quite so high, *i.e.* 74°. The arrangement of the privies was often exceedingly bad both as to health and decency. The proportion of cubic space to each hand employed was less than in the mule spinning-room, but in no case was there anything like overcrowding.

It remains to say a few words about the reeling-room and the doubling-room.

The yarn intended for exportation is wound on large reels and made into hanks of a given length.\* These reels are turned by machinery; they are managed by women and young girls. The work, beyond the labour of standing, and a slight stoop necessary for those who are taller than the average, does not involve much muscular exertion. It is continuous and monotonous, like most of the other operations in a cotton mill. The reeling-room requires no excessive temperature. The average of our observations gives 70 degrees; but it might be lower without damage to the character of the work. The atmosphere of this room, and the appearance of its inmates, compare favourably with those of the card-room and the spinning-room. Reeling.

Some of the yarn is made into cotton thread by doubling or twining, a process in which two or more threads are passed through water and twisted together. The doubling-room is also a pleasant place compared with the spinning and card room. No high temperature is required, and the water-troughs through which the thread passes supply the moisture which in the air of the other rooms is commonly so deficient. Doubling.

Fine yarn that is intended for fabrics in which silk is used, or for some other purposes, undergoes the process of gassing. The thread is drawn rapidly through a gas jet in order to burn off the loose fibre attaching to it. The rooms in which this work is done are necessarily to some extent permeated by the products of gas combustion. We found them close and smelling of gas, notwithstanding the ventilation, which was effected in one case by a small flue placed over each gas-flame, in another by fans. The work here is done by women, and an opinion was expressed by one of the medical men of the localities where it goes on as to its unhealthy character. The number employed in it, however, does not appear to be very great. Gassing.

From the spinning rooms we pass to the weaving sheds.

The first process is to wind the cops of twist produced by the spinners upon large bobbins preparatory to being warped. The warper takes the bobbins from the winder and runs from 400 to 600 threads together upon one beam. This work is also done by women.† Of the rooms in which these two processes go on we can speak in the same terms as of the reeling rooms. No special temperature is needed in them; their warmth, which usually reaches 70 degrees, appears rather due to the connexion of the room with the other parts of the factory and to the unwillingness of the operatives to open the windows than to any other cause. Cotton weaving.

The work of the winders is neither more nor less arduous than that of the reelers. But the warpers or beamers have in most mills the great advantage over other cotton operatives of being able to sit down for a considerable portion of the day. The beams are taken from the warpers into the sizing-room, where several are set together, and their combined threads are passed through the sizing mixture and then over hot rollers to another beam, which is then taken to the looming-room that the threads may be passed through the healds and reeds of the loom. The warp is then taken to the weaving shed and is ready for the weaver. The heat of the sizing-room is often very great, but as it is generally a shed with apertures through the roof, through which the air can be frequently changed, the atmosphere is not stifling or oppressive. Adult males only are employed in this process. The sizing mixtures lately employed have led to many complaints from the weavers, to which we shall refer afterwards.

\* The number of hanks that go to the pound distinguishes the count. Thus 30\* is that kind of yarn of which one pound weight contains 30 hanks. All the hanks are of the same length, *i.e.* 840 yards.

† A portion is warped in another way, by a warping-mill managed by a man.



The work in the looming-room is to a great extent done by old men and boys. There is nothing specially arduous about it.

The weaving-shed, whether from the number of its inmates or from the various questions relative to the subject of this inquiry which have been raised as to its operations, is, next to the spinning-room, the most important department of a cotton factory.

The number of looms in the cotton manufacture actually running, and exclusive of those that for various reasons were standing, was, in 1871, as follows:—

England	-	-	-	-	165,032
Scotland	-	-	-	-	22,621
Ireland	-	-	-	-	3,372
Total					<u>191,025</u>

The number of weavers was, in—

England	-	-	-	-	57,555
Scotland	-	-	-	-	12,114
Ireland	-	-	-	-	1,864
Total					<u>71,533</u>

It will be noted that in England the proportion of looms to each weaver is nearly three; in Scotland and Ireland it is not quite two.

Practically it is very common for a weaver to attend to four looms with the help of a child, and not by any means uncommon to manage this number without any assistance. The majority of the weavers are women, and many of them are married women. Their pay is in all cases by the piece. On the average the earnings will be at the rate of 4s. 6d. or 5s. a loom. In rare instances a very superior weaver would earn on four looms as much as 28s.; and in one case, where the weaving was very bad, owing to the heavy sizing and constant breaking of the warp, the employer told us that many of the hands could not earn more than 2s. 6d. from each loom.

The number of looms allotted to each weaver and the speed of the machinery have both increased considerably during the last 40 years. We have the authority of the Masters' Association for saying that "in 1848 and 1849 the female of 17 would have only two looms to attend to. Now she will attend to four looms without assistance."

Going still further back we come to the early days of power-loom weaving, when, as is still the case in many flax mills and woollen mills, the weaver had but a single loom. The price paid to the worker per piece has, according to the masters' statement, not changed, therefore the pecuniary gain to the operatives has been considerable. It is, however, with the question of increased exertion that we are here principally concerned. The speed of the machinery has also increased considerably. From the evidence given in the Report of the Factory Commission of 1833 the speed of power-looms varied between 90 and 112 picks (*i.e.*, throws of the shuttle) a minute (*see* D. 2., p. 28, Report, 1834). It now varies between 170 and 200; the average, so far as we observed, being about 175 or 180.

The increase of labour and attention devolving on the operatives from these changes is to a considerable extent counteracted by the invention of the weft-fork (a most ingenious contrivance by which the machinery is thrown out of gear, and the loom stops whenever the weft breaks), and by that of the self-acting templets which keep the width of the cloth constantly stretched. There is also an improved regulator for keeping the speed of the shuttle constant. Without these contrivances, indeed, the management of four looms, or even of three, by one person would be impossible; and even with them we cannot but think that the cotton weaver of the present day has a distinctly greater strain on hand, eye, and attention than his predecessor of 40 years ago. It must be observed that though the loom stops when the weft breaks there is no self-stopping motion when the threads of the warp break. And this last accident occurs rather frequently with the brittle oversized threads now so often used. When not perceived quickly the broken ends as they work up and down soon entangle and break other threads of the warp with them. The repair of the injury thus done to the weaving takes often a considerable time. Each of the broken and entangled threads must be disentangled, tied to a new end, and passed through the healds and reeds. The process often takes from 10 minutes to a quarter of an hour, during which the loom is of course stopped. In one weaving shed in the Haslingden district, containing 70



looms in operation, the number that were stopping at one moment from breakages either in weft or warp, or from the necessity of again filling the shuttle with thread, was considerably more than half. This was, in our own experience, quite exceptional, though we were informed that in many of the smaller mills in the neighbourhood the weaving was quite as bad. In the greater number of those visited by us the number stopped at any one moment would vary from one fifth to one eighth.

The brittleness of the yarn is one result of the great grievance of which the cotton weavers especially complain, the oversizing, and the adulterated sizing of the warp, which has taken place since the American War. This subject, in its sanitary relations, was specially investigated in 1871, by Dr. Buchanan, of whose most able and exhaustive report we here reproduce some of the most important passages:—

“Up to 20 years ago, ‘sizing’ of cotton consisted in the use of some fermented flour and tallow, in order to give tenacity to the warp and to lessen friction in the weaving process. The amount of such size required for this purpose to cotton of the quality that was usual 20 years ago, averaged, for ordinary cotton goods, about 20 per cent. of the weight of the warps.

“About 20 years ago, it was observed by some sizers that the brownish colour given to cotton cloths by size made from inferior kinds of flour could be reduced by the addition of a small quantity of China clay to the size; and further, that this material so far reduced the glutinous quality of the flour that the sized warps would weave easily with a less amount of tallow in the size. In 1854, at the time of the Russian War, the increased price of the usual sizing materials led to further substitution of China clay. Some manufacturers, when these facts came to their notice, would have nothing to do with the new substance, and insisted on having the desired whiteness and freedom in weaving by the use of good flour and tallow in the size. But other firms were content if they got the results they wanted in the appearance of their cloth, and could get their sizing done more cheaply by employing sizers who used China clay. This was the first stage in the use of the substance, a certain quantity of the clay entering into the composition of the size, and the number of factories becoming more numerous that used such sizing; but the total amount of size in proportion to cotton not becoming materially increased.

“This was the state of matters when, in 1862, the American War produced the English cotton famine. Cotton then very rapidly rose in price, and the better sorts were almost unattainable. Now it appears that warps of shorter fibred cotton are difficult to weave, unless the needful tenacity of the twist be given by a larger amount of size than would be wanted for better sorts. Of size made of flour and tallow, warps from the worse kinds of cotton are stated to require even more than 20 per cent. of their weight.

“The product is, of course, worse in quality than cloth made from better raw material; but as poor cotton had to be employed, it was necessary to use such quantity of size as would allow it to be woven.

“But the lack of cotton in 1862 introduced another practice. Weight for length had been, as it still is, the chief test of the goodness of any description of yard-wide cloth; and with the scarcity of raw material came the practice of giving a fictitious weight to cloths containing less cotton, in order to make it appear that they contained more. It became a matter of rivalry with sizers, which of them could, on the order of manufacturers anxious to meet the demands of merchants, ‘put on’ most foreign matter upon the cotton warps.

“From this practice of ‘heavy sizing’ the more reputable manufacturers long kept aloof, but they did so at the expense of their immediate trade; and for the last three years every yard of cotton cloth made at Todmorden, and many other places, has been weighted with quantities of size not required for any manufacturing purpose, but used as an adulteration.

“The ‘size’ that is thus put on to cotton warps is of various composition. It may still consist in the main of flour and tallow, some sort of salt being added either for the purpose of lessening the glutinous quality of the flour (which otherwise would, when used in quantity, stick the warps together) or else for the purpose of retaining moisture, and thus of increasing weight. Epsom salts and chloride of magnesium (with sulphate and chloride of zinc, not yet in common use at Todmorden,) have been the principal salts used for one or both of these purposes; and these substances go by the generic name of ‘antiseptics,’ a name which would appear to belong more properly to those of the salts which have the further property of preventing mildew in the artificially weighted cloths. This class of substances is that to which the memorialists refer as ‘poisonous ingredients.’



" The salts above mentioned are not, in the ordinary sense, 'poisonous'; that is, the small quantity of them that comes off the cotton warps in the weaving process would not, if taken into the stomach, kill a person. It is, indeed, asserted that more mischievous substances have, for their 'antiseptic' properties, been put into size. These are the terms in which a newspaper refers to certain of such:

" 'Size is fermented vegetable and animal matter, and when once life, vegetable or animal, has been started in it, it is rarely and with great difficulty extinguished. And here again comes another source of mischief. The antiseptic, Mr. Molesworth so mysteriously vapours about, is an addition intended, practically speaking, to keep the mixture of cotton size and clay from vegetation, and as a rule, consists of alum, arsenic, or baryta. None of these compounds are desirable elements of our daily bread or food, but their effect and quality have also been exaggerated.'

" After the best inquiries I was able to make, I have satisfied myself that this statement, so far as regards the use of arsenic and baryta, has no application to the process of sizing as practised at Todmorden. It will subsequently be seen that this opinion is supported by chemical analysis. I think it doubtful whether arsenic has anywhere been at all commonly used.

" But although the sizing that shall give the desired amount of weight does not necessarily include China clay, yet, in practice, that substance is far most commonly added in heavy sizing; for not only does it give a whiteness to the over-sized cloth, and help the weaver by 'opening the twist' (that is, lessening the cohesiveness of the warp threads that would result from the over-use of the flour size alone), but the clay itself serves, with particular efficiency, the desired object of giving weight to the cloth. One third of clay (33 to 37 per cent.) is the usual proportion for these purposes introduced into 'size,' the remainder consisting of flour and some fatty substance, with or without one or other of the so-called 'antiseptics,' and, perhaps, also some animal glue or resin. The composition of the size, and the proportions of its ingredients, vary in different factories and with different sizes, and the minuter processes upon which depends the ability to get the greatest amount of size upon the warps, are frequently trade secrets with particular sizers. In general terms, however, the practice of sizing at Todmorden for the kind of cloths that are made there, consists in putting on to the warps from 50 to 90 per cent. of 'size,' one third of which consists of China clay. The chief differences consists in the amount and nature of the fatty substances used, and in the employment or not of some or other 'antiseptic.'

" The adherence of China clay to the warp is much affected by these differences. Whatever the other ingredients of the size, some of the clay comes off in the weaving process. That quantity is smaller when the rest of the size consists of flour and fatty matters only; larger when the fatty matters are in smaller quantity, and when 'antiseptic' is used.

" In weaving warps of inferior cotton, weighted with China clay and flour mixed with deliquescent salts, there is especial occasion to keep the weaving sheds damp, as in this way the little compound of cotton, flour, and clay is less liable to break, the clay comes off less, and the resulting cloth is also heavier by the weight of the retained moisture. The sheds are warmed usually by low-pressure steam pipes, about eight feet from the floor, and their temperature was found (17 sheds) to vary from 59° to 67° Fahr., with a mean of 62°, the external temperature on the same days varying from 39° to 59° Fahr., with a mean of 48°. Hygrometric observations showed that in the weaving sheds the amount of vapour in a cubic foot of air (varying from 3·9 to 5·1 grains, with a mean of 4·5) was everywhere and always in notable excess of the amount in the outer air (varying from 2·5 to 4·7 grains, with a mean of 3·3) on the same days, and that the air of the weaving sheds almost invariably contained notably more moisture than that of other departments of the mill. In these weaving sheds, the excess of damp in the air, desired for facility of weaving, especially for weaving the over-sized warps, is obtained from the moisture retained in the size, and (incidentally, yet probably in most part) from the persons of the workers, while there is careful avoidance of any draught that could dry the tender warp. The conditions that are thus most favourable to the weaving were being (during the winter weather of my visit) ensured by windows and so-called 'ventilators' being habitually kept closed. Beyond those here mentioned, however, no other sources of artificial dampness were seen at Todmorden.

" But it may here be noted, with reference especially to remonstrances which have been addressed to my Lords of the Council by weavers at Blackburn, that there are certain cotton weaving sheds in Lancashire where other means of procuring the



“ desired dampness were adopted. These means consist in the injection of steam into the shed from perforations in the heating-pipes, and in ‘digging’ or keeping the floor of the shed damp with water, the sheds in either case being kept closed as much as possible, and these practices are adopted, in part at least, as the corollary of a system of sizing not indeed identical with that in use at Todmorden, but not differing from it in any such essential respects as to need record in this connection.

“ In the course of my inquiry at Todmorden, I visited 17 weaving sheds on the premises of 12 manufacturers. In four sheds, belonging to two manufacturers, there was, in daylight, no perceptible haze in the atmosphere. In all the others there was more or less of haze, caused by very fine particles of dust. In all the sheds there was more or less dust on every surface where it could settle, and this though the floors and rooms had been cleaned of the dust on the previous evening, or in the course of the same day. This dust was generally loose, but in one or two establishments it tended to adhere to the floor. These were places where sizing was done in the establishment, and where fatty material but no ‘antiseptic’ was used. The looms were in all cases covered with opaque dust, varying in amount from a slight bloom, in the sheds of the just-mentioned establishments, to a thick layer in some other sheds. The quantity of dust was found to depend, in part, upon the sort of cloth that was being made. In the most dusty sheds the clothes and hair of the weavers were seen covered with fine white dust. Further, the strange visitor experienced, in all the more dusty sheds, and roughly in proportion to the amount of visible dust, very great irritation in the nose, and in a less degree to the eyes and throat. To this irritating effect of the dust, a frequent visitor, and still more a weaver, gets speedily accustomed; though there is a certain number, apparently a minority, of weavers who remain incommoded by it whenever their work is more than usually dusty. I need hardly say that there is no cause for satisfaction in the deadening of sensations that should be sentinels against irritating matter entering the throat and lungs.

“ Respecting the matters composing the dust of weaving sheds in Todmorden, particulars will be found in the appended analyses, made for the purposes of this report by Dr. Dupré. I have only to observe upon them, that there is a good deal of agreement in the general composition of the dust; the chief difference consisting in the proportions of the several substances composing it. None of the more poisonous minerals were found in any of the specimens examined. Speaking of ‘clay’ in its ordinary sense (*i.e.*, anhydrous clay, with the addition of about one eighth its weight of moisture), it is seen that from one third to one half the dust consisted of this substance.

“ As for the China clay, against which especially the representations of the memorialists are directed, the statement is confidently made by manufacturers that, through its weight, the particles must fall directly downwards from the looms, and cannot reach the face-level of the workers who stand over them. This statement is little less than absurd to any one who goes, without preconceived notions, into an average Todmorden weaving shed. Wherever dust can lodge, at all levels of the shed, on the hair and cap of the workers, on the heating-pipes, eight feet from the ground, everywhere the dust is of the same opaque white kind. When the gas is lighted, the spaces between the lights are white in the weaving sheds, while in the adjacent throstle room the spaces between the gas jets are perfectly black. That this dust is, in effect, the China clay, quite as much as other matters, has been proved by direct experiment.

“ In the dust taken from the top of a warming-pipe, two feet above the weavers’ heads, Dr. Dupré finds 43 per cent. of clay; while the floor-dust of the same shed contained 35 per cent. of it; and in the dust taken from a board placed just under a ventilator of another weaving shed 47 per cent. of clay, the dust from the floor of this last shed consisting of 38 per cent. only of the same substance. The actually larger proportion of clay in the dust of the higher levels probably comes from the dust there being more exposed to such currents of air as exist in the shed, and which fan away some of the lighter (*i.e.*, cotton) particles.

“ It is alleged by some of the manufacturers that men employed at the extremely dusty works in Devonshire and Cornwall, where this clay is obtained, are healthy and long-lived; to which statement I think it enough to oppose the high mortality from lung diseases among potters, employed under indoor conditions much more nearly resembling those of these cotton weavers.”\*

\* [Dr. Buchanan’s Report on Certain Sizing Processes used in the Cotton Manufactures at Todmorden, and their influence upon Health. Returns to an Order of House of Commons, 13th May 1872.]



We visited some of the Todmorden weaving sheds with the view of ascertaining whether any important change had taken place since the publication of Dr. Buchanan's report. We found in the first shed that we entered full confirmation of his statements. The air was cloudy with dust, which fell on a polished surface sufficiently in six or seven minutes for very distinct marks to be made.

The dustiness of the air of the weaving shed was far more marked in Todmorden than in the weaving sheds of Burnley, Blackburn, and other districts. The Burnley cloth is, to a great extent, intended for calico printing. There is, therefore, no object in adding artificial weight to the cloth. In Blackburn, much of the cloth is as heavily sized as in Todmorden. An employer there made no difficulty in confessing to us that "prices now-a-days were run so low that if it were not for the sizing and the China clay mixed with it, he should make no profit at all." This gentleman informed us, that in his sizing mixture, China clay and flour were used in equal proportions. Another manufacturer, who bought his warps ready sized in Todmorden, informed us, that in a piece of cloth weighing four pounds and a half the warp (unsized) would weigh two pounds two ounces; the weft one pound four ounces; and the size one pound two ounces. A third stated, that in a piece of his cloth weighing 19 lbs., there would be from 5 to 6 lbs. of size. This gentleman groaned (though he worked) under the system. "There wants a level making," he said.

In the Blackburn weaving sheds, where the dust, though considerable, is less abundant, the use of steam jets is very common, and was much complained of by the workpeople. We did not, however, in any case find "the clothes of the operative [as alleged in the workmen's statement] saturated with moisture." We visited one weaving shed of moderate size where forty jets of steam were turned on. The atmosphere approached, but did not reach saturation, showing on a fine frosty day 60° with the dry, and 57° with the wet bulb; the shafting and machinery were dulled and rusted with the moisture; but neither the heat nor the steam were for a moment comparable to that found in the wet spinning room of a flax mill, or to the densely clouded rooms of dye works.

We must observe, that the largest and best mills are free from the reproach of excessive sizing. In them the atmosphere is free from dust or from moisture. And in few of the weaving sheds, either small or great, did we find any high temperature. The ventilation and the arrangements of privies and waterclosets were often extremely defective. The nature of the work and the number of looms attended by each person necessarily gives to each a plentiful allowance of floor space. The sheds are lighted from the top, and are said, we think with reason, to be often oppressively hot in summer. In our own experience, the atmosphere was not usually unpleasant except during the close of the winter's day when the gas was lighted.

The appearance of the workpeople in the weaving sheds was healthier and more vigorous than in the card room and spinning rooms. In the latter, especially in Manchester and the towns in its immediate proximity, many of the women have a pale worn look, and the features of the women generally in this part of the district are remarkably uncomely. Their appearance seemed to us to improve in the northern parts of the county, in which, and especially in the weaving sheds, we remarked a considerable number of strong healthy women with plenty of colour. We could not avoid noticing at the same time the advanced pregnancy of several of them.

It would appear, from statements made to us which we had reason to think accurate, that it is very much easier to bring pressure to bear upon the energies of female operatives than of male. It is well known that with many workmen, especially if they be members of Trade Unions, the consciousness that their fellow workmen are present and are watching their work, tends rather to moderate than to intensify their zeal. Animated by the common object of selling their labour dear, they are apt to think an exceptionally zealous workman a traitor to the cause of labour. With women the reverse would seem to be the case. Less able to fix their eye upon a distant object, less apt to enrol themselves in a well drilled organization for which sacrifices are to be made, the ultimate compensation for which themselves and those immediately connected with them may never or not for a long time touch, they are far more keenly sensitive to the motives of approbation and vanity, and also to those of immediate tangible reward. It would seem to be as easy to goad women as it would be difficult to goad men, into doing the greatest amount of piecework in a given time. The admiration of their companions, and the approbation of the overlooker, appear to be at least as powerful inducements as the increase of their wages. A woman who can mind four looms without an assistant has attained a certain position, and is an object of attention. "Hoo's a four-loomer, hoo's like to be wed," will be commonly remarked of such a one.



We are not, of course, criticising these motives; we mention them merely as influences which tend to heighten the intensity of labour. And connected with these, we may mention another, pointed out to us not merely by operatives but by a large employer of labour in the cotton districts. It has become the practice of late years to give a commission to the overlooker of the weaving shed upon the amount of work done. This officer has, therefore, a direct pecuniary interest in stimulating the energies of the operative to the highest point. In some respects, this system (which it will be understood we are not at all concerned to criticise) acts favourably for the weaver. When any difficulty occurs, when the warp requires to be changed, or any other occasion arises for calling in the services of the overlooker, these services are doubtless more promptly and willingly rendered than when this officer had no interest in the amount of work done. Probably, therefore, the weaver as well as the employer finds pecuniary benefit in the system. But that it tends to strain working energies to their highest point, and that it is susceptible of considerable abuse, would also appear highly probable. One of the operative delegates has enlarged upon this subject, and we quote his statement, an *ex parte* statement, of course, but strongly illustrative of the way in which the system, in coarse and ignorant hands, may press upon the workwoman:—

“Weavers gladly accepted more looms, not only because of the increased value of the wages it enabled them to earn, but out of a spirit of rivalry which exists among weavers, particularly the young women, as to who shall have the honour of earning the most. This spirit of rivalry and competition is fostered and intensified by another new system brought into existence since 1847, of paying overlookers according to the earnings of the workpeople under their control. Thus, the overlooker is stimulating and driving them all day long; and on the making up day, he (overlooker) goes round to each weaver with a slate or paper, and asks the amount of their week's earnings. But before going round, he will generally ascertain, either from the books or some other source, the highest earnings of any weaver in the shop; and every one who is not well up to this mark will receive a severe chastisement at his hands, very often in some such language as the following: ‘What tha’ h—hes ta bin’ doing to ged no more then this? Number —hes gotten —; and if tha does not ged more next week tha’l hev to go whoam, and d—quick!’ But most overlookers, not content with this severe chastisement, determined to expose and shame them still more, post upon the wall in a conspicuous place in the shop a list of their earnings.

“I have known many instances of, not only females, but adult males, asking off their work for a few days on pretext of sickness, until the booking up day has got over, in order to avoid the chastisement and exposure consequent upon their being a little short of the usual quantity of work.”

To sum up our report of the cotton district,—

1. The cotton manufacturers employ nearly half the total number of protected operatives in textile fabrics.
2. Certain departments of this manufacture, viz., the spinning and carding, appear to us to have, either from high temperature or from dust, or from both combined, a debilitating tendency.
3. This tendency is much aggravated by imperfect sanitary arrangements.
4. The operation of reeling, doubling, winding, warping, and weaving have in themselves no such tendency.
5. In certain special districts, especially in the neighbourhood of Todmorden, the dust in the weaving sheds caused by excess of adulterated size, is injurious to health.
6. The amount of machinery attended by each hand has largely increased during the last forty years.
7. The speed has also increased.
8. These two conditions are partially, but not fully, compensated by improvements in machinery. The exertion of the operative per hour (except in the case of the adult males who attend self-acting mules) is, so far as we can judge, considerably greater than it was forty years ago.
9. The strain upon the workpeople, and especially upon women, is heightened by the practice, which we understand to have been introduced during the last twenty years, of giving a bonus to the overlookers upon the amount of work done.



*Flax Manufacture.*

The flax in all the factories which we visited had undergone the preparatory processes of "retting" and "scutching" before being brought into the mill.\*

Breaking.

The "breaking" process is not always used. It consists in cutting the fibres into three pieces, "stricks," the root-end, the middle, and the top-end, which are then separated from each other, the middle being the finest. This is done usually by boys, who are for the most part full-timers, but in some few cases we found half-timers employed. It is a simple and not a laborious process, but a good deal of dust is given off, so that the windows have to be kept open in the coldest weather. Sometimes this work is done by a machine, which drops the three stricks into separate boxes. In other cases the whole fibre is used. This is called the "long line" process, the other the "short line."

Roughing.

The first process of flax preparing is called "roughing," or sometimes "stacking." It consists in passing the flax through a comb by hand, and is done generally, if not always, by men. A good deal of dust is generated here also, and the stooping posture involved seems irksome.

Heckling.

Then comes the machine heckling, in which the bundles or stricks of flax are fixed in a pair of wooden or iron clams by means of screws. These clams are then made to travel between pairs of combs (or "heckles") which pass vertically over them, combing out the tow (or short fibres) and dust, and arranging the long fibres parallel. Each strick after being once heckled has to be turned the other way up and heckled again, and in some cases the whole process is repeated more than once. Boys are employed to fix the stricks in the clams, to replace them, to arrange them together when thoroughly machined, and to tie them up in rough bundles in readiness for the next process. These boys generally are (and always in our opinion ought to be) above the age of 13; the work is undoubtedly laborious and continuous. The atmosphere generated by the heckling machine is very oppressive from the cloud of dust given off; and this is from time to time increased by the emptying of the tow boxes, each of which is emptied about every hour. In some cases the heckling machines are covered over, but we saw no heckling room to which the above general observations will not apply. They are all extremely dusty, and the physical labour is excessive for young children. And this is so far recognised by the employers that the youngest of the children are employed only in sweeping, the labour of "screwing," &c. being thought too severe for them. In some cases double machines are used, which appear to save labour, as a single machine is worked by three boys and a double machine by four.

The employment of half-timers in the flax trade appeared to us to be looked on with disfavour by the masters, and to be rather forced on them by the paucity of labour. In some of the best mills, no half-time girls are employed at all, and the boys only in doffing the spinning frames. In the Scotch flax district the employment of half-timers has been till lately quite exceptional.

The ill effects of the heckling process upon the boys (technically called "machine boys") engaged in it is shown in spasmodic attacks of cough, during which the boy generally holds on to the machine to assist the efforts of coughing; an effect so familiar to workers, that a boy who is observed doing so is said to be "poucey," from the "pouce" or dust by which this cough is provoked. This dust is both fibrous and granular, but the latter very largely preponderates. It is for the most part a fine, soft, and palpable powder, proceeding evidently in great part from the putrefactive process to which the flax plant has been subjected. Mixed with these organic particles, there is doubtless a considerable portion of pulverized mud.

The flax is now hand-heckled, *i.e.*, passed by hand over other finer combs. This is done exclusively by men. It is the final refining process, and the finer sorts of flax, which are too delicate and costly to bear the somewhat rough process of machine-heckling (where nearly one half its weight is lost) are in some places heckled entirely by hand.

In some factories the flax is then "sorted," *i.e.*, the different qualities are separated from each other by girls, and passed lightly over a comb, so as to straighten them again a little. This is light work, and there is little dust left in the flax. In all these processes the fibres combed out from the flax (or line) are made into tow. The tow from the last named process (sorting) is sometimes kept separate, and makes the finest tow yarn.

\* The "retting" is a partial putrefaction, for the purpose of softening the fibre and detaching its softer from its more woody portion; the "scutching" is for the purpose of breaking and knocking out the woody part or "boom" from among the softer fibres.



All this is just the same for the long and the short line.

In the heckling process no artificial heat is required for the manufacture itself, but as it is necessary to keep the windows open as much as possible in order to allow of the escape of dust, the heat of steam pipes is used to raise the shed to such a temperature as may be tolerable to the workers; and some jets of steam are also usually sent into the room, in order to prevent the electrical condition which the flax assumes when the air is very dry, and which causes it to adhere to the machinery.

In some of the "heckling shops" which we visited, attempts had been made to withdraw the dust either by exhaust-fans in the roof, or by revolving fans in the windows. Both these plans were to a certain extent successful, since a great mass of dust and flax fibre could be seen outside the fans, but they had not been carried out, in any factory which we visited, to anything like completeness, for though some of the dust was removed, the atmosphere of the shop was still much loaded with it.

In some manufactures, as for example, in the carpet factories, the heckling process is dispensed with. Here the hemp\* is cut into lengths of about a foot, dressed with oil, stacked for four or five days, and then passed through the "breaker-card," which scutches, cards, and arranges it into a sliver. The coarser fibres and wood are thrown down, and the former are made into tow. The slivers are made up into large bales, which are again passed through the "finishing card," by which fresh tow is separated. These processes are dusty, the chief dust being made by the emptying of the tow-boxes. Only adults are employed in them, men and women.

From the heckling machine the flax or "line" (*i.e.*, the long fibres left in the clams after the shorter fibres have been stripped off by the heckles) is brought to the "screw-gill box." The heckled flax is fed in bundles on to the endless apron in front of the machine, is then delivered to the gills by which the fibres are combed and laid parallel, and passed out at the back of the machine in the form of a "sliver" (or strand of parallel fibres) into a can, which is then taken to the drawing and roving frames. Preparing, drawing, &c.

The feeding is a continuous but very light labour. Two women are employed in feeding one machine. The minding of the machines involves hardly any work at all beyond that of removing and replacing the cans. In one of the mills we visited one girl minded each row of about six machines, assisted by a man who removed the cans when full.

A good deal of fine dust is generated in the preparing process. It does not rise in a cloud into the room as it does in the heckling shops, but it is found in large quantities about the frames, and is held by some persons of experience to be as injurious as the more perceptible and coarser dust from the cards, because less likely to be rejected by coughing. On this point, however, we do not feel qualified to speak.

From these gill-boxes the line is transferred to the drawing and roving frames, to be made up into spinning bobbins, exactly as in other textile manufactures. Or the drawing frame may be combined in one machine with the screw-gill box, so that the line is wound at once on a bobbin instead of coming out as a sliver. But as these processes of drawing and roving appear to us to involve nothing specially injurious, either from dust, heat, damp, or physical labour, it is not necessary to dwell further on them.

The line is now ready for spinning; but before speaking of this process it will be necessary to describe those by which the tow is prepared for it.

The tow, as before stated, consists of the shorter fibres, which are "wasted" out of the line at the various stages of its preparation, and which, therefore, vary in fineness, in length of fibre, and in the proportion of dirt, woody fibre, and other impurities which they contain. These various sorts may be spun separately; but in general the first step in the preparation of tow is to mix them together, which is done by adult males. Tow carding.

The tow then goes to the carding engine, similar to the cotton-carding engine, only the machinery is larger and rougher. This is an exceedingly dusty process, even more so than that of heckling. The workers are women, whose clothes and hair were, in all the tow-carding rooms which we visited, covered thickly with a layer of dust and fibre. In many places they wore a kind of mask over the mouth, made of a portion of tow, to stop the dust, or "pouce," as it is technically called in Belfast, from entering the lungs. But the practice is by no means universal, nor does the con-

\* The differences between the manufacture of flax and hemp being unimportant have not been referred to.



trivance seem very effectual. The loose, long fibre of flax does not form nearly so effectual a mask as the close web of cotton-wool which is used for the same purpose occasionally in the cotton districts. The temperature of the tow-carding rooms is low, and the rooms very draughty in consequence of the absolute necessity for keeping doors and windows open, even in the roughest weather. Steam heat and steam jets are used, as in the heckling shops, but in the severe weather, which happened to prevail during our visit to the flax mills, the climate of these parts of the mill was extremely inclement, and it can hardly be doubted that this increases the tendency to lung affections which the atmosphere of the room must provoke.

Attempts have been made to counteract these tendencies by placing fans in the roof, or by making ventilating openings, or by placing chimneys over the cards; but the same remarks apply as in the heckling shops, viz.:—that however successful this might be if it were perfectly carried out, it has not been effectually done as yet.\* In some cases, the cards are covered over at the back; but we did not observe any notable difference in the atmosphere. Masks or respirators have also been manufactured for the use of the operatives, and sold at a low price: but hitherto the workpeople cannot be persuaded to give them a trial. It is right, however, to notice that the admixture of metallic dust which we had noted as occurring in the cotton-carding rooms, does not take place (at least to any appreciable extent) in tow carding. The machines are cleaned by hand daily (in some places, for a quarter of an hour before each meal), and a longer cleaning is given to them on the Saturday. But they are only stripped and ground at rare intervals of a month or even longer. But we conceive that the generally injurious nature of these dusty processes admits of no doubt; and a medical man, who has bestowed especial attention on the health of the flax operatives in Ireland, assures us that “the continual inhalation of air loaded with flax dust” (“pouce”) almost always induces disease of the lungs, which, in the great majority of instances, terminates in phthisis.”

Dr. Pardon's  
Answers,  
No. 117.

The same German authority† whom we have previously quoted with regard to the dust of cotton factories, makes the following remarks as to the dust generated in flax manufacturing:—

“Many of the above processes are unhealthy on account of the amount of dust generated, which consists partly of organic, partly of inorganic elements. It acts in the first instance like that of the cotton manufacture, exciting cough. But expectoration is more difficult than in the case of cotton; and minute particles and fibres of flax may be discerned in it. The worker becomes ultimately so far habituated to the atmosphere, that the violence of the cough gradually subsides; but obstinate catarrh supervenes, which nothing but absence from the factory can remove. Acute pneumonia is somewhat more common with flax operatives than with cotton operatives, which may possibly be due to the greater stiffness and inflexibility of flax fibre, though on this point we speak doubtfully. Of all operations in the flax manufacture, heckling is unquestionably the most attended with danger.”

The tow is sometimes (but only in a few of the mills we visited) carded a second time. This is a much less laborious, and also a less dusty process than the first carding. Thus in the first carding each engine occupies two women, while in the second carding room, one woman can attend to two cards.

In some mills, again, the carded tow is combed by engines resembling those used in the worsted manufactory, but this is exceptional. The “noil,” or short fibre, from these combs is sold to mix with cotton waste. The waste in the carding process is sold out of the mill.

From the carding engine the sliver passes to drawing and roving frames, by which it is prepared for spinning. As in the preparation of “line,” these processes appeared to us not insalubrious. Steam jets are blown into the room sometimes, but we noticed no excess of temperature or moisture. In other cases a tube brings moistened air out of the wet spinning rooms.

\* An exception must be made to this statement in the case of a very large mill in Dundee, where an elaborate and systematic attempt has been made to extract the dust from the carding-room. Very powerful fans are connected with a system of flues which pass to that portion of each carding-engine where the greatest amount of dust is generated. By this means half a ton of dust is extracted weekly. Yet even here the amount of dust through the room was considerable, although the mitigation of the evil was great. This fan, and another, less efficient, which we saw in the same locality, proceed on the right principle, that of catching the dust at the place where it is generated. All attempts to extract it from the room after it has once been thoroughly disseminated through the air are comparatively futile.

† Dr. Hirt, *Krankheiten der Arbeiter*, Part i., p. 176.



The wet spinning of flax and tow is performed usually on frames which are similar in all essential particulars to the fly spinning frames used in the worsted and other manufactures, but with the additional peculiarity that the roving is drawn through a trough of warm water before it is spun. The object is to soften the fibre by dissolving the gum which it contains, so as to allow it to be drawn out without risk of breaking. As a general rule, the coarser the yarn is, the more heat is required, and also the more spray is distributed from the yarn as it twists round in the flier. Wet-spinning.

The amount of heat generated by the water in the troughs, the steam which escapes into the room, and the spray from the spindles, are recognized causes of unhealthiness in the wet-spinning process; and the Act of Parliament, 7 Vict. c. 15, s. 19, provides, "that no child or young person shall be employed in any part of a factory in which the wet-spinning of flax, hemp, jute, or tow, is carried on, unless sufficient means shall be employed and continued for protecting the workers from being wetted, and where hot water is used, for preventing the escape of steam into the room occupied by the workers."

The means which are employed to prevent the workers from being wetted, are either to place a guard, or splash-board, in front of the spindles, the workers being also provided with aprons, or as is almost universal in the Irish spinning mills, to trust to the aprons only. It will be seen that either practice is equally consonant with the words and spirit of the Act, provided the protection afforded by the aprons is "sufficient" in the judgment of the Factory Inspectors or of the Court to which they may appeal. And it seems that although splash-boards are in general use in the English mills they are hardly at all used in Ireland.

Out of a large number of mills visited in Belfast these splash-boards were only found in the coarse spinning rooms of one mill, and we were informed that this was the only mill in which they existed. There is a prejudice against them on the part of the workers who think that they are in the way, and render it more awkward to reach over to the frame and piece the ends. In the mill above referred to, the overlookers say that the workers always remove the guards if they can.

The aprons which are worn over the light garments in which the spinners work do not afford, however, by any means perfect protection,\* and in some of the rooms the amount of steam which is allowed to escape from the troughs is at times so great that the wet is constantly dropping from above.

It would be very difficult without going more into details than is permissible here, to give any adequate idea of the varieties in respect of both heat and moisture which prevail in wet spinning rooms. We entered some, where coarse tow-yarn was being spun, in which the temperature was as high as 88°, and the whole upper part of the room was occupied by a dense steam.† On the contrary, in some of the finest line-spinning the water is hardly warm, no steam whatever is generated, little if any spray is distributed by the spindles, and the temperature of the room is merely kept high enough to insure the comfort of the workers. Between these two extremes there may be found every degree of variation.

The arrangements of the rooms are also very various. Thus we have seen rooms in which fine spinning was being carried on, where the ceiling being lofty, domed, and provided with skylights opening into the air, no inconvenience whatever was perceptible from heat or steam.

Still the general impression left on our minds by what we saw of wet-spinning, was that the process was unwholesome from the amount of heat and steam in the rooms. Then, again, in Ireland, the state of the floor has to be considered. For here almost all the spinners and doffers work bare foot, and it is asserted in Mr. Baker's report for April 30, 1866, p. 27, that onychia, or ulceration of the toes, is common among these workers. A cord and weight is attached to each bobbin, and it is no uncommon thing for one of these weights to fall on the worker's toe, causing a trifling wound, which it is believed gives rise to ulceration in consequence of the moisture in which the foot is always sodden. It may be so, but Mr. Baker in a subsequent report (December 31, 1867) says he has not been able to verify it, nor did our inquiries at Belfast enable us to do so.

\* See to the same effect the half-yearly report of D. Walker, Esq., Assistant Inspector of Factories, in the "Reports of Inspectors of Factories," April 30, 1869, page 42.

† This is not, however, the ordinary state even of such a spinning-room, but in many cases, when the machinery is first started, jets of steam are injected into the troughs to raise the water to the proper heat, and this is at first too much. Then the lids of the troughs are obliged to be open for a time to prevent the water from running over, and to cool it down to the proper temperature; and the room referred to was so exceptionally bad that higher wages were given to the workers employed there, in consequence.



The spinning is carried on by women. The labour is not very great, but it varies too much to enable us to give any arithmetical account of it.

The doffers are mostly young full-time girls who are learning to be spinners, though half-timers (boys and girls) are also employed. They are constantly occupied; for when not engaged in doffing the frames they have to go into the alleys and assist the spinner in piecing her broken threads.\*

We were told by a deputation of working-men at Belfast, that their children frequently faint with the heat of the spinning-room; and this statement was confirmed by an independent and credible witness, and is we believe true. Another effect of the heat can easily be seen on the skin of the arms of the young children employed as doffers. A very large proportion of them have their arms covered with an eruption, (technically known as lichen) analogous to the "prickly heat" so common in the tropics. This eruption is attributed by some to the irritation produced by the oil used in spinning. It does not seem to affect the older persons employed, their skin having probably become inured to the irritation. As far as our limited means of observation went, this affection is less common in the fine, than in the coarse spinning rooms.

There prevails also in the flax spinning a peculiar form of fever which almost always attacks those who for the first time commence working in flax mills, and which is called the "mill fever" by the workers themselves. It is thus described in a letter received from a surgeon long in practice in a flax spinning district:—

"After working for about two days the worker is attacked with rigors, vertigo, nausea, and vomiting; these symptoms are speedily followed by pains in the head, thirst, heat of skin, &c., and this state continues from two to eight days, when the disease subsides of itself. No treatment is required, as the worker knows it runs a certain course and leaves him quite well, but rather weak for a day or so, when he returns to the mill without any fear of ever taking it again. This disease is almost peculiar to those employed in the spinning rooms, and the cause assigned for its origin is the smell of the oil, along with the vapour and heat of the room, being inhaled by the new comer."

We have spoken above of the process of wet spinning as we found it practised in the rooms which we visited, but it seems to be the opinion of some of the best spinners that an improvement in the ventilation and arrangements of the spinning rooms, whereby the steam should as far as possible be excluded from the room, and the small quantity of steam which must escape be at once imbibed or absorbed by the atmosphere of the room, which for that purpose is to be kept dry and constantly renewed, would be as beneficial to the process of spinning as it certainly would be in our opinion to the health of the workers in that process. We have mentioned that we found some rooms free from any excess of heat or moisture, but this seemed rather in consequence of no heat being used in the spinning. An interesting letter from a firm of flax spinners, describing a system of warming and ventilation which they have found effectual in securing a uniform temperature of 60° of dry air in their spinning rooms, will be found in the Report of Mr. D. Walker already referred to, p. 44.

Reeling.

The dyeing of the yarn is done by adult males, (who in most places work absolutely naked, with a cloth round the loins as in a Turkish bath, but for half the day only,) and it is then reeled. The only difference between this process in flax and in cotton is, that in the former (at least at Belfast) most of the reeling machines are worked by hand, which makes it harder manual labour than most of the processes carried on in mills. Steam-power, however, is being introduced to turn the machines.

But neither this process, nor that of "winding," where the yarn intended for warp is wound on to large bobbins for the warping mill, or that for weft is made into cops for the shuttle, call for our special remark. They appeared to us fairly healthy processes, though a good deal of dust is no doubt generated in the "winding." These are the only processes in flax spinning where the labour is paid by the piece.

The dressing or sizing of the yarn is also done by adult males. No ingredients deleterious to health are, as far as we know, mixed with the size.

The yarn which is not used for weaving is "twisted" or doubled to make thread. This process is essentially the same as in the cotton trade.

Dry-spinning.

In the flax districts of Arbroath and Dundee the yarn spun is for the most part of a coarse kind, much of it being used for sail cloth. It is not subjected to the wet process, but is spun dry. The evils of excessive heat and moisture are thus avoided; but on the other hand that of dust, which is of course entirely absent in the wet

\* In one room, in a very good mill, there were 33 frames with two sets of doffers. Each frame required doffing about every hour, and the doffing lasted about three minutes.



spinning process, is here present in a marked degree. Fine, short, brittle fibres break off from the yarn as it spins; and there is also a considerable amount of impalpable granular dust, which in the Arbroath district extends from the spinning room to the weaving shed.

We were struck in the Scotch flax district by the easy and almost leisurely way in which labour was carried on in the spinning rooms as compared with the unremitting application of the Lancashire operatives. All the spinners had seats provided for them, of which a large number availed themselves. The number of spindles assigned to each was small, varying from 50 to 80, and the number of ends breaking was in no case such as to necessitate constant movement. Some of the women were knitting, and all appeared much at their ease. In fact, the work very much resembled the picture frequently drawn to us, whether truly or otherwise, of Lancashire weaving and spinning as it was 20 or 30 years ago. It is certainly very unlike what it is at present.

The process of linen weaving does not differ sufficiently from other kinds of weaving to justify any long description. The weavers are for the most part women, they mind almost always two looms each, or, with very broad looms, or with very fine cloth, only one. Some boys and a very few men are employed; the wages average probably about 15s. a week. The speed of the looms varies with the width of the cloth. The sheds always have some steam blown into them, but this was not done to any disagreeable, still less unwholesome, extent in any of the sheds we visited. A greater quantity is necessary in summer, in order to counteract the evaporation, but we saw no distinct evidence of any unhealthiness from this cause. The linen cloth after having been woven is examined, in order to detect any faults which may have been made in it by weaving, but such faults can only be partially stamped out by the beetling process. They cannot be corrected as in some other kinds of cloth. If there are many faults the linen is sold off as refuse. Weaving.

From this the cloth goes to the bleachers or dyer, and is generally sold out of the mill. In some cases the processes of finishing are carried on in the mill. The first is "beetling," in which the linen is placed on rollers, and these are passed slowly round under a row of large wooden mallets, or beetles, which are kept in constant up and down motion, some size having been first put in. The effect is to make the surface smoother, and to stamp out some of the faults. In this process some women and boys are occasionally occupied, though more commonly it is superintended by men only. Beyond the distressing noise and vibration, there seemed no cause of unhealthiness in this process. Then the cloth is sheared by a machine which cuts its surface truly even, taking off all the knots which had been left in it. A large quantity of fibres is thus sheared off the surface, but there is no diffusion of dust nor anything unhealthy in this operation, which is performed by women as well as men. The cloth is now folded and made into bundles for sale. Finishing.

The general sanitary arrangements of the mills are of the most various description. We found buildings in which the rooms were dark, low, ill-ventilated, and crowded with machinery, and in which the privies opened directly out of the working rooms. On the other hand we visited one mill where all the different processes of spinning and weaving were conducted in one large shed, covering about three acres of ground, lofty, well ventilated by skylights, with all the shafting of the machinery below the floor; and all the privies separated entirely from the shed. In some places we found the privies communicating with moveable soil-pans which were emptied continually, and themselves having ventilation independent of that in the rooms.

Before quitting the subject of flax, it may be convenient to note here some peculiarities of the Scotch flax and jute districts. The number of married women, and the number of half-time children, are both much fewer than in England. It appears to be considered somewhat discreditable for a woman to work in a factory after her marriage; and she only does so under the presence of strong necessity. In Arbroath of 784 women employed in mills where the question was asked, only 43, or about 5½ per cent were married. In Dundee with its mixed population of Irish and Scotch the proportion is larger.

The system of employing children half-time was quite unknown till lately in Arbroath; and even now it is only adopted by one firm there. In Dundee where Irish children abound it is more common; and one firm there employs as many as 620. Altogether the number of half-time children in Dundee is 2,220, and of them 885, or 35 per cent., are under 10 years of age.



Further it is interesting to note that of the six hours now demanded by the operatives two in Dundee, and three in Arbroath have been already conceded by the employers; the hours of labour in Arbroath being only 57 per week.

With regard to the question whether this diminution of hours has been accompanied by a diminution of production, some difference of opinion appears to prevail. All the masters were agreed that in the spinning department production was diminished proportionally to the shortening of time. In the weaving, however, some allowed that the difference had been made up by increased energy on the part of the workers. Others said that it had been made up in the first instance, but that their energies had subsequently slackened.

#### *Jute Manufacture.*

The manufacture of jute, which gives employment to many thousands of persons in Dundee and its neighbourhood, may be dismissed in a very few words. The fibre resembles that of flax in many respects, but it is coarser and less tenacious. It was at first treated in the same manner as flax; *i.e.*, heckled, the finer fibres separated from the coarser, and each prepared and spun as "line" or as tow. This plan is now almost entirely abandoned; all attempts to extract from jute anything analogous to "line" are given up; and the whole mass of fibre is placed upon the carding-engine and treated as tow. But from the sanitary evils peculiar to tow carding and preparing, jute is entirely exempt. Before it reaches the carding-engine it has been profusely sprinkled with a mixture of water and train oil, so as to give sufficient flexibility to its brittle fibres. The result of this is, that in jute carding, and preparing or spinning, hardly any dust is given off. The jute manufacture is generally considered healthy; and from what we saw we should be quite inclined to indorse this view. The oil used gives a disagreeable smell to some of the rooms; but there is no reason, so far as we are aware, for thinking that it renders the air unwholesome.

#### *Woollen and Shoddy Manufacture.*

The main processes of the manufacture of woollen cloth are as follows:—

*Sorting.*—Here the fine and coarse wool are separated from each other; a process carried on in daylight, and by men only. *Hand picking* is performed by women, who remove any pieces of stick, &c. too large to go through the picking machine.

*Washing and scouring* are the next processes.

*Drying.*—The wool is placed first in a centrifugal machine to drive out the water, and then in a hot room.

*Picking.*—The wool is here passed through two machines,—the "blower," in which the heavier and looser impurities are blown out from the fibres, and the "picker," in which the wool is passed through rows of teeth mounted on a revolving cylinder, from which they are brushed off by a brush revolving in the opposite direction. The fibres which are too coarse to pass through these teeth drop to the bottom of the machine, carrying with them the pieces of dirt, &c. The picked wool is blown out from the back of the machine. The coarser fibres which have been wasted out with the dirt, are taken up again, separated from the latter, and worked in. Not much dust is generated usually in the process of picking, for the refuse falls into a covered box, though in some kinds, chiefly black wool, a good deal of flue flies about the room. Nor is there any unhealthy tendency in the process, which is usually superintended by women. When the yarn is to be mixed with any inferior article (mungo or shoddy), the wool is then taken to the *blending* machine, where these substances are intimately mixed with it.

Mungo is the name given to the pickings of broad cloth, (or perhaps of woollen cloth generally,) while shoddy is formed of the pickings of any kind of material, as flannel, old stockings, and even, as it seems, cotton materials or linen rags,—in fact, almost anything that can be got to adhere to the woollen fibres with which these pickings are mixed. The rags from which mungo and shoddy are made are torn to pieces in a machine called the "devil," consisting of cylinders armed with teeth revolving upon one another, between which the fibres pass, and by which they are torn up as fine as is required, the operation being repeated on different machines as often as necessary. In this process a very great deal of dust is generated,\* and it is somewhat dangerous

\* This dust, as we are informed by one of the certifying surgeons, is known to bring on a complaint resembling coryza, known by the name of "the shoddy fever."



in other ways. Thus, coarse substances, pieces of stone, &c., sometimes strike fire from the teeth and cause a conflagration, and shortly before our arrival one of these machines had burst, with an explosion that killed one of the workmen, and which was referred to the probable admixture of some gun cotton with the shoddy rags. But the dust is blown away by a fan and the machine is entirely closed. This and all the previous processes, except picking, are carried on exclusively by adult males, so that they are not germane to our present inquiry.

There are mills which are used exclusively for the manufacture of shoddy for sale to the cloth mills. In these works, the labour of women is used for the sorting and cutting up of the rags previous to their being torn up or "devilled." In the best of these mills the mixture, after having been torn into fine fibres in the "devil," is scoured and dried. It is then roughly carded, by which the fibres available for spinning are separated from the waste, which is made into flock for stuffing mattresses. A good many young persons are employed in this labour, but no half-timers, as far as we saw. It appears to be by no means unhealthy, especially if we except the "devilling," spoken of above, which is always done by men.

The wool is now treated with some vegetable oil. This is done in some places by hand, in others the oil is evenly spread over the fibres by a machine consisting of an endless apron, on which the wool is spread, and over which is a revolving brush saturated with oil from a trough placed above it. In either case the oiling is done by men.

The wool, whether pure or blended, now goes to the *carding*. This consists of two processes essentially the same, and in their general effect resembling the carding of cotton; but in this manufacture the first of the carding processes is called "scribbling." The wool (or the mixture of wool and shoddy) is fed on to the apron of the scribbler by women or boys, and the sliver from the other side of the scribbling engine is conducted by machinery to the carding-engine, in front of which is the "condenser," by which the sliver is wound into a loose coil and reeled round a large bobbin; this bobbin is then ready for the mule. Many of the machines have an intermediate process, but this does not affect the sanitary conditions of the room. The sliver is conducted uninterruptedly from the commencement to the end of the set, whether of two or of three engines, and no extra labour is involved in the use of the intermediate machine. Carding.

Thus all the labour which is required in the preparation of carded cotton for spinning (viz., slubbing, drawing, and roving) is saved, for the mule in wool-spinning performs the roving as well as the spinning. From this cause, chiefly, short-timers are almost entirely dispensed with in the woollen and shoddy manufacture. To illustrate the extent to which this improvement in the machinery has reduced the employment of children and other persons under the protection of the Acts, we may give the example of a carding-room where we found 10 sets of engines at work. All these were under the care of nine persons (all women and boys), who seemed to us by no means hard-worked. Before the self-feeding machinery was introduced, the same work would have occupied (as we were informed) 10 men (slubbers), 10 women (feeders), and from 20 to 30 half-timers, or other young persons, as pieceners. The women feed and mind the engines, the boys carry away the full bobbins and put in the empty ones. The removal of the full bobbins to the spinning room is done by other persons and in different ways, according to the arrangement of the mill.

The scribbling and carding engines have to be cleaned every day, and sometimes twice a day, and the cylinders are ground about once a week. This is done by men. There is no generation of flue, dust, or metallic particles at all to be compared with the state of things in cotton carding. The carding rooms which we saw contained occasionally a good deal of the flue of the wool, but the atmosphere was not irritating, and the temperature not excessive; in fact, in the wintry weather, which then prevailed, some of the rooms were rather unpleasantly cold.

In a few mills the old "slubbing billy" is still in use, chiefly in the manufacture of pure but coarse Cheviot wool; but this is not sufficiently common to need any remark. A few of the short-timers employed in the district may act thus as pieceners.

The spinning is done usually by the self-acting mule. The number of spindles which each hand has to mind is considerable. The length of time during which the mule stands at the end of the draw, to give the twist to the yarn, enables a spinner engaged on warp spinning to mind two long mules, these being so arranged that the one is drawn in for piecing while the other is standing open for twisting. Taking the spinning rooms which we visited as a fair sample of the work, we Spinning.



should be inclined to say that the number of broken ends varied so much, that it is hardly possible to give any numerical averages; in the higher qualities of cloth there would be very little piecing to do. The nature of the work will also vary with the colour of the wool, the black wool requiring very sharp sight to enable the piecer to see his ends. Wool spinning does not require the high temperature necessary in cotton spinning. All that is necessary is that the room should not be cold enough to make the oil thick. This end is answered if the workpeople merely keep up such a heat as is agreeable to themselves, but here, as everywhere else in factories, there was great indisposition on the part of the operatives to avail themselves of the opportunity of opening the windows, while there was no ventilation independent of their control.

The same mules serve for "doubling," i.e., twisting two or more threads together.

Sizing.

The sizing is done by men only, and no material prejudicial to health is used.

Weaving.

After having been spun, the yarn goes out of the mill to be dyed,\* if necessary, and then comes the process of weaving, as to which we need say very little. The looms are much broader than those used in weaving cotton-cloth, and each weaver minds only one loom as a rule. This dispenses with the necessity for the self-stopping motion of the "weft-fork," and for the self-acting templets, but it also necessitates constant attention. Seats are provided for the weavers in some of the weaving sheds, and on the whole the work does not seem hard, though, like all other weaving, it strikes a stranger as exceedingly monotonous. More attention is required when the jacquard loom is used for the manufacture of figured or "fancy" goods. But the slower and gentler motion of the broad looms used in the manufacture, especially broad cloth, renders the noise and vibration in the weaving sheds much less distressing in woollen than in cotton weaving.

The weaving sheds are heated with steam pipes, but no steam is injected into the rooms.

Finishing.

The cloth, when woven, is picked over, to remove any knots which may have been left in it. The finest cloths are picked over three times. The first picking ("raw picking") is done before the cloth is scoured, immediately after it leaves the loom, and is for the purpose of removing any double threads which may have been woven into it. The faults thus made close in the process of scouring. The second picking is called "burling." This is a process subsequent to the scouring. Here the cloth if white is suspended in the light, if dark is laid on a board, and the small knots, pieces of cotton or lint, and any such substances which have accidentally got woven in, are removed with small forceps. Then, after the cloth has been milled, it is again picked over ("finishing picking") to remove any inequalities which may have escaped the burler's or which may have adhered in the subsequent processes. The "raw picking" and "finishing picking" are not always used. The burling and the other pickings are carried on by women. The white cloths require sharp sight, as the inequalities are detected by the transmitted light; in the dark colours this is done by the touch. In either case it requires close attention, but it can be suspended at pleasure, as there is no machinery. The women usually sit at their work, and in many places the burlers only work from 8 a.m. to 5 p.m. The process is pointed to as unhealthy by some of our medical correspondents, but we could not satisfy ourselves that it is so.

It is hardly worth while, for the purposes of this report, to go minutely through the various processes by which the rough cloth from the loom is made fit for the market. They may be reduced to five, viz.:

- (a.) Fulling or milling, in which the cloth is treated with soap and water, and then its fibres are made to contract or "felt" together by being beaten with large wooden mallets (fulling) or pressed between rollers (milling). By this contraction the cloth loses from one tenth to a quarter of its breadth and somewhat less in breadth. Some refuse is thus hammered out of it which is used to stuff flock beds. Before being milled, the cloth is scoured from oil in an extremely offensive mixture (of urine, blood, and pigs' dung), but this, as well as the fulling process, is carried on by men only.
- (b.) "Gigging," or "dressing," in which the surface of the cloth is raised by being first washed in pure water to remove the soap of the fulling mill, and then passed several times over frames filled with teazles, first in its wet state, then after having been stretched to its full width and dried on steam rollers.

\* The dyeing is sometimes done in the mill itself; but it does not come within the scope of this inquiry.



- (c.) "Shearing," or "cutting," in which the raised surface of the cloth is cut down smooth in order to give a gloss to the cloth. This operation is repeated a number of times proportioned to the fineness of the cloth. Some of the coarse cloths are cut only twice, some of the finest more than twenty times, and both transversely, (cross cutting), and longitudinally. In these cutting processes boys are employed, (mostly full timers, but some half timers also,) to hold one side of the cloth as it passes through the machine, and in cross cutting, to fix the hooks by which the edge of the cloth is held. The work is extremely light in both cases.
- (d.) Different kinds of "finish" are now given to the coarser cloths by various ingenious machines worked by men, which it is not in the least necessary to describe.
- (e.) And, finally, the cloth is brushed by being passed first through steam, and afterwards over a revolving brush, folded between pieces of thick paper, pressed under great weights, and is then ready for sale.

In the whole of this manufacture it must, we think, be admitted that the part taken by the persons under the protection of the Factory Acts is neither necessarily insalubrious from high temperature, dust, or impurity of atmosphere, nor laborious, except, in the sense in which all work at steam-driven machines carried on, with two remissions, for ten and a half hours, must be so. The labour of very little children has been almost abolished, except for the very lightest and easiest tasks, and all the work which can be called at all heavy is done by adult males. In fact, an opinion prevails in the woollen districts, and is supported by respectable medical authority, that the oil (natural and artificial), which is met with in the manufacture, has a wholesome influence on persons who are emaciated, or consumptive. And it is a common observation, that much older persons are to be seen at work in the weaving and other departments of a woollen factory than is the case in other branches of textile manufacture. It is, however, to be noted, that the death rate of women between the ages of 15 and 45 in the principal cloth districts stands higher considerably than in the English life table, or than in the Staffordshire iron districts, being in 1870 and 1871, 1009 per 100,000 per annum in Huddersfield, and 941 in Dewsbury. During the succeeding decade (45-55) the excess of mortality is even higher.

In many mills in the west of England there is a habit of working shorter hours in the winter than in the spring and summer. In one large factory the hours of labour are calculated at 10 only in a full day; so that if under a press of trade, they work up to the full time allowed by the Factory Acts, it is paid for as overtime. In another, the winter hours were from 8 a.m. to 6.30 p.m., with half an hour's interval for dinner, giving also 10 hours. In many the burlers, as above noticed, worked shorter hours, and in some, where the number of looms is considerable, the weavers are permitted to take holiday on Saturday.

#### *Worsted Manufacture.*

The worsted manufacture is chiefly carried on in Bradford, Halifax, Keighley, and the neighbouring townships. In Scotland it employs not more than 6,000 persons. In Ireland the number of those engaged in it does not reach 100.

The wool of which worsted yarn is made comes from the long-woolled varieties of sheep. Only the longer fibres of the fleece are used; therefore the first process of the manufacture is wool-sorting. The shorter part of the wool is sold to the woollen trade. The long wool is sorted into three or four kinds, which differ much in value. This business is carried on exclusively by adult males.

The wool is then washed in soft soap and water in two successive tanks, after which it is laid on a drying frame where warm air is passed through it. The washed and dried wool is next passed through a series of preparing boxes, in which the fibres are passed through the teeth or "gills" of a species of comb or card and made gradually parallel. A second process of washing succeeds. When the wool has been again dried by passing over hot rollers a small quantity of fine oil is sprinkled over it. It is then passed through a second series of gill boxes similar in their principle to the first. It is now ready to be combed.

The object of combing the wool is to deprive the wool of the short fibres which even in the longest sorts are found combined with it. This process, at the time when the Factory Commission of 1833 visited Bradford, was performed by hand, and at the workman's house. Heat is necessary for wool combing, and this was supplied by charcoal braziers. The fumes of the charcoal, the stooping attitude of the workman, the confined cellar in which he often worked, combined to render this an extremely



unhealthy employment. The operation is now performed with vastly greater rapidity by one of the most ingenious machines that are to be found in any department of textile industry, the wool-combing machine, and is entirely devoid of the sanitary evils that formerly attended it.

Drawing.

The combed wool, now entirely free from the short fibres or "noils," after passing through two finishing frames (similar to the gill boxes) is coiled up into large balls or "tops," and taken to the "drawing room." There it is again passed through a series of three gill boxes, the last of which gives it a slight twist; and then through a system of drawing frames, working on the same principle as the slubbing frames and roving frames in the preparing room of a cotton factory. After passing through the last of these it is ready for spinning.

Such is the series of preparatory processes for "long" wool. There is, however, a shorter wool which yet is intended for worsted spinning. This, after being washed, is passed through a carding engine similar to those employed in the cotton manufacture. It then passes through the combing machine and the subsequent processes above described.

In these preparatory operations many women are employed, and several men and lads, but no young children. The temperature required is not excessive; we found it varying, in clear frosty weather, from 65° to 75°. It was highest in the wool-combing sheds, where the combing part of the machinery has to be kept artificially hot. But in most cases windows were freely open, and the atmosphere in no instance was oppressive. Of atmospheric dust there was very little, its absence being due probably to the thorough washing and subsequent oiling of the material, and to the length of the staple. The labour had the usual monotonous character of all factory work, but did not strike us as severe. The women attending the carding engines, and those of the wool-combing machines which were under female superintendence, seemed to us to have lighter work than those engaged in the card room of a cotton factory.

Spinning.

The labour in a worsted-spinning room much resembles that in the throstle-room of a cotton factory. The spinners are young girls or boys, principally the former, each of whom attends to a certain number of spindles varying from 120 to 220. The spindles are arranged on either side of long frames, and the spinner works in the gangway between two frames, taking one side of each. When the bobbins are full they are taken off, and new ones substituted by the "doffers." These are children, younger than the spinners, a large number of them working half-time only. On the average there will be from one to two doffers to each frame according to the number of spindles in it. But as it is of importance that a frame should not be kept out of gear for a quarter of a minute longer than is absolutely necessary, as soon as the bobbins require renewing all the doffers in the room, or a large number of them, are at once engaged upon it. The process of doffing can be performed in two or three minutes, and then, unless there be another frame ready for them, they have nothing whatever to do. The proportion of work-time during which the doffers are unemployed is very considerable; certainly as much, on the average, as three hours. They are almost always able to sit down during these intervals.

The principal grievance urged by the advocates of shorter time in worsted spinning appears to be the great increase alleged to have taken place of late in the number of spindles attended by each hand. It is contended that the spinner has a greater distance to walk up and down, and a greater strain upon his attention than formerly.

The fact of the increased length of frames does not appear to be disputed. In one of the oldest mills in Bradford we saw rooms where the number of spindles to each frame did not exceed 96, *i.e.*, 48 to a side. In less antiquated mills this number would be increased to 60 on a side, or 120 in the frame; and in the newest machines the spindles would be yet further increased by 20, 30, or 50 per cent. The largest frames that we saw had 110 spindles on either side, the frame being about 33 feet in length.

It is also certain that the number of spinners has not increased proportionally to the number of spindles. On referring to the records of the Commission of 1833, we find it stated that "*one side of* weft-spinning (worsted) with 38 spindles is quite "*enough.*"\* The number attended at the present time is from three to four times as great.

To what extent the workwoman is compensated for this increase by the improvements that have taken place in worsted spinning and in its preparatory processes, we

\* Evidence taken by Mr. Power, C. 2, p. 67.



think it would be very difficult to decide with precision. That to a very considerable extent she is so compensated there can be little doubt. It cannot, however, be disputed that the eye and the foot have larger spaces over which to travel. The degree of exertion varies extremely in different mills. In one case we watched two sides of 60 spindles each for 20 minutes, and noticed that in that time 81 threads required piecing. The spinning in this case was of low counts. The spinner was an adult, and had a third side of 60 spindles to watch; she was in constant motion, and seemed to us heavily worked. This was a case where the machinery was old, and the spindles were working unsteadily. In another case, spinning 36<sup>s</sup>, we counted 42 piecings in six minutes; there the machine was stated to be of the newest construction. And we saw work not very dissimilar in one of the best and largest mills of the district. These, however, are samples of the most laborious spinning; the average of what we saw was somewhat less arduous. In 92 sides that we looked at, we noted 156 broken threads, *i.e.* nearly two threads in each were constantly down; and there would doubtless be others which, though not broken, eyes more experienced than ours would judge to require attention. There is therefore a steady unremitting call upon the attention, although the strain may not be at any one moment very heavy. When the wool was dyed the thread was said to be more apt to break, and was certainly harder to see.

The temperature of the spinning rooms was in most cases above 70°; rising in two instances to 77° and 79°. There would appear, however, to be no reason whatever for this except the dislike of the workpeople for cold fresh air. A high temperature is not required for worsted spinning. The windows generally are of better construction than in the cotton districts. The privy arrangements are also in most cases markedly superior.

Many of the remarks that have been made as to the weaving sheds of the cotton districts will apply to worsted weaving. The work is done in the great majority of cases by women; a considerable portion of these are married; and the practice of working till the last stage of pregnancy, and of returning to work within a month, sometimes within a fortnight, or even a week, of childbirth, is as common in the West Riding as in Lancashire. Weaving.

The worsted weaver attends to two looms; never to more, and rarely, in plain weaving, to less. The web requires more attention than in cotton weaving. Knots caused by defects in the yarn have to be picked out as the work proceeds; and a great part of the weaver's time is occupied in this. The looms are provided, as in the cotton manufacture, with the weft-fork, and with the self-acting templets. The speed of the shuttle is slightly less than in the cotton-loom, varying for ordinary plain stuffs from 152 to 172 picks per minute.

The principal change that has taken place in worsted weaving during the last 20 years is that two looms are now given to each weaver instead of one, as formerly. Strong objections were expressed by the workpeople to the introduction of the two-loom system, and strikes in several instances took place. But the system is now thoroughly and peaceably established, and as the wages are paid by the piece, the workpeople derive incontestable pecuniary advantage from it. That the day's work has become more laborious by this change, seems to us also quite certain; though probably the increase in wages has been much more than commensurate with the increase in exertion. From 7s. to 9s. are commonly earned weekly from each loom, and in many cases more than this.

The general appearance of the workpeople in the worsted district struck us as somewhat superior in vigour and health to that of cotton operatives. Cases of marked deformity, such as appear to have been of very frequent occurrence 40 years ago, appear now to be as rare as in non-factory districts. Many of the women and children are evidently enjoying robust health.

Careful analysis of the Registrar-General's records of mortality, shows, however, that the adult women of Bradford, Halifax, and Keighley, and their respective neighbourhoods, are liable to a higher death-rate than the average. Taking the period during which the health of women is of the greatest national importance, the period between 15 and 45, the normal rate of mortality, as recorded in the English Life-table, is 866 per 100,000. In the registration districts of Bradford, Halifax, Keighley, including not merely the towns of those names, but the adjacent rural and suburban villages, the death-rates for women of this age are 1,048, 1,135, and 1,197.\*

\* The death-rate is based on the average mortality of the years 1870 and 1871, compared with the population given in the Census of 1871.



*Silk Manufacture.*

Silk spinning.

In silk spinning a distinction must be made between the spinning (or throwing) of raw silk and that of silk-waste.

The silk comes from abroad in large rough parcels or hanks (technically called "books"), which consist of a number of different qualities and sizes mixed together.

Sorting.

These are separated and sorted from each other by girls, who just reverse the process by which the "book" was made up. They put together the various qualities of the raw silk ready for the "danters," and lay aside the waste, *i.e.*, the rough silk which adheres to the various skeins.

Winding room.

The skeins of raw silk are then wound on to bobbins; the winding frames being under the superintendence of women called "danters," who have little girls, many of them half-timers, to piece the ends as they break. The ends break constantly, so that the work and the motion of the fingers is continual. It requires very sharp sight, and we noticed several cases of squint in one of the rooms where this process was going on; but on inquiry we could not ascertain that this disease had been observed to be prevalent.

Cleaning.

From the winding the bobbins go to the "cleaning room," where they are unwound, and the thread drawn between two perfectly smooth blades set at a given distance from each other, so as to remove all dirt and inequalities, and the thread is then wound on to other bobbins at the other side of the frame. These frames are managed generally by full-timers (boys), who piece the ends when they break, and who doff and fill the frames.

Doubling.

From the cleaning the silk goes to the doubling frames, where two or more ends are twisted together. This is a very simple process, requiring but little attention.

Spinning.

From the doubling frames the silk goes to the spinning room. Here there was great noise, and the rooms we saw were very close and hot, the temperature being about 75° Fahrenheit. The frames are usually set very close together. They are similar to the throstle frames used in cotton spinning. Each piecer minds about two sides, of 40 spindles each.

As far as we could judge, there did not seem much piecing to do, and the work was light. It was done by men and boys (full-timers). In the same room are the "throwing"-frames, where the silk is doubled two threads together, or more, according to the yarn wanted, and wound on a reel into a hank which is to form a woof ("tram" or "shoot") or a warp ("organzine").

In the same room the skeins are knotted, *i.e.* tied up so as to separate each skein, and the piecer's knots are trimmed off with scissors.

There is not any artificial heat required for any of these processes. The spinning rooms were hot and close from the windows being kept shut and from the crowding of the machinery.

Up to this time the silk has been what is technically called "hard," *i.e.* it still retains the natural gum. It now goes out of the mill to be dyed. Before the colour is put in the gum is washed out. This deprives most colours of silk of a portion of their previous weight, roughly estimated to us at one fourth, though some dark colours gain in weight, even as much as 50 per cent., from the heaviness of the dye. But this renders them friable.

All that is necessary to notice here is, that the "hard" condition of the silk prevents it from generating dust or flue during the various processes above enumerated. The silk returned from the dyers is wound into bobbins for organzine and tram.

The first step is to separate the skeins from each other on a "parting-ree," and arrange the appropriate skeins parallel on a reel ("winding-ree"), from which they are wound off on a bobbin, each "winder" winding about 22 ends.

From this point no person is employed as a full-timer under the age of 13.\*

In the above process women and girls are employed, the men's fingers being too clumsy. There is nothing insalubrious in it. The heat ought not to be more than 65° for good winding, though in places we found it higher, from imperfect ventilation.

The next process is the "draw-frame," where the silk for the "shoot" is drawn a little tighter, and wound on bobbins to a uniform weight; or the "warping-mill" for the organzine, which is essentially the same as in cotton.

\* It is provided in the Act 7 Viet. c. 15. s. 62. that children above eleven years of age employed solely in the throwing and winding of raw silk may work ten hours a day.



The weaving is done almost exclusively by women, who usually mind two looms each. The looms are self-stopping, and as far as we could judge the weaving was by no means laborious, nor was there any excessive heat or any dust. The speed of the looms is usually about 110 picks per minute.

The spinning of waste silk is quite a different manufacture. The first step is to boil the gum out, a process in which men are employed. The silk comes out in the shape of a mass of long intertwisted fibres. Waste-silk.

The silk is drawn out into a web of parallel fibres, between a revolving drum armed with teeth, which drives it down on to another (external) cylinder, set with series of hooks at certain intervals. The silk is cut at each of these series of hooks, and stripped off by a pair of "clams" or flat handles of wood. The clams, when full, are put parallel and vertical into a "bed," over which a series of combs pass, which lay the fibres even with each other, and scratch off the shorter fibres. The latter are again put into the bed, and combed again. The refuse, which is too short to be used, goes to the carpet manufactory. There is a good deal of dust generated in the process of dressing. It is done usually by men, but in some places by women. In one room where we saw it going on, there were fans over each frame, by which the dust is sucked up and delivered into the open air. At the time of our visit (very cold winter weather) there was not much dust perceptible; but it is said to be much worse in summer. Dressing.

The dressed silk is next passed through a frame with gill-boxes, like the "preparing" machine in the worsted manufactory, by which it is drawn out and coiled round a drum or spindle into a "lap," i.e. a long skein of parallel fibres, which is drawn into a sliver in another frame, and several (say 16) of these are arranged or pressed together, and again slightly drawn, into another sliver; they are then slubbed and roved. The silk will probably pass through three drawings, one slubbing, and one roving. Drawing.

All this is done by women and girls, (some half-timers). The atmosphere seemed pleasant, and the work light. They earn 10s. to 14s. a week.

The spinning is done on the same kind of frames as the "fly-spinning" of worsted. No heat is required in the process, in fact excessive heat is carefully avoided, as it makes the silk electric, and in this condition its fibres start up, like the hair on a cat's back, so that it becomes rough. In very hot weather they damp the floors to obviate this. Spinning.

In those instances of this process which we noted, the frames were going extremely well, hardly any ends coming down. There will commonly be two winders to three "sides," a side having from 120 to 150 spindles.

From the spinning bobbins the silk is reeled off into skeins, which are picked over by little children (half-timers, sitting in a row by the windows) to take out any impurities. This is very light work. The yarn is now ready for sale.

On the whole, the silk manufacture seemed to us a very healthy one, the only process in which any dust is generated being the "dressing of waste silk," which, however, is by no means so bad as the carding of cotton or tow, or flax heckling; and the manual labour is certainly not severe in any part, nor is there any unnatural temperature.

But as the work of the children appears equally continuous in this as in other branches of labour, we cannot see any reason for the exemption of children over 11 from the rules as to half-time, which prevail in other manufactures.

The number of children in the silk factories of Macclesfield who were examined by our medical colleagues is unfortunately small, and contains, of course, no children above the age of 10. The inferences, however, to be drawn from the subjoined table, when compared with the tables found elsewhere in our report, would seem to point in the direction that we have indicated.

#### MACCLESFIELD CHILDREN.

No. examined.	Age.	Sex.	Height.	Weight.	Measurement of	
					Chest empty.	Chest full.
			inches.	lbs.	inches.	inches.
13	9	Male	47·92	55·15	22·26	23·80
17	"	Female	48·00	53·51	23·01	23·98
26	10	Male	48·83	56·52	22·74	24·89
7	"	Female	48·78	52·92	22·01	23·58



The results of a comparison of this table, on which, however, we lay less stress than we should have done had the number examined been greater, with Table D. (urban factory children), are as follows :

Macclesfield boys of 9 are inferior in height,		
"	"	weight,
"	"	measurement of full chest,
"	"	expansibility of chest ;
Macclesfield boys of 10 are inferior in height,		
"	"	weight ;
being in the measurements of the chest almost exactly similar.		
Macclesfield girls of 9 are slightly superior in height.		
"	"	inferior in weight.
"	"	measurement of empty chest
"	"	and of full chest.
"	"	expansibility of chest.
Macclesfield girls of 10 are inferior in height.		
"	"	weight.
"	"	measurement of empty chest.
"	"	full chest.

#### *Lace Manufacture.*

The machines for the manufacture of lace are worked exclusively by men. Owing to the irregularity of the demand and its dependence upon fashion, the ordinary restriction upon the moving power is modified, and the machine is allowed to run from 4 in the morning till 12 at night. This is done by two relays of workmen. The first comes at 4 and works till 9. His place is then taken by another, who works till 1. The first then resumes his work till 6. The second continues till 12. The payment is by the piece, and the two who work at the same machine are paid as one man, no attempt being made to discriminate their share of the work done. No practical difficulty is experienced in this arrangement.

A few women are employed in reeling cotton for the machines, and a few lads are engaged in filling the bobbins with thread, in replacing the empty bobbins by full ones, and in fitting them into their "carriages."

The rooms in which the work is carried on are for the most part badly ventilated, and vary in temperature from 70° to 76°, the external temperature being at the time of our visit about 50°.

The principal process in which women are employed, and the most objectionable, is the dressing of lace. The lace when returned from the bleach works is passed through a starching process, and is then stretched out on frames in long rooms and dried rapidly at a high temperature. In some cases the stiffening size is applied after it has been stretched on the frames, and here there are a still larger number of women employed in spreading out the size evenly with rollers, in striking out the excess of it with light rods, and in lightly brushing the material with large wooden brushes covered with flannel. The temperature in these rooms at the time of our visit was between 85° and 90°. But the employer told us that it not unfrequently rose to 110°, especially on dull days when the gas was lit, and when the material was of a kind that required rapid drying. In a few of these rooms the air was kept in constant motion by a large fan, the four vanes of which revolved round an axis parallel with the length of the room. But in most the air was stagnant and extremely oppressive. The number of women employed in these rooms is considerable. They work the usual factory hours.

A large number of women are employed in warehouses at mending, finishing, packing, &c. But the hours during which they work are short, not amounting to more than 52½ per week. All can sit, if they please, at this work ; and, as compared with the ordinary factory worker, their position appeared enviable.

#### III.—OPINIONS OF MEDICAL PRACTITIONERS.

Another element for forming a judgment on the matters submitted to us, obviously, was to be found in the experience of medical practitioners, whose position brought them into contact with factory operatives, either as certifying surgeons, medical officers of hospitals and dispensaries in factory towns, or private practitioners.



Accordingly we circulated to a large number of gentlemen holding such positions a paper containing the seven questions following:

1. Have you had medical experience of factory operatives; if so, how long?
2. Have you formed any opinion whether the factory labour, as now carried on in your district, has any deleterious influence on the health of the operatives? Are there any diseases which you have noticed as being peculiarly prevalent amongst them?
3. Are there any processes in the manufactures of your district which you believe to be specially injurious to women or children, and if so, in what way?
4. Has the labour any tendency to increase the rate of infant mortality? If so, does this depend on the mothers suckling their children imperfectly, or on their working too near their confinement? Do you know how soon married women usually work at the mill before and after delivery?
5. Do you think that "short-timers" commence work at too early an age, or that their hours of work are too long?
6. Do you think the present age of 13 years too early for a child to commence working full time?
7. Do you think that the present day's work ( $10\frac{1}{2}$  hours) is too long for young persons, or for grown-up women?

To these questions we have received answers from 171 gentlemen, and we will first give the general result of those answers.

1. As to the length of their experience of factory operatives, it is stated as follows:—

1-5 years	-	-	-	16
5-10 "	-	-	-	22
10-15 "	-	-	-	26
15-20 "	-	-	-	16
20-25 "	-	-	-	24
Over 25 "	-	-	-	60
Unstated	-	-	-	7
Total	-	-	-	171

Thus it is seen that more than half have had an experience of this class of practice extending over more than 20 years.

2. The second question is divided into two parts: (a.) Is factory labour generally deleterious or no? To this the great majority reply in the negative. 134 answer this part of the question,—40 in the affirmative, and 94 in the negative. (b.) To the question what special diseases they have found particularly prevalent amongst factory workers, the following answers have been received:

Phthisis and chest affections	-	-	-	51
Bronchitis, emphysema, and asthma	-	-	-	49
Dyspepsia	-	-	-	28
Rheumatism	-	-	-	12
Scrofula	-	-	-	13
Uterine derangements	-	-	-	9
Anæmia	-	-	-	7
Heart disease	-	-	-	5
Ulcers	-	-	-	5
Pneumonia and pleurisy	-	-	-	5
Ophthalmia	-	-	-	4
Varicose veins	-	-	-	4

Then follow a miscellaneous train of disorders, instanced only by two or by one observer, viz. hysteria, skin disease, chlorosis, typhoid fever, febricula, œdema of ankles, erythema nodosum, Bright's disease, polypus, hernia, hæmorrhoids, diseases of the scalp, mill fever, onychia, "peculiar eruption on face and arms," rickets, and flat-foot.

We would call especial attention to the fact that only one authority in each case is found stating that he has observed an unusual prevalence of flat-foot or rickets among the factory population. It must be remembered, however, that flat-foot in its slighter degrees is not an ailment for which professional advice is often sought.

3. To the third question, whether they could point to any processes specially injurious, 99 replied in the negative, 12 instanced manufacturing processes not within the scope of this enquiry, 15 pointed to cotton carding, 11 to the use of China clay or



other material in the size, 8 to the dusty atmosphere generated in various processes, 7 to the heckling of flax, 6 to the infusion of steam into weaving sheds, 6 to the great heat required in some of the processes, 4 to the incessant nature of the toil in weaving; while single observers instanced "wet spinning," "exposure to wet in the manufacture of linen" (both probably meaning the same), "cleaning and preparing raw cotton," "calico printing," "lace dressing," "carding of silk," "gassing of yarn," and "the preparing of flax for spinning," as in their opinion prejudicial to health.

4. The fourth question asks in the first place whether factory labour as at present carried on has any tendency to increase the rate of infant mortality. A great preponderance of opinion inclines to confirm this; the number of those who answer explicitly is 132,—101 in the affirmative, and 31 in the negative. Now as many as 118 reply to the next part of the question, that the factory women suckle their children imperfectly. Of these 118, 6 are among the number of those who do not see any tendency in the system to increase the ratio of infant mortality\*; but there can be no doubt that the rest intend, when giving no explicit answer to the general question, to answer implicitly in the affirmative, by giving this reply to the specific question about the suckling. It will therefore be right to say that the great majority, if not the whole, of the medical men in these districts think that the lives of the infants of factory mothers are sacrificed by imperfect suckling, and by improper feeding when at nurse in the absence of the mothers.† 24 also allege as a cause of infant mortality the mothers working too near their confinement. All these 24 are among the previous 118.

But we have met with no practitioner of medicine in these parts who does not lament the short period which women in factories permit themselves for their confinement, whether they regard this as a proved cause of infant mortality or no.

Out of those who have answered this part of the question, 33 say the women usually leave the mill more than a fortnight before their confinement, and 77 less than a fortnight. 71 say they usually return to work in less than a month after delivery, and 47 more than a month. One of our correspondents instances a case in his own experience where a woman left her work at 6 p.m., was confined in the evening, and presented herself again to work next morning, but was sent home again. And though this of course is an extreme case, yet several say they have known many cases of women returning within a week of their delivery, and being admitted to work.

An old factory surgeon (employed in that capacity since 1834) puts the general opinion in unusually forcible terms when he says: "I regard the mother's return to the mill as almost a sentence of death to the child."

The surgeon to the great works at Saltaire says: "I believe if married women were kept at home to attend to their houses, nine tenths of the evils in the factory districts would be removed."

Mr. Ingle, medical officer to Salford Workhouse, says:

"The total number of deaths in Manchester‡ in four years was 41,805. The number of deaths of children aged five years and under was 20,025, or 48 per cent.

"In the north of England only 7 per cent. of children under one year die annually.§

"Nearly 25 per cent. die in Manchester."

5. The fifth question relates to short-timers. 84 think the present age too early, 61 are of the opposite opinion, 25 think the present hours of work too long for these young children, 76 do not.

\* Nos. 4, 47, 59, 137, 152, 161. Almost all these mean that the increase in the mortality (which they admit) depends on the accidents of the system rather than on the system itself.

† An analysis of the 31 negative answers affords additional proof of the accuracy of the general conclusion that the factory system as now carried on in large towns does increase the rate of infant mortality; for,—  
Nos. 13, 15, 25, 55, 57, 60, 14 reside in districts where the suckling women do not go to the mill, or where  
86, 93, 100, 116, 120, as a rule married women are not employed.  
135, 150, 171.

Nos. 37, 80, 165.

Nos. 18, 59, 137, 152, 161.

3 reside in healthy rural districts, where very probably the same rule applies.

5, while answering that the labour *per se* has no such tendency, admit that imperfect suckling does increase the mortality. These perhaps might, as accurately, have been classed with the affirmative answers.

4 answer dubiously, not having had their attention specially called to the point. 1 merely says that this evil is less than formerly.

The remainder, four only in number, answer simply in the negative, without any qualification, writing from large factory towns.

‡ Probably this gentleman means Manchester and Salford.

§ This is true only of a very few districts, but in many the mortality does not rise above 11 or 12 per cent.



6. With regard to full-timers, 69 think the present age should be raised, 96 think not.

7. With regard to the young persons under the protection of the Factory Acts, 46 think their present working hours too long, 119 are of the opposite opinion. As to the grown women, 31 think their day's work too long, 132 think not.

Besides these answers from individual medical men, our questions were laid before the Bradford Medico-Chirurgical Society, and we have been favoured with the following answers, which we think it right to give at full length, as a useful summary of the opinions entertained by a body of medical men of high position and extensive experience in this matter:—

Q. 1. Have you had medical experience of factory operatives; if so, how long?

A. Yes; the experience afforded by a residence in the worsted manufacturing town of Bradford, and extensive practice amongst its population during periods varying from 1 to 35 years.

Q. 2. Have you formed any opinion whether the factory labour, as now carried on in your district, has any deleterious influence on the health of the operatives? Are there any diseases which you have noticed as being peculiarly prevalent amongst them?

A. Adult male workers do not exhibit ailments specially dependent on their work, with the exception of wool sorters (especially of alpaca), who suffer from irritating bronchial and lung affections. A similar affection also is developed in one process of the silk manufacture now carried on here.

Amongst the women of factory operatives, much more than among the general population, derangements of the digestive organs are common, *e.g.*, pyrosis, sickness, constipation, vertigo, and headache, generated by neglect of the calls of nature through the early hours of work, the short intervals at meals, the eating and drinking of easily prepared foods, as bread, tea, and coffee, and the neglect of meat, and fresh cooked vegetables. Other deranged states of a still worse character are present, *e.g.*, leucorrhœa, and too frequent and profuse menstruation. Cases also of displacement, flexions, and versions of the uterus, arising from the constant standing, and the increased heat of and confinement in the mill. A few cases of mollities ossium in girls and boys are observed, but these are not common.

Q. 3. Are there any processes in the manufactures of your district which you believe to be specially injurious to women or children, and, if so, in what way?

A. Œdema and varicose veins of the legs are common amongst female mill-workers of middle age.

Q. 4. (a.) Has the labour any tendency to increase the rate of infant mortality? (b.) If so, does this depend on the mothers' suckling their children imperfectly? (c.) or on their working too near their confinement? Do you know how soon married women usually work at the mill before and after delivery?

A. (a.) Yes. The evils occurring in women as detailed in answer to question 2 indirectly affect the more perfect growth of the child *in utero*, and dispose it when born more easily to become diseased. Anæmia is induced by dyspepsia, and the child *in utero* suffers from this.

(b.) Yes. The children are undoubtedly imperfectly suckled, seeing that a child should be suckled fully every two hours, whereas periods of four and five hours pass without its having its mother's breast. Moreover, the suckling is imperfect in proportion as the milk is badly elaborated, which it is sure to be in dyspeptic and anæmic women; women's breasts, too, when not emptied become congested, whence the child gets the milk, not in a pure, but in an impaired state; this congested state of the breasts is not so common as the other evils, and for obvious reasons.

But the mother's absence at the mill involves the greatest evils to the child. The careless nurses (and they are notoriously so) with whom the children are left permit exposure to cold in various ways to affect them, whence congestions follow, and bronchitis and pneumonia are induced. In the absence of the mother's breast these nurses give improper food,—at best cow's milk badly proportioned; but oftener bread, water, and sugar, and even food generally used by adults, which is utterly incapable of digestion by children so young, and hence diarrhœa and other gastro-enteric disorders; the children thus continue unnourished, and become emaciated and tubercular, and ultimately die.

(c.) Women often work up to the day of their confinement, and sometimes are taken in labour at the mill. They occasionally return to the mill at or even within the 14th day after confinement; this is a fruitful source of "version" and "prolapsus."

Q. 5. (a.) Do you think that "short-timers" commence work at too early an age (b.) or that their hours of work are too long?



A. (a.) Yes. They ought not to commence work before the age of 9 years, nor cease to be half-timers till the age of 14 years. (b.) Yes.  $4\frac{1}{2}$  hours would be long enough.

Q. 6. Do you think the present age of 13 years too early for a child to commence working full time?

A. Yes.

Q. 7. Do you think that the present day's work ( $10\frac{1}{2}$  hours) is too long for the young persons or for the grown-up women?

A. Yes.  $9\frac{1}{2}$  hours appears sufficiently long for young persons under 20, but 8 hours would, *cæteris paribus*, more greatly conduce to their health.

For grown-up women, *i.e.* women over 20,  $9\frac{1}{2}$  hours is a reasonable time so long as they remain unmarried. The employment of married women in mills, however, is fraught with so many evils, especially to their children, that it would be more in accordance with sound knowledge and experience if they were reduced to the period fixed for "half-timers."

\* The older and more experienced of the members of this society are in favour of the exclusion of mothers from mills during their pregnancy, and for 10 months after their confinement.

Some of the members of this society, indeed, recommend that no married women be permitted to work in the mill at all.

Signed on behalf of the members of the Bradford Medico-Chirurgical Society, at a meeting held February 4th, 1873.

Sub-committee. { J. H. BELL, M.D., President.  
P. E. MIAL, M.R.C.S., Member.  
DAVID GOYDER, M.D., Secretary.

In addition to these answers to questions which we ourselves circulated, we have received from associations of working men in Arbroath and Dundee, in Bradford and in Manchester, answers to questions somewhat similar which they circulated to the medical men in their respective neighbourhoods.

We subjoin the questions circulated by the Bradford and Manchester associations :

1. What effect have the present hours of factory labour on the health and growth of children under the age of 13 years?

2. What effect has the employment of mothers during the present factory hours,—

(A.) As to their own health?

(B.) As to infant mortality?

3. In your opinion would the reduction of the present hours of labour from  $10\frac{1}{2}$  to  $9\frac{1}{2}$  hours per diem tend to improve the health and physical powers of women, young persons, and children now employed in mills?

Those from Dundee were substantially the same.

Forty-two answers were received to these questions. To the first question, 26 replied that in their opinion the present hours of factory labour exercised an injurious influence on the health and growth of children. One replied doubtfully, five could see no evidence of any deleterious influence, nine gave no answer.

As to the effect of the employment, of mothers during the present hours,—

(a.) On their own health, 32 thought it was bad, two thought not, eight did not answer.

(b.) As to its tendency to increase infant mortality, all those who answered the question at all, 37 in number, were unanimous.

Twenty-nine were in favour of a reduction in the hours of labour, seven were doubtful of its doing any good, two were opposed to it.

It is open to observation that the answers of the medical men to whom the workmen wrote are much more nearly unanimous in recommending the proposed change, and in denouncing the physical ill-effects of the present system, than the more numerous body to whom we applied. And very possibly they were written to partly because their opinions were known or surmised. But still those opinions were no doubt honest and independent, and they must be accepted as showing what is thought on the subject by a large body of medical men practising in the district.

The result of this inquiry approaches unanimity only on one point, but on that point we submit that the medical evidence is absolutely conclusive; *viz.*, the great damage and loss of life caused by the employment of suckling women, as they are now

\* Two of the members of the society dissented from this clause.



employed in factories. Indeed it hardly requires medical evidence to show that the desertion by a mother of her infant, during the whole hours of a working day, must entail a large amount of infant mortality; nor is this as far as we could learn, doubted by any person, medical or not, who has any experience of the factory system as it prevails in large towns. Those of our correspondents who see no evidence of increased infant mortality, reside chiefly in country districts, or in parts of the kingdom where suckling women do not generally work in mills (see the foot-note on page 38). The ignorance, poverty, and recklessness of the persons (very commonly strangers) in whose care these poor infants are left, no doubt greatly aggravate this necessary tendency, which is again increased by the early hour at which the mother has to carry out her baby to the nurse, often preventing her from properly suckling and tending the child before leaving home, and exposing the latter to the winter weather at the coldest period of the day. Nor can any one question that the resumption by a woman of labour involving  $10\frac{1}{2}$  hours of standing and walking daily, so shortly after her delivery as is customary in these districts, must have a most injurious effect on her own health.

So far our medical testimony is we may say unanimous, and its conclusions agree with the results of every day experience.\*

Some enactment then which may limit or prevent the employment of suckling women in the mills seems to us to be urgently called for.†

With regard to the general effect of the factory labour on the health of those employed the testimony is far from conclusive. The majority do not see any evidence of a general deleterious tendency in the labour itself. And this is quite consistent even with an admission that the factory population tends gradually to deteriorate. For there are many incidental accompaniments of the factory system which might produce such a result, though the labour itself were pronounced healthy, such as the aggregation in large cities, the temptations to intemperance and other vices, the unhealthy state of dwellings and bad habits of diet. Many of our correspondents dwell on some or all of these incidental causes of disease.

We may quote the following from a speech made a short time since at a public meeting at Bolton by Mr. Aldermen Ferguson, himself a certifying surgeon under the Acts:

“ He was perfectly satisfied from close observation during the last ten years, in a situation which gave him the best opportunities of judging, that the children of the mill population were steadily, year by year for their age, getting smaller and physically less capable of doing their work. If they asked him how that was he would tell them. In the first place, it was owing to a great extent to the intemperate habits of the parents transmitting feeble constitutions to the children; and in the next, to the mistaken manner in which the mill people fed their children. They brought them up on tea and coffee, instead of upon more substantial food. As an example: During the last month in the Great Bolton district, he had had to reject as many as 19 children simply because they had not the strength and development

\* See the section of this Report headed “Statistical enquiries,” page 55.

† All the evils connected with the unnatural desertion of their infants by mothers engaged in factory labour are summarized with terrible force by Mr. Simon in his 4th Report as medical officer of the Privy Council (1861), p. 33, in a series of quotations from a Report furnished to him by Dr. Greenhow which is published at length in the same volume. These quotations are too long to be given here, but they fully bear out the statements made in this Report; and we may say that they apply to the present state of things as completely as to that which prevailed when they were published. Mr. Simon concludes thus:

“ It is scarcely necessary to observe, that against this state of things there is no resource in any present provision of law. And the root of the evil is an influence with which English law has never professed to deal. Money is on one side; penury on the other. Domestic obligation is outbidden in the labour market; and the poor factory woman who meant only to sell that honest industry of hers, gradually finds that she has sold almost every thing which other women understand as happiness. But the root of this evil is perhaps out of reach of law, certainly out of reach of remedies which I am competent to advise. And I will only suggest, with reference to one part of the consequences, that factory masters who employ adult female labour would do something to mitigate the suffering and demoralization which result from it, if they would establish within their factories, under well-advised regulations, nursery-rooms, where working mothers might leave their infants in some proper and kindly charge, and might, as often as necessary, have access to them.”

There can be no doubt that, if the abatement of this evil by legislation is as hopeless as Mr. Simon seems to think, some good might be done here and there by the benevolence of individual masters in establishing nurseries, as suggested above, or lying-in clubs, which would enable mothers to give themselves a reasonable period of absence from labour. But it is obvious that no system which depends on individual good feeling can meet so universal an evil. And we cannot allow ourselves to despair of the introduction of a practicable measure of legislation on this subject; especially since the evil is one which is confessed and deplored by every employer of labour, with whom, up to the present time, we have conversed, and which they all profess themselves anxious to co-operate in checking.



"required by the Factory Act, and these numbers were steadily year by year increasing. Another evil he had noticed was that many young children of 12 years of age or thereabouts were beginning to learn to smoke, acquiring the habit from their fathers, and possibly from their mothers also. This was a condition of things which, in his mind, excited painful considerations. What was to become of the factory population if this physical degeneration went on?"

This quite agrees with what we are told by our other correspondents, for the dyspepsia, which is so commonly alleged as one of the most prevalent diseases among the factory operatives, is referred by at least a dozen surgeons in various parts of the country to the excessive use of tea.\*

The bronchitis and other chest affections, again, which seem to constitute the most common disorders connected with factory labour, are referred by many of our correspondents† not so much to any necessary condition of the labour, as to incautious exposure to changes of temperature without the change of clothing which would render them harmless.

If it is difficult to separate the effects of mill-labour itself from those of causes such as these which have no connection with it, it is still more so to distinguish the necessary effects of the labour from those of causes at present connected with it, but which might be removed by better arrangements. Thus, Dr. Ebenezer Watson, of Glasgow, says "there are many influences injurious to health to which the workers are subjected; such as imperfect ventilation, crowding, dust of cotton, &c., and nauseous smells. The diseases to which I believe the workers are liable are those likely to be engendered or aggravated by the above-mentioned influences."

Dr. H. Browne, Manchester, says "diseases of the digestive and respiratory mucous membranes are not quite twice as frequent in the factory workers, who attend the Infirmary as out-patients, as in the remaining out-patients of all classes and both sexes."

"In one thousand recorded cases taken at random, 247 are female mill hands; of these, 77 are cases of diseases of digestion and 60 of chronic bronchitis. Amongst the first 312 names of men and women other than mill hands, 39 are cases of diseases of digestion and 43 of chronic bronchitis. The excessive amount of indigestion and bronchitis do not appear to depend on the work itself except indirectly. From extensive and careful records I believe that the frequent use of hot tea with poor living is the chief cause of the indigestion. All must dine hastily, and many never leave the mill.

"As to bronchitis it is explained by the early walk to the mill in all weathers, and the impossibility of changing any wet clothes."

Dr. Crompton, of Manchester, speaks as follows:

"The most formidable cases of *indigestion* occur amongst them, and this is the commonest form of indisposition for which they present themselves. This we commonly term '*tea indigestion*,' as arising from taking tea in excess and to stave off the feeling of hunger, but I see similar indigestion in poor old Irish women (not employed in factories), and in sempstresses, and arising from the same cause.

"In factories the heat produces thirst, and to allay this cold stewed tea is largely drunk. It might be a question whether it would not be desirable to have a filter of pure cool water in each room in a factory (the filter could be kept cool by evaporating water from its exterior). Pure water would allay thirst without impairing appetite.

"The effect of drinking so much tea is that mothers (especially) take insufficient solid food to maintain their strength (especially during pregnancy), and to yield good nourishing milk during nursing. These circumstances taken together with the absence of the mother from her child during the hours of labour are, in my opinion, most mischievous, and account for the large mortality among their children, or their stunted appearance as they grow up.

"If factory operatives lived in good air at their homes, or on as *plain* food as the labouring farm population, I do not see why they should materially degenerate, especially if no mothers were allowed to work for say nine months after their confinement (whether the child lived or not)."

With regard to the answers we have received to the question whether any of the processes are in themselves injurious we would remark that though we thought it right to put this question in order to elicit the opinions of those surgeons who might

\* See amongst others the answers numbered 52, 59, 78, 81, 94, 118, 132, 133, 139, 171.

† See numbers 1, 33, 43, 119, 120, 123, 127, 140, 160.



be familiar with the processes carried on in the mills, yet these are only a small minority. The certifying surgeons seldom visit the interior of the mill; in fact, under the present system, they are only called on to do so in case of machinery accidents.

Still the answers of the comparatively few who instance any special process as injurious correspond very closely to the conclusions which we have indicated from our own observations.

On the subject of raising the age for commencing half time work from the present standard—8 years—the balance of opinion inclines in favour of the proposed change. And although the majority do not think that the present hours are too long for the little children, yet a great number dwell on the hardship of exposing such young children without food to the bitter climate of a northern winter at 5 or 5.30 a.m.\* in order to reach the mill at 6 o'clock.

And it seems plain that some provision which would enable these children to stay at home till after breakfast would materially tend to favour their healthy growth.

The collective opinion of those practitioners to whom we wrote is decidedly against raising the age for "full timers," and they testify still more decidedly that they have not noticed any harm directly connected with the length of the present working day. But the opinion of the Medico-Chirurgical Society of Bradford to the opposite effect is worth great consideration, especially as the labour carried on at Bradford is confessedly less trying to health than the cotton, and, in our opinion, the flax trade. Nor should the preponderance of opinion among the 38 answers to the questions circulated by the Workmen's Associations be left out of sight.

Besides any specially injurious tendency connected with the processes themselves, or with the habits which factory life brings with it, some medical authorities dwell upon the wearisome monotony which strikes a stranger perhaps more forcibly than any of the other drawbacks of the mill. In fact the exquisite ingenuity which has invented a separate machine for each minute step in the manufacture entails upon the person in charge of such machine a constant repetition during the whole of the working day of the same action, unrelieved by any interest in the thing itself, any difficulty calling for the exercise of the mind, any change of place, or scenery, or surroundings, in fact any relief whatever from the day's monotony.

The following is extracted from a speech by Dr. Crichton Browne of Wakefield, delivered to the Leeds Philosophical Society on January 7th, 1873 :

"He alluded to physical degeneration arising from the minute division of labour, and the want of variety of mental nourishment. But," he continued, "what is the moral to be deduced from these? Certainly no censure against the division of labour; that, with our close packed seething population, and the call for rapid production, is an awful necessity. The moral is this,—that we must do something to mitigate the evils springing from the division of labour; that we must seek an antidote for them. And in the first place, it seems to me that a shortening of the hours of labour is an unavoidable corollary of its infinite division. When labour was greatly varied, every portion of it was relief and relaxation in relation to that part which preceded it. Now that it is so painfully monotonous there is no relief or relaxation connected with it. We must therefore curtail it so that relief and relaxation may be sought out of labour, and we must curtail it to such an extent that total exhaustion is avoided, so that relief and relaxation may be partaken of with relish." (Leeds Mercury, Jan. 8, 1873.)

At the same time, though the thing done is so monotonous and uninteresting, any negligence is fatal to the work, and the attention must be unremitting, and this call for unremitting attention is increased, as we have shown elsewhere, by the increased speed of machinery, and the constant demand for increased production. This point has not escaped the attention of our correspondents.

Mr. Robinson, of Dukinfield, says, "The injurious element in factory labour (chiefly in spinning and weaving) is the incessant and increased action of machinery, preventing the body having those brief periods of repose which if left to itself it instinctively would have. I attribute the difference in healthy vigour between colliers and mechanics on the one hand, and factory workers on the other, to the constant demand upon muscular and mental activity made by the constant action of the swift machinery. The absence of brief periods of rest, in my opinion, does more to exhaust the heart than any other condition."

The same gentleman in answer to question 7 (as to whether the present day's work is too long for the protected persons) replies, "If the speed of machinery is not to be

\* We have noted as many as 20 answers to this effect.



"increased, it is too long. But I would not advise any person, young or old, male or female, to exchange a slow speed and long hours for swifter speed and an hour less."

Another point which, though not perhaps one directly contemplated in our enquiry, yet is not remotely connected with the health of the persons under the protection of the Acts, relates to the duties of the certifying surgeons. Under the present system, while the surgeon has the power of rejecting a child when presented to him for certificate, if he thinks it deficient in physical power he has no means of knowing the kind of labour to which the child may be put, nor its actual effects on the child's health. Several of our correspondents are of opinion that a change in this respect might be for the benefit both of the masters and their workpeople.

Dr. Ebenezer Watson, surgeon to the Glasgow Royal Infirmary and certifying surgeon, says, "In the foregoing answers I have supposed that the surgeon has a knowledge of the kind of work to be done by those he certifies able for it; but it seems to me an anomaly that, officially and by the Factory Acts, he has no power to enter the factory to ascertain this for himself. I think it is very necessary that this should be remedied, and I think that the certifying surgeon should be called upon to enter the works to examine into and report upon the healthiness of the places where the workers, old and young, are employed, as well as upon the health of the workers themselves."

The following is extracted from Mr. Baker's report for October 31st, 1868, p. 199:

"In my last report but one, I advocated an additional principle which I knew would be most advantageous both to the employers and employed, namely, that once a month the certifying surgeons should be required by the mill owner, for his own sake, and for the welfare of his hands, and for the securing to himself efficient labour, to pass through all his rooms when his workers were at work, to notice them carefully, and to point out any that were suffering from the kind of labour, or dust or gases to which they were exposed." \*

#### IV.—EXAMINATION OF CHILDREN.

We attached, before commencing our inquiry, great importance to this branch of the subject. Very strong statements have been made both by the opponents and supporters of the present factory system as to the degeneracy or the vigour of the operative population, and as to the prevalence or absence of disease amongst them. It is contended on the one hand that women and children employed in factories, compare favourably, owing to their light work, high wages, and superior food, with any section of the population, agricultural or urban; and it is urged with equal vehemence on the other side, that the direct contrary of this is the fact; that a process of steady degeneration is going on in the towns of Lancashire and the West Riding; that its progress is veiled by the continual immigration of new blood from rural districts; but that notwithstanding the palliative effects of this supply, the fatal effects of factory labour were even now alarmingly apparent.

A rough opinion as to the justice of these contending statements may no doubt be formed during the course of a visit to a factory. Nor did we neglect the opportunities which our numerous inspections of factories afforded, of forming our impressions as to the physical development and vigour of both adults and children employed. We have already recorded these impressions in various parts of this Report. But it must be obvious that opinions formed in this way must necessarily be more or less indefinite and vague, and cannot, whatever the credit or experience of the observer, carry conviction to those whose minds have been previously confirmed in an opposite conclusion. Nor in truth should we have found it easy, by this method of simple observation, to have formed a conviction upon the subject that would have thoroughly satisfied ourselves. We found in factories a considerable number of healthy and vigorous persons. We remarked also the absence of any striking deformities, such as appear to have resulted from the excessive hours of labour 40 years ago. But to the questions, Will the children employed in a cotton mill or a worsted mill compare favourably or the reverse, with children of the same age, race, and district not so employed: are they stunted in their growth, or the reverse; do they show a greater or a less percentage of disease or deformity; we should have found it hard to return any but a conjectural answer. It appeared necessary to us therefore to institute a careful and systematic examination of children upon an extensive scale, in a great variety of areas, and upon a uniform plan; registering their height, weight, and dimensions of the

\* See also Mr. Baker's report for April 30th, 1866, pp. 25 and 26.



chest, and recording all instances of such malformation or diseases as a medical observer could promptly and without loss of time appreciate. Our object was to compare and contrast children employed in factories with two other classes of children; first, with children inhabiting factory districts, but not employed in factories; secondly, with children from adjacent districts where no factories were situated. It was also necessary to distinguish between factories situate in large towns, and those of suburban or semi-rural districts: to meet the obvious objection that whatever results were observed might be attributable rather to the child's locality than to its occupation. Lastly, the occupation not merely of the child but of the child's parents seemed to us an element which it was essential to take into account.

We obtained your consent to the employment of medical assistance in this branch of our enquiry. Five gentlemen, Mr. W. Cant, Mr. Haward, Mr. W. Power, Mr. C. Roberts, and Dr. E. Seaton, acting under our instructions, visited a large number of schools in Lancashire, Cheshire, and the West Riding of Yorkshire. It was of course essential that the plan upon which their observations were registered should be strictly uniform, so as to admit of statistical averages being drawn. With this view we prepared the following form:—

MALES.													DATE AND PLACE OF SCHOOL.	
Name.	Age.	Employment.	Employment of Parents.	Employment of Grand-parents.	Height.	Weight.	Measurement of Chest, Empty.	Measurement of Chest, Full.*	Dentition.	Rickets.	Scrofula.	Skin Diseases.	Flat Foot.	REMARKS.

The forms for each sex were of course separate.

With regard to the method to be pursued in examination, our assistant inspectors were instructed as follows:—

The children were to be taken either in alphabetical order, or in their order as they stood in the schools, so as to exclude all possibility of selection.

The children were to be measured with their feet bare.

The measurements round the chest were to be taken round the nipple, after a full expiration, and after a full inspiration. The boys were to be stript to the waist; in the case of girls the measurement was to be taken outside the dress.

*Dentition.*—Slight imperfections, or decay of the milk teeth, were not to be considered worth noticing.

*Rickets, &c.*—Under this head were noted such appearances of the bones of the head, wrist, legs, and chest walls as indicated old rickets. Any other deformities, except flat foot, were also to be noted here.

*Scrofula.*—This was to be judged of by the presence of enlarged glands, scars in the neck, enlargements of joint ends of bones, when exposed, or marks of present or past strumous ophthalmia.

*Skin Diseases.*—The exact disease was of course to be specified.

*Flat Foot.*—This required no special explanation.

In reference to the conduct of this examination, our thanks are due to Sir F. Sandford, and to Her Majestys' Inspectors of Schools for the districts to which our enquiry was directed, for the information which they kindly afforded to us; and to the clergymen and other managers of the schools visited for the readiness with which they forwarded our object. No difficulties of the slightest importance were experienced in the course of the investigation.

\* i.e., measurement of chest after a deep expiration, and a deep inspiration.



Dividing the districts visited for this purpose into (a) urban factory districts, (b) suburban factory districts, and (c) non-factory districts, urban and suburban, children were inspected in the following places belonging to the first or urban class :—

Bradford.	Bury.
Keighley.	Heywood.
Halifax.	Rochdale.
Blackburn.	Stockport.
Preston.	Macclesfield.
Burnley.	Dukinfield.
Bolton.	Ashton.

In the following places belonging to the second class, *i.e.* suburban factory districts :—

Lowmoor.	Halliwell.
Pudsey.	Crawshawbooth.
Denholme.	Waterfoot.
Bingley.	Tottington.
Ingrowe.	Warth.
Oakworth.	Bellfield.
Steeton.	Irwell.
Sutton.	Longridge.
Silsden.	Kirkham.
Kildwick.	Colne.
Skipton.	Habergham.
Septon.	Marple.
Meltham.	Reddish.
Cross Stone.	Compstall.
Harleywood.	Styall.
Sowerby.	Walsden.

And in the following belonging to the third class, those in which no textile manufactures of any importance are carried on :—

York.	Keswick.
Thirsk.	Penrith.
Northallerton.	Lancaster.
Malton.	Chester.
Sedbergh.	Chapel le Frith.
Kendal.	Chinley.

In all about 10,000 children have been examined. We send the records of measurements accompanying this report, believing that their preservation in a public office may be found of interest to official or statistical investigators at a future time.

The general impression made by the factory children upon the inspectors was in many respects not unfavorable. As compared with the children of the East of London, or of the poorer parts of Liverpool, they were markedly superior. They did not appear to be more liable than ordinary country children to rickets or scrofula. Their general health in most other respects seemed fairly good. Attention was however drawn from the first to the frequency of diseased dentition, and of the flattening or suppression of the arch of the foot. Further the attention of some of the observers was called to the almost uniformly dirty condition of the children's heads; and although a similar condition was observed in many of the schools in non-factory districts, still there the examples of cleanliness were far more numerous than in factory schools. In the schools of Bradford and Keighley very few out of the many hundreds examined had heads free from vermin; and a similar condition is reported from Bolton, Bury, Heywood, and Rochdale, and the surrounding neighbourhoods. The fact that in many of the schools of non-factory districts a similar state of things was found shows that a reduction of working hours, giving more time to women for domestic duties, would not of itself remedy such an evil. We cannot but think, however, that it might contribute towards the cure.

Passing from general impressions to the actual registration of facts, we have compiled from the large mass of observations presented to us the following six Tables :—

TABLE A. gives the average measurements at each age, from eight to twelve inclusive, of children employed in factories, and whose parents were also so employed.



TABLE B. gives the same average for the children of York, Chester, Keswick, and the other non-factory districts.

TABLE C. for children of factory districts, not employed in factories themselves, and whose parents were not so employed.

TABLES D. and E. distinguish factory children, irrespectively of parentage, according as they live either in large towns, or in suburbs and villages.

TABLE F. compares children of non-factory districts, factory children of large towns, and factory children of suburban and semi-rural districts, with respect to the prevalence of disease amongst them.

The result of a comparison of these tables may be thus briefly stated :

The children of Table B. (non-factory districts) are superior to those of Table A. (factory children of factory parents), in the following cases :

Height :

Males, at all ages from 8 to 12.

Females, at all ages from 8 to 12.

Weight :

Males, at ages, 9, 10, 11, 12.

Females, at ages, 8, 9, 10, 11, 12.

In measurement round empty chest :

Males, at no age.

Females, at no age.

In measurement round full chest :

Males, at ages, 9, 10, 11, 12.

Females, at no age.

In expansibility of chest, as shown by difference after expiration and inspiration :

Males, at ages, 8, 9, 10, 11, 12.

Females, at ages, 9, 10, 11, 12.

The difference in height steadily increases, in males from a superiority of  $\frac{9}{16}$  of an inch at eight, to one of an inch and a half at 12; in females, from a superiority of a quarter of an inch at eight, to one of an inch and a half at 12.

The difference in weight increases in males from an inferiority of half a pound at eight, to a superiority of 4.25 pounds at 12. In the case of females, from a superiority of two pounds at eight, to one of 4.5 pounds at 12.

The children of non-factory districts are slightly inferior in the measurement round the empty chest; but this inferiority is more than compensated in the case of males, and is nearly compensated in the case of females, by the greater expansibility of the chest.

If we compare Table A. (factory children of factory parents) with Table C. (non-factory children of non-factory parents), we find the difference less striking. It will be seen, however, that in the larger number of cases the advantage rests with the latter. Thus, children of Table C. are superior to those of Table A.

In height :

Males at all ages.

Females at all ages:

Weight :

Males, at ages, 9, 10, 11, 12.

Females, at ages, 8, 10, 11, 12.

Measurement round empty chest :

Males, at ages, 9, 10, 11.

Females, at ages, 9, 10, 11.

Measurement round full chest :

Males, at ages, 9, 10, 11.

Females, at ages, 8, 9, 10, 11, 12.

Expansibility of chest :

Males, at ages, 11, 12.

Females, at ages, 8, 9, 10, 11, 12.

It will be remarked that there are five ages, and that each age presents five points of comparison, *i.e.*, altogether 25 points. The males of Table C. have the advantage



over those of Table A. in 17, the females of Table C. over those of Table A. in 22. Nearly four-fifths of the points of comparison are in favour of Table C.\*

The comparison of Table D. and Table E. results, as might be expected, in showing the superiority of the suburban over the urban factory children. It will be remarked, however, that while the urban children are markedly inferior to the children of Table B. (non-factory districts), not even the suburban factory children rise to its level; although it will be remembered that Table B. includes three such large towns as York, Chester, and Lancaster.

In Table F. the per-centages of disease or malformation in urban factory children, suburban factory children, children of non-factory districts (town and country), and children of large factory towns not employed in factories, are compared.

With regard to the state of the teeth, the suburban children show better than the urban, and the rural children better than either. If we look simply at the large factory towns, and compare the children employed in factories with those not so employed, we find the latter somewhat better off than the former, but the difference is slight.

The same appears at first sight with regard to rickets; but this is due to an exceptional prevalence of this affection in the large Cheshire factory towns. If we confined ourselves to the large factory towns of Lancashire and the West Riding, the prevalence of rickets among non-factory children would be decidedly less than among factory children.

With regard to scrofula and diseases of the skin, the difference between these four classes is not very notable.

In the case of flat foot the result is different. Here factory children whether in town or suburb appear markedly inferior to children of non-factory districts, and also to the children of factory towns not employed in factories.

Thus while in 1,570 children of non-factory districts (in Table F. a.) 27 only, or 17.1 per thousand, were found affected with flat foot, there were 203 out of 2,569 in Table F. b. (factory children in large factory towns), or 79 per thousand; and 100 out of 2,383 in Table F. c. (factory children in suburban and semi-rural districts), or 41.9 per thousand;—out of 813 in Table F. d. (non-factory children in large factory towns) only 25, or 30.7 per thousand, were so affected.

The cause of ordinary flat foot is universally admitted to be prolonged standing, or walking, or carrying of weights, especially when the ligaments of the foot are weakened by constitutional causes, or are tender by reason of youth. It seems impossible to resist the conclusion to which the above figures point, and which is quite consistent with what we have observed of the kind of labour required in the various textile processes, that the prolonged standing and walking involved in almost every operation carried on in them tends to produce flat foot, and that this tendency acts more powerfully on children in large towns than on those in the country, inasmuch as the former are already of weak fibre and pre-disposed to the deformity. But it does not appear that it is developed to such an extent as to attract attention unless the foot is bared, since only one of our medical correspondents makes mention of it. Nor indeed is this surprising. For any extreme degree of flat foot, such as is seen without removing the boot, or which would prevent an ordinary boot from being worn, would compel the sufferer to abandon factory labour, and thus he would no longer be looked on as a factory hand.

The dependence of this affection upon occupation seems further to be indicated by the fact that its prevalence increases with the age of the children, in the case of those employed in factories; whereas with those not so employed the slight amount that is found is irrespective of age. Thus of urban factory children at the age—

Of 8, 3 out of 198 were affected, or	15.1 per 1,000.
Of 9, 23 out of 504 „ „	or 45.6 „
Of 10, 34 out of 663 „ „	or 51.2 „
Of 11, 60 out of 576 „ „	or 104.2 „
Of 12, 83 out of 628 „ „	or 132.4 „

At the age of 13 and upwards, when they work ten hours instead of five, we were not able to follow them, but it may reasonably be supposed that the progression above indicated does not cease.

\* It must, moreover, be remembered that Table C. includes some children whose non-employment in factories was due to weak health.



TABLE A.  
FACTORY CHILDREN of FACTORY PARENTS (Urban and Suburban).

Number examined.	Age.	Sex.	Height in Inches.	Weight in Pounds.	Chest Measurements in Inches.	
					Empty.	Full.
30	8	M.	45.75	55.60	22.46	24.55
30	"	F.	46.48	50.73	23.16	24.37
80	9	M.	48.05	58.41	22.52	24.59
110	"	F.	47.62	54.63	23.41	24.62
140	10	M.	49.77	62.14	22.89	25.11
130	"	F.	49.52	59.75	24.12	25.42
130	11	M.	51.44	67.22	23.43	25.81
120	"	F.	50.80	63.94	24.66	26.04
120	12	M.	52.82	70.74	23.91	26.29
140	"	F.	53.13	71.46	25.25	26.77

TABLE B.  
CHILDREN in NON-FACTORY DISTRICTS (Urban and Rural).

Number examined.	Age.	Sex.	Height in Inches.	Weight in Pounds.	Chest Measurements in Inches.	
					Empty.	Full.
140	8	M.	46.66	55.08	21.75	24.08
100	"	F.	46.73	52.82	22.28	23.59
230	9	M.	49.21	60.02	22.27	24.62
160	"	F.	48.63	56.53	22.80	24.21
240	10	M.	51.00	65.29	22.79	25.25
140	"	F.	50.07	61.19	23.41	24.83
180	11	M.	52.87	71.01	23.34	26.01
140	"	F.	52.66	68.00	24.28	26.01
150	12	M.	54.05	75.00	23.78	26.43
90	"	F.	54.41	75.95	24.91	26.76

TABLE C.  
NON-FACTORY CHILDREN of NON-FACTORY PARENTS in FACTORY DISTRICTS (Urban and Suburban).

Number examined.	Age.	Sex.	Height in Inches.	Weight in Pounds.	Chest Measurements in Inches.	
					Empty.	Full.
20	8	M.	46.72	53.15	22.31	24.21
20	"	F.	47.40	53.64	23.01	24.73
60	9	M.	49.09	59.40	23.13	24.94
30	"	F.	49.37	57.79	24.30	25.75
50	10	M.	51.02	63.76	23.30	25.29
30	"	F.	49.76	60.78	24.23	25.62
30	11	M.	52.57	70.22	24.07	26.49
30	"	F.	52.80	68.97	25.39	26.92
20	12	M.	53.56	70.94	23.76	26.16
17	"	F.	53.39	70.55	25.05	26.88



TABLE D.  
URBAN FACTORY CHILDREN (Irrespective of Parentage).

Number examined.	Age.	Sex.	Height in Inches.	Weight in Pounds.	Chest Measurements in Inches.	
					Empty.	Full.
109	8	M.	46·81	54·08	21·94	23·86
89	"	F.	46·54	50·65	22·84	23·84
235	9	M.	48·35	58·08	22·26	24·26
269	"	F.	47·88	56·20	23·44	24·67
361	10	M.	49·63	61·68	22·73	24·83
314	"	F.	50·05	60·30	24·32	25·92
284	11	M.	51·36	66·13	23·3	25·52
292	"	F.	51·58	64·99	24·7	26·07
316	12	M.	52·64	69·85	23·74	25·98
312	"	F.	52·7	69·73	24·98	26·48

TABLE E.  
SUBURBAN FACTORY CHILDREN (Irrespective of Parentage).

Number examined.	Age.	Sex.	Height in Inches.	Weight in Pounds.	Chest Measurements in Inches.	
					Empty.	Full.
131	8	M.	47·13	55·23	22·03	23·99
95	"	F.	46·28	52·40	22·89	24·16
279	9	M.	48·30	59·00	22·47	24·55
216	"	F.	48·14	56·33	23·52	24·73
282	10	M.	50·41	63·39	22·92	25·19
279	"	F.	49·76	61·37	23·94	25·46
302	11	M.	51·76	68·14	23·53	25·90
275	"	F.	51·67	66·60	24·47	25·91
264	12	M.	53·18	72·74	23·90	26·34
266	"	F.	53·27	72·09	25·02	26·69

TABLE F.

Degree to which—

- (a.) Children of non-factory districts (urban and suburban),  
 (b.) Factory children in large towns,  
 (c.) Factory children in suburban and semi-rural districts,  
 (d.) Children of large factory towns not employed in factories,  
 are affected with diseased dentition, rickets, scrofula, skin diseases, and flat foot.

(a.) Of 1,570 children in non-factory districts,\* of all ages from 8 to 12, we find affected with—

Diseased dentition	-	-	-	-	56 or 35·6 per 1,000
Rickets	-	-	-	-	25 or 15·9 " "
Scrofula	-	-	-	-	28 or 17·8 " "
Skin disease	-	-	-	-	17 or 10·7 " "
Flat foot	-	-	-	-	27 or 17·1 " "

\* York.  
Chester.  
Lancaster.  
Thirsk.

Northallerton.  
Malton.  
Kendal.  
Keswick.

Penrith.  
Sedbergh.  
Chapel-le-Frith.  
Chinley.



TABLE F.—*continued.*

(b.) Of 2,569 factory children in large towns, of all ages from 8 to 12, we find affected with—

Diseased dentition	-	-	-	-	-	234 or 91·0	per 1,000
Rickets	-	-	-	-	-	31 or 12·0	" "
Scrofula	-	-	-	-	-	58 or 22·5	" "
Skin disease	-	-	-	-	-	55 or 21·1	" "
Flat foot	-	-	-	-	-	203 or 79·0	" "

(c.) Of 2,383 children in suburban and semi-rural districts, of all ages from 8 to 12, we find affected with—

Diseased dentition	-	-	-	-	-	138 or 58	per 1,000
Rickets	-	-	-	-	-	55 or 23	" "
Scrofula	-	-	-	-	-	64 or 26·8	" "
Skin disease	-	-	-	-	-	47 or 19·7	" "
Flat foot	-	-	-	-	-	100 or 41·9	" "

(d.) Of 813 children in large factory towns, not employed in factories, we find affected with—

Diseased dentition	-	-	-	-	-	71 or 87·3	per 1,000
Rickets	-	-	-	-	-	*25 or 30·7	" "
Scrofula	-	-	-	-	-	12 or 14·7	" "
Skin disease	-	-	-	-	-	14 or 17·2	" "
Flat foot	-	-	-	-	-	25 or 30·7	" "

We append some general remarks made by our medical inspectors. In many respects they agree; in some the impressions formed differ. All such impressions, however, must of course yield to the test of actual recorded fact.

Mr. Cant writes:—"The general impressions I derived from my inspections incline me to think that the children in the manufacturing districts are on the whole a fairly developed and healthy race, and that they do not compare unfavourably with those of agricultural towns and villages. This is especially the case as regards the manufacturing villages and suburban parts; for the opinion I formed of the large town districts was not quite so favourable. I found more children with the marks of old rickets (chiefly consisting of enlargement of the ends of the ribs) and pigeon-breasted deformity among the manufacturing than among the agricultural population; but these I think were chiefly in the large town schools. Very few presented marks of struma; and there was but little skin disease. Many of the children in the manufacturing district were exceedingly dirty, and ptheiriasis (lice) was very general amongst them."

Mr. Haward writes:—"The first and most striking impression was the extremely good average standard of health, development, and intelligence of the children generally, and the almost entire absence of those diathetic diseases, scrofula, rickets, syphilis, which prevail so greatly among the children of many large towns."

"The only deformity which seemed to me notably prevalent was flat foot, which was very commonly present in a slight, and less frequently so in a severe degree. The above remarks apply both to factory and non-factory children; and my impression is that a comparison of these two classes in the same district shows (with the two exceptions to be presently noticed) no difference between them. Neither did I discover that the children of factory operatives differed in any way from those who were not so when living in the same district."

"Two conditions only did I observe as peculiar to or more prevalent among the children employed in factories; one of these was a papular eruption resembling lichen, and occurring chiefly over the arms and neck; this, although not very common, I observed only among factory operatives.† The other condition, which although not confined to was I think much more frequent among the factory children, was caries of the teeth."

Dr. Seaton writes:—"Having in view as a standard of comparison the children of London and Chester, my impression is that those in the factory towns I visited, Stockport, Stalybridge, Ashton, Macclesfield,‡ are as regards physical development slightly above the average. Both girls and boys have for the most part good figures;

\* A large proportion of the 813 non-factory children came from Macclesfield, in which rickets appear to be exceptionally preponderant. Had the Cheshire district been left altogether out of the calculation, and Lancashire and the West Riding alone considered, the proportion of rickets in table (d.) would have been considerably less than in those of (b.) and (c.)

† This would appear to be due to the irritating properties of the oil used. (J.H.B. and T.H.)

‡ This impression, however, is not borne out by the measurements, especially in the case of Macclesfield. (T.H. and J.H.B.)



“ the boys without being large-framed are well proportioned; they have well-shaped limbs and ankles, and mostly carry their heads erect. The same may be said of the girls, who depend more for their beauty on their well-proportioned figures than on their comeliness of face.”

Mr. Charles Roberts writes :—“ I think the factory children are fairly well developed, are remarkably free from constitutional diseases, and, with the exception of flat-foot, and a relaxed state of the ligaments of the knees and elbows, are free from deformities.

“ In general conformation of body the factory children do not compare favourably with the non-factory children. In the manufacturing towns the children are short of stature, have thick limbs, and large feet and hands, and are muscular and in tolerable condition as to fat. They produce the impression on the mind of having bodies too old for their heads (and ages). In the rural and semi-rural manufacturing districts the children are taller, heavier, and better developed, *i.e.*, have more symmetrical figures, but both are inferior to the non-factory children in all these particulars.

“ Flat-foot, with a general disposition to knock-knee, is very common among the factory children, while both are rare among the non-factory children, among whom there is a disposition to the opposite state, of bow-leg. In the tables only those cases of flat-foot are noted in which the arch of the foot is quite obliterated, but double the number of children in the factory districts were suffering from various minor degrees of the deformity.

“ A few cases of deformity of the chest are noted in the tables as ‘pigeon-breasted,’ but they were all of a slight character. A few cases of the opposite state, of depression of the sternum, came under my notice also, but in no instance did I find a marked ricketty affection of the long bones, or of the bones of the face. No case of bow-leg came under my notice in the factory districts, not even in the infants schools.

“ Scrofula, like rickets, appears to be equally rare among the factory and non-factory children. Probably many of the ‘old scars in the neck,’ recorded in the tables, were the *sequelæ* of some of the eruptive fevers, as in most instances no other signs of scrofula existed.

“ In a large majority of the factory children the gums were red and spongy, but did not bleed, nor were there any other signs of scurvy. It is very probable, however, that this state of gums is due to the deficient supply of vegetables in the dietary of the children. From numerous inquiries made among the children I learned that they generally had meat with potatoes only three days in the week, and bread and butter, and tea or coffee, with little milk, the remainder. The other meals also consisted of bread and butter and tea, and not of porridge and milk, as formerly. The non-factory children showed no signs of spongy gums.

“ The development and state of the teeth varies much in the districts I visited. In Bolton the elder children, and especially the girls, had sound, white, well-shaped, regular teeth, but they were on the whole inferior to those of the non-factory children. In Bury, Rochdale, and the Rossindale Valley, the teeth were decidedly inferior to those of Bolton. The tables will show the number of cases of very bad teeth, but numerous instances of a slighter character existed. Teeth with contracted crowns, serrated edges, and deep perpendicular grooves were common; others were marked with deep transverse grooves, as if a file had been drawn across them, and when caries existed it was generally in the course of one of these grooves. Many of the teeth were a bad colour, badly shaped, and irregular. All these imperfections in the teeth point to some fault in the health and nutrition of the child during the early stages of their development. In some of the younger children in the manufacturing districts the jaws were contracted, and the teeth crowded and irregular, but this did not appear to be due to a ricketty constitution, but to a premature development of the teeth as it disappeared at a later date. A similar state did not exist in the non-factory children, whose teeth were less developed than the factory children at corresponding ages.

“ From this fact I think that the state of the development of the teeth is not a reliable test of age.

“ The number of the family in the factory districts is smaller than that of the non-factory. In obtaining this information from the children it came out immediately that there is a very great infant mortality in the factory districts, and probably a great number of miscarriages.

“ The personal habits of the factory children contrast very unfavourably with those



“ of the non-factory children, and indicate the existence of very faulty domestic  
 “ arrangements among the factory operatives. The children were very dirty in both  
 “ body and clothes, the hair very unkempt, and almost invariably swarming with  
 “ lice; an irregular form of prurigo, and marks of scratching on the chest and back,  
 “ pointed to the existence of body lice also. Few of the children were free from the  
 “ marks of flea bites. The boys’ shirts and stockings were in a very bad condition,  
 “ and in numerous instances their clothes had belonged to previous owners. In all  
 “ these particulars there was a marked improvement going from west to east, Bolton  
 “ being the worst, and Rochdale the best. The non-factory children were clean,  
 “ well dressed, and almost free from parasites.

“ I would sum up my inquiries in the following manner:—

- “ 1. The *town* factory children are inferior in physique to the *rural* factory children,  
 “ and both to the agricultural.
- “ 2. Factory and non-factory children are equally free from constitutional  
 “ diseases.
- “ 3. Flat-foot is common among the *town* factory children, less common among the  
 “ *rural* factory children, and rare among the agricultural. I believe this  
 “ deformity to be an indication of weakness, and the employment of children  
 “ in the factories at too early an age.
- “ 4. The teeth of the factory children are inferior to those of the non-factory  
 “ children. The imperfections point to the existence of impaired nutrition or  
 “ disease at an early period of life.
- “ 5. From the spongy state of the gums it is probable that the diet of the factory  
 “ children is deficient in vegetables.
- “ 6. It appears probable that the teeth are developed at an earlier age in the  
 “ factory than the non-factory children, that the teeth are not, therefore, a  
 “ reliable test of age.
- “ 7. The number of the family in the factory districts is smaller than that of the  
 “ agricultural. There is a higher rate of infant mortality in the factory  
 “ districts.
- “ 8. The factory children are dirty and infested with parasites, and are evidently  
 “ neglected by their parents in these particulars.
- “ 9. The factory and non-factory children appear to be about equal in general  
 “ intelligence.

“ *Note.*—From a sanitary point of view the factory children are often placed under  
 “ more favourable circumstances in the factories than in the schools. Some of the  
 “ schools I visited were crowded to excess, and in some instances the children were  
 “ massed together three deep, forming almost solid squares, for the purpose of  
 “ teaching. There is no adequate lavatory accommodation. The ventilation was bad  
 “ in many instances, or seemed bad from the smell of the children’s dirty clothes,  
 “ and during the cold weather the rooms were imperfectly warmed. The water-  
 “ closets were in many instances filthy and insufficient, and in some instances, I was  
 “ told, were common to both sexes. The attendance of factory children at these  
 “ schools is compulsory, and the schools should, therefore, I think, be subject to  
 “ medical inspection, or brought within the provisions of the Factory Acts. Many  
 “ of the schools were well constructed and in a proper sanitary state.”

#### V.—STATISTICAL INQUIRIES.

We now turn to the sources of information supplied by the Registrar General’s tables of mortality and the tables of population. These have not yet been published for 1871, but, by the courtesy of the Registrar General, extracts bearing on the present subject have been supplied to us.

The textile districts of Lancashire, Cheshire, and the West Riding, are distinguished by a high general rate of mortality. So high is this death-rate that, notwithstanding the existence in Lancashire and Cheshire of many healthy rural districts, such as Altrincham, Nantwich, Wirnall, Ormskirk, Fylde, Garstang, the general rate of deaths for the counties of Lancashire and Cheshire in the average of years between 1851 and 1861 was 2,550 per 100,000, a much higher rate than the death-rate of London during the same period. In Yorkshire, notwithstanding the marked salubrity of the North and East Ridings, the death-rate was 2,309; very nearly equal to that of London; the London rate being 2,363.



Turning to particular localities, we find the death-rate of some of the principal districts concerned in the textile trades to be as follows, taking the average of the ten years 1851-60, with due allowance for increase of population :—

Registration Districts of Stockport	-	-	-	2,562
" Macclesfield	-	-	-	2,483
" Bolton	-	-	-	2,688
" Bury	-	-	-	2,315
" Manchester	-	-	-	3,148
" Ashton	-	-	-	2,666
" Oldham	-	-	-	2,538
" Rochdale	-	-	-	2,370
" Burnley	-	-	-	2,364
" Blackburn	-	-	-	2,634
" Preston	-	-	-	2,717
" Huddersfield	-	-	-	2,196
" Halifax	-	-	-	2,355
" Bradford	-	-	-	2,569
" Leeds	-	-	-	2,772
" Dewsbury	-	-	-	2,472

It will be borne in mind that the Registration Districts include in most cases a large suburban or semi-rural area. The rate of the towns by themselves would be considerably higher.

We find in the next place, that almost all of these districts are distinguished by a high rate of infantile mortality. The death-rate among children under a year old was as follows, during the ten years from 1851 to 1860, and during the two years 1870-71.

Death-rate per 100,000 among children under one year in the following Registration Districts :—

	1851-61.	1870-71.
Stockport - - -	25,353	24,350
Macclesfield - - -	22,715	18,867
Bolton - - -	23,411	21,750
Bury - - -	21,180	19,256
Ashton - - -	24,713	22,305
Oldham - - -	23,373	21,998
Rochdale - - -	19,937	21,332
Burnley - - -	21,117	25,680
Blackburn - - -	22,560	25,323
Preston - - -	24,440	29,035
Huddersfield - - -	18,291	17,805
Halifax - - -	20,593	19,622
Bradford - - -	25,034	23,857
England and Wales -	17,731	

Now, the first remark to be made upon these figures is that the high death-rate which they show is, of course, not to be attributed exclusively, if even it were to be attributed mainly, to the occupations of the people. Liverpool, a non-textile town, has a general and infantile death-rate higher than any of the cotton towns. The annual reports published by Mr. Simon are full of proofs of the dependence of high death-rates, especially of high infantile death-rates, upon bad sanitary conditions, and especially on inadequate removal of excrement from the houses of the poor, overcrowding, faulty construction of streets, courts, and houses, &c. &c.

On the other hand, the reasons for the belief that the conditions under which large proportions of mothers work in factory towns contribute largely to the rate of infantile mortality, appears to us, as we believe they have appeared to most other sanitary inquirers, overwhelmingly strong.

In 1862 and 1863, the years of the cotton famine, the total mortality of the eight principal cotton towns of Lancashire\* was considerably less than in the thriving, prosperous year which preceded the famine: the numbers of deaths being in 1861, 23,026; in 1862, 22,231; and in 1863, 21,124. This is in itself a most remarkable

\* Bolton, Bury, Ashton, Oldham, Rochdale, Burnley, Blackburn, Preston. Here, as elsewhere, it is the Registration Districts, not the Boroughs, that are spoken of.



fact; and one which cannot be entirely accounted for by migration of population from these districts; since the number of births in 1862 was actually greater, and in 1863 not very much lower than in 1861; the numbers for the three years being respectively, 34,341, 34,833, and 32,632. But the most important point to note is that the infant mortality decreased much more rapidly than the general mortality. The number of deaths of infants under a year old was 6,623 in 1861, 5,892 in 1862, and 5,544 in 1863; being in 1862 only 88·9 per cent., and in 1863 only 83·7 per cent., of the mortality in 1861. The mothers debarred from the factory, and therefore underfed, were yet obliged to keep at home, and nurse their children. And of the two opposing influences—famine and maternal care—the latter would seem to have been the more effectual.

That many women continue working till an extremely advanced stage of pregnancy is a fact admitted on all hands, and of which we were in many cases eye-witnesses. That the return to the factory takes place often within a month, and sometimes within a fortnight after delivery, is also admitted. That the infant is removed from its sleeping-place between five and six in the morning and placed in charge of a neighbour, often some ignorant old woman whose interest and ignorance alike lead her to feed it improperly and inadequately, and often to keep it quiet with soporifics, is also a fact not admitting of much discussion. We are entitled to take it for granted that these things have their influence in swelling the death-rate, though, in the present sanitary condition of these districts, it may no doubt be difficult to separate with precise exactitude the results of this from those of other injurious sanitary conditions.

The following extract from a Report, by Dr. Ballard, upon the sanitary condition of Bolton in Lancashire will illustrate this part of our subject sufficiently:—

“The ignorance of the mothers and those about them must be regarded as another cause of the high mortality of the infants. Many of them cannot write their own names, their education having been neglected in their early life in order that they might be useful at home in taking care of the younger children, or in order that they might add to the earnings of the family by working in the factories. Nor can their education for maternal duties be regarded more favourably. They were themselves probably brought up in the manner traditional in their station of life, and they naturally bring up, or attempt to bring up, their own offspring as they were brought up themselves, and generally to manage them as they in their youth saw other children managed. Their experience has been that of a vicious and fatal system, and they have had no opportunity, nor have the means been afforded them, of learning a better.

“The third cause to which the high death-rate of infants must be referred is the practice among female operatives who become mothers of returning to their work at the factory as soon as possible after their confinement. On inquiry among the women themselves, and of the surgeons practising in Bolton, I learn that in some cases the women have been known to return as early as a fortnight after their infant has been born, and very commonly they return to their labour within the month. If the woman should chance to have a relative or female friend at home, or a girl sufficiently old to carry the baby, with whom she can leave it, this is the plan usually adopted; but if not, when she leaves for the mill at half-past five o'clock in the morning, she takes the baby out of a warm bed and carries it to some person, generally an elderly female, with whom she leaves it for the day. In preference she will carry it to some one residing near the factory at which she works, and this may be a half a mile or a mile from her house. The season of the year makes no difference. If the distance be not too great, the mother will return at breakfast or dinner time, or both, to suckle her infant, otherwise she will not see it again until she leaves work in the evening. In the meantime the infant must be fed. Very young babies are fed usually with milk (such as it is) out of a bottle. Some of these bottles which I saw in use were uncleansed, sour, and encrusted with curdled milk; and the medical men inform me that this quite coincides with their own repeated observations. In other cases the youngest infants are fed, as those a few months old are, with bread sopped in warm water in a cup, which is left for hours upon the hob to keep warm, and becomes sour. When about to be used, the bread is broken down with the spoon, and a little milk is added. I saw one cup of sopped bread thus prepared for use. It was said to have been boiled, but it contained tough pieces which boiling had not even softened. A halfpenny-worth or a penny-worth of milk (quarter of a pint to a pint, according to quality,) per diem is considered a liberal allowance. The mothers pay, I understand, from 2s. 6d. to 3s. 6d. per week



“ to the persons who take charge of their babies; this to include the food. These  
 “ persons having their own household business to attend to, and moreover a certain and  
 “ considerable amount of neighbourly visiting and gossiping to perform, commonly  
 “ depute some little girl to hold the baby in their absence; and such children may be  
 “ seen any day and at any hour, and almost anywhere in the town, sitting on the  
 “ doorstep of the house, exposing the infant to the cooling influence of the draught  
 “ between the door and the fire. It is no matter for surprise that this system of  
 “ management results in all the evils of mal-nutrition, in attacks of diarrhoea in the  
 “ summer and of pulmonary inflammation in the winter, and very often in the death  
 “ of the infants. One of the district registrars informed me that he had often occasion  
 “ to reprove mothers, coming to him for the necessary certificate to present to the  
 “ burial clubs in which their infants had been entered, on account of the jaunty air  
 “ with which they made the application. In the course of my experience as a medical  
 “ officer of health, I have seen a great deal of the families of the poor in London, but  
 “ I can safely say, that during the few days I was engaged in visiting the habitations  
 “ of the operatives in Bolton, I saw a larger number of miserably emaciated infants  
 “ undergoing the process of gradual starvation upon the system there in vogue than  
 “ I had ever seen before in as many months. Three or four illustrations may not be  
 “ out of place.

“ In a dirty unventilated house in Glazebrook Lane there was a very emaciated infant  
 “ in the arms of a woman far advanced in pregnancy, whose husband was in prison,  
 “ and who for a time was residing with her mother. The infant, I found on inquiry,  
 “ was the illegitimate child of a ‘factory lass,’ and was nearly nine months old,  
 “ although, from its size, it did not appear more than five months old. It was being  
 “ attended by a doctor, who was giving it medicine, as it had been suffering from  
 “ diarrhoea. The woman had had the care of this baby ever since it was born, the  
 “ mother bringing it at six o’clock in the morning, and taking it away at six in the  
 “ evening. She paid 3s. 6d. per week to the old woman who kept the house. She  
 “ said she gave it ‘milk, and arrowroot, and such like,’ and showed me some sopped  
 “ bread with plenty of lumps in it which she said had been boiled. ‘Yes, she gave it  
 “ milk—a penny-worth a day.’ I saw the milk; it was very poor indeed; and  
 “ although it had been standing for five hours presented scarcely a trace of cream  
 “ upon the top.

“ In an unventilated cottage in No. 3 Court, Old Acres, there was a girl, aged  
 “ 10 years, in charge of a young infant and two young children. The infant was  
 “ emaciated, and its mouth slobbered with bread-pap. The father, employed at  
 “ night, was asleep in the only upper room; and with him was another young  
 “ child, coughing during the whole time I was in the house. The mother works at  
 “ the factory, and comes home at meal times.

“ At the infirmary of the workhouse there was an infant miserably emaciated, aged  
 “ five months. It had been there with its mother for six weeks, and was said to be  
 “ improving. The mother, an unmarried woman, told me she had had a child before,  
 “ who lived four days. She was confined with the last at a house in a court leading  
 “ out of Churchgate, Bolton, and two weeks afterwards returned to her work. She  
 “ was a spinner in a factory at Sharples, and did not come home all day. She left her  
 “ baby in charge of the woman of the house, who herself had a baby 12 months old,  
 “ whom she suckled, and who was healthy and fine.

“ Another emaciated infant was in the infirmary with the mother, a married woman.  
 “ She says she suckled her baby at home for four months, during which it was in good  
 “ condition; and then she went to work at the factory, leaving it in charge of a  
 “ woman in Spring Gardens, Bolton, and coming home in the middle of the day to  
 “ suckle it. She paid 1½d. per day for a pint of milk, which the woman in charge was  
 “ to give the baby. It began to fall off in about a month, and then emaciated rapidly  
 “ until they came into the infirmary.

“ There was a third baby, aged 11 months, in the infirmary with the mother. It  
 “ was greatly emaciated, with a cough and diarrhoea. The woman said she ‘was a  
 “ card-room hand’ at a factory, and had had two children before, one of which died  
 “ at three months and the other at 14 months of age. She resided in Gas Street,  
 “ Moor Lane, Bolton, and went to her work three weeks after her confinement. She  
 “ used to take her baby at half past five in the morning to a woman in Spring Gardens,  
 “ and visited it at dinner-time. It was fed from the first with bread and milk out of  
 “ a spoon. The neighbours told her that the woman used to give the child ‘sleepy-  
 “ stuff,’ and she herself noticed that the baby was always asleep when she visited it.

“ I am informed, on good authority, that it is not an uncommon thing for persons



" of the operative class, like this last-mentioned woman, to lose all their children one after the other in this way.

" The administration of narcotic nostrums by mothers and persons having charge of infants is exceedingly common. With one voice the medical men in the town, and also those in the outlying districts, testify to the prevalence of this fatal practice. Such patent medicines as Godfrey's Cordial are too expensive for the lower classes to indulge in; they purchase a compound known here under the name of 'Infants Preservative,' or they purchase poppy-heads, and make for themselves a narcotic dose. The more respectable chemists in the town say that they refuse to sell poppy-heads, or syrup of poppies, or any opiate preparations; but two or three of them have informed me that it is a fact well known in the town that certain members of the trade supply the little shopkeepers in Bolton and the neighbouring villages with nostrums of their own preparation. In addition to this, narcotic preparations are prepared and sold by women who make a business of it; and the address of one person (now dead) was given me by a woman who had known of the house for forty years, and had frequently been there herself as a purchaser."

The following information was furnished to us by a member of the Bradford Town Council:—

In September 1872, 178 infants under five years of age died in Bradford. 115 of these deaths, or 64·6 per cent., were of children under one year; 47, or 26·4 per cent., were of children above one year and under two years; leaving 9 per cent. for the remainder.

These 178 children had 172 mothers. Of these 62 went away from home to work, principally of course to factories. 110 did not go to work. An inquiry was instituted as to the number of children that each of these sets of mothers had borne, and the proportion of them which had died. The result was this:—

The 110 mothers who did not go out to work had borne 544 children, of whom 248, *i.e.* 45·5 per cent., had died.

The 62 mothers who went out to work had borne 185 children, of whom 127, *i.e.* 68·6 per cent., had died.

It is, however, sometimes avowed, and perhaps often tacitly assumed, that in this high rate of infantile mortality we may recognize one of Nature's stern but merciful procedures by which the weaker lives are early weeded out, and the stronger alone left. It is maintained that great as the evil may be, it is at least not one which tends to the degeneracy of the adult race.

Let us examine if this be so; and pursuing still further our dissection of the aggregate death-rate, ask what, in factory towns, is the mortality of women during that part of their lives during which their health is of the greatest consequence, politically speaking, to the future vigour of the nation. Let us compare the death-rate of adult women in the Towns of Lancashire and the West Riding, first with the standard of "Healthy Districts" on which the present English Life Table is based: secondly, with that of England and Wales generally: thirdly, with a manufacturing district bearing a high general death-rate, but in which the work is done by men only; women being left to their natural vocations of wives, mothers, and managers of households.

It will be seen by the subjoined table, that of 100,000 women between the ages of 15 and 45, there die in such healthy districts as those from which the English Life Table is formed, 866 annually. It will be remarked that in manufacturing districts like those of the Black Country, where men work and earn high wages, and women mind their homes, the health of women, though the general death-rate is high, is distinctly superior to that assigned in the English Life Table. And it will be noted that in the textile districts where women in addition to their household duties are engaged for long hours in factories, the opposite result is seen. In every instance without exception the rate of adult female mortality in the cotton and woollen districts is very considerably above that of the English Life Table, above that of England and Wales, and still further above that of Wolverhampton, West Bromwich, Walsall, and Dudley.

It is satisfactory to note that in the cotton districts a marked improvement has taken place in the last twenty years; an improvement altogether distinct from and superior to that which is observable in the general death-rate of each locality. It is perhaps not too much to attribute a portion, perhaps no inconsiderable portion, of this improvement to the restrictions on female labour enforced by the Factory Acts. Yet the latest results, those of 1870 and 1871, still show a state of health far inferior to the English standard.



If we pursue the inquiry to the following decade, the period between 45 and 55, the inferiority of the factory districts becomes even more striking.

**MORTALITY of WOMEN between ages of 15 and 45 in Factory Districts, estimated by the number who die out of 100,000 living between these ages.**

	1871.	1861.	1851.
Stockport - - - -	1,006	1,050	1,131
Macclesfield - - -	1,065	1,311	1,393
Bolton - - - - -	983	1,123	1,120
Bury - - - - -	1,001	989	1,133
Ashton - - - - -	1,026	1,118	1,203
Oldham - - - - -	1,014	1,063	1,235
Blackburn - - - -	990	1,189	1,242
Burnley - - - - -	1,051	1,270	1,189
Preston - - - - -	1,170	1,260	1,184
Rochdale - - - - -	945	1,016	1,233
Bradford - - - - -	1,048	1,111	1,193
Halifax - - - - -	1,135	1,071	1,080
Keighley - - - - -	1,197	1,249	1,205
Huddersfield - - -	1,009	1,104	1,109
Dewsbury - - - - -	941	—	—
Wolverhampton - -	825	840	—
Walsall - - - - -	746	787	—
West Bromwich - -	741	708	—
Dudley - - - - -	760	730	—
England & Wales - -	—	920	—
"Healthy Districts" -	866	866	—

In the formation of this Table the mortality has been taken not simply from the Census year itself, but from the average of 1870 and 1871, of 1860, 1861, and 1862, and of 1850, 1851, and 1852.

**MORTALITY per 100,000 of WOMEN between 45-55, and of total period between 15-55; taken on average of years 1870 and 1871.**

	45-55.	15-55.		45-55.	15-55.
Stockport - - - -	2,205	1,198	Halifax - - - - -	1,570	1,205
Macclesfield - - -	1,698	1,179	Keighley - - - - -	1,490	1,244
Bolton - - - - -	1,911	1,123	Huddersfield - - -	1,589	1,101
Bury - - - - -	1,792	1,128	Dewsbury - - - - -	1,421	1,008
Ashton - - - - -	2,009	1,191	"Healthy Districts" -	1,192	919
Oldham - - - - -	1,412	1,140	England and Wales (1861)	1,489	1,008
Blackburn - - - -	2,021	1,144	Wolverhampton - -	1,574	986
Burnley - - - - -	1,976	1,195	Walsall - - - - -	1,473	896
Preston - - - - -	1,908	1,229	West Bromwich - -	1,535	823
Rochdale - - - - -	1,948	1,104	Dudley - - - - -	1,230	845
Bradford - - - - -	1,642	1,113			

We should have been glad to follow this part of the investigations more minutely by statistics, not merely of the districts where textile industries are carried on, but of that particular part of the population engaged in those industries. In the districts indicated about 25 or 30 per cent. of all the adult women are employed in factory labour. If the excess in adult female mortality affecting the district is to be attributed to such labour, of course such excess would become much more visible if we were able to isolate the female factory population from the remaining two-thirds who are engaged in house-work or domestic duties.

The Report of the Registrar-General for 1864 contains the occupation of males who died in 1861. But there is no similar record for females. And we may remark that even for males this register is not altogether a satisfactory basis for conclusions, because the occupations in which many classes of operatives are engaged at their death is not the same as that which they have worked during the greater part of their life; this latter in many cases being that which had undermined their health and sown the seeds of disease. It may not unfrequently happen that a stripper or grinder is forced to leave his occupation, and betake himself for the last two years of his life to some lighter and healthier pursuit. This last would be that under which



he is registered at death, and statistical inferences of a highly erroneous character may thus be formed.

A very large mass of observations has been collected and arranged by Mr. H. Radcliffe, the Secretary of the Manchester Society of Odd Fellows. The rate of mortality in his publication is given for a great number of different trades, and amongst others for three classes of mill operatives (males); viz., spinners, weavers, and men employed in other branches of factory labour. The mortality in these classes of workmen is compared at the age of 20, 30, 40, 50 and 60, with that of other trades, and with that of the total body of members of the Association at the same ages. The result is as follows:—

AVERAGE MORTALITY per cent. at the ages of 20, 30, 40, 50, and 60.

	20.	30.	40.	50.	60.
Manchester Unity	·8434	·7907	1·1011	1·6707	3·2681
Spinners	·5093	·8404	1·0085	1·7504	3·0114
Weavers	1·1120	·5860	1·1787	1·6545	2·6874
Other Mill Operatives	·4605	·6865	1·0652	2·1502	4·4840

It will be seen that male spinners and weavers have, so far as this table goes, a somewhat inferior rate of mortality on the whole to that shown by the mass of the Association. Other mill operatives, those engaged in card-rooms, &c., have on the other hand a rate of mortality higher than the average rate of the Association.

The numbers, however, examined at each age in Mr. Radcliffe's table, varying as they do from 150 to 900, afford probably hardly a sufficient basis in every case for sound inferences. And even were the case otherwise, it must be always remembered that a day's work which was consistent with a given state of health in a man, might not be consistent with the same standard of health in a woman, and this for two reasons: first, the inferiority in physical strength of women to men; secondly, the fact elsewhere alluded to, that when the man leaves the workshop or the factory, he is at leisure and at rest; for the woman, in a large proportion of cases, the whole routine of household labour is super-added.

We have endeavoured also to obtain such returns of absence from work through sickness, as might throw light upon the question, but in this we have failed.

In most mills the working staff is extremely fluctuating. In very few is there any attempt to distinguish between absences due to caprice or discontent, to child-birth, or to ordinary sickness. Associations like those of the Odd Fellows keep returns of sickness, but these give information for males only. And even here, owing to the varying degree of strictness which prevails at different periods, and in different branches of the Association, in supervising the genuineness of each illness, we have gathered that it would be extremely unsafe to attempt to draw conclusions.

On the whole the general results of our statistical investigations would seem to be:—

That there is a high rate of general mortality in the factory districts:

That there is a high rate of infantile mortality:

That there is a considerably higher rate of mortality amongst women of the reproductive age in factory districts than in other manufacturing centres where women are not employed:

That a large proportion of this mortality consists in phthisis and other diseases of the respiratory organs.\*

\* For the proof of this statement we refer to the Parliamentary Return (Feb. 5, 1864), drawn up, we believe, under Mr. Simon's direction, and showing, among many other important facts, the prevalence of phthisis and respiratory disease, in males and females between the ages of 15 and 55, in every Registration District in England. It will be noted that the women of Lancashire and the West Riding suffer from phthisis more severely than the men.



## CONCLUSION.

The changes contemplated in the present arrangements of factory labour are of various kinds. They are not all advocated by the same persons, nor do they all affect the same classes.

1. It is proposed to reduce the hours of labour for all women, children, and young persons, from 60 to 54 hours per week: i.e., to fix them at  $9\frac{1}{2}$  hours for the first five days, and  $6\frac{1}{2}$  hours on Saturdays.
2. To exclude children under 9 or under 10 from factories altogether.
3. To raise the age at which children shall be allowed to work full time, from 13 to 14.
4. To abolish the distinction which at present exists between the age of full time work in silk throwing and that in other branches of textile industry.
5. Consideration of the subject of infantile mortality in factory districts, has led us to the conviction that some means should be taken for restricting the employment of mothers of suckling infants.

We are precluded by the nature of our inquiry from entering into the economic or the social aspects of these proposals. Our function is to speak of them from the medical aspect only, so far as this can be separated from the rest. Medical men in inquiries of this kind must of course so far consider the question of wages, as the immediate purchasing power of the principal necessities of life is concerned. Without entering deeply into the probable economic results of further legislative restriction of the hours of labour, with regard to which the most contradictory opinions prevail, we shall assume, as the most simple, if not the most probable, hypothesis, that wages as they now stand will be reduced proportionally to the diminution of hours; i.e., 10 per cent. The question before us, therefore, takes this shape: would six hours more of leisure per week promote the health of the work-people to an extent which would not be counterbalanced by a diminution, to the extent of one-tenth, of wages?

We are disposed to answer this question in the affirmative. We do not think that with the high rate of wages that has prevailed for some years in Lancashire, "where thousands of women" according to the masters' statement, are earning "upwards of 20s. weekly," that a diminution of 10 per cent. in wages, disagreeable and restrictive as it might be of some luxuries of the operatives, would tell to any appreciable extent unfavourably upon their health. We do think that, light though factory labour in almost all its departments unquestionably is, additional leisure of six hours per week would tend to increase the vitality and vigour of the women and children engaged in it.

We have already referred more than once to the unrelenting and monotonous character of all labour at a machine driven by steam. If the day's work of a housemaid or even of a charwoman be closely looked at and compared with that of an ordinary mill hand in a card room or spinning room, it will be seen that the former though occasionally making greater muscular efforts than are ever exacted from the latter, is yet continually changing both her occupation and her posture, and has very frequent intervals of rest. Work at a machine has inevitably a treadmill character about it; each step may be easy, but it must be performed at the exact moment under pain of consequences. In hand-work and house-work, there is a certain freedom of doing or of leaving undone. Mill work must be done as if by clockwork. And this we cannot but think is one of the reasons why Keighley has a higher death rate for grown up women than Rotherham; Bradford than Wolverhampton or Dudley.

It must be remembered too that a large proportion of factory women, whether married and mothers or not, have house-work to do as well as mill work; and that this has to be added to their hours of labour.

We have spoken of factory labour in general, independently of special evils attaching to certain branches of it. Our Report has indicated the existence of specially unfavourable conditions in two manufactures which together employ more than three-fifths of all protected persons in textile trades, viz., the cotton and the flax manufactures. Some of these evils admit of entire removal, and all probably of mitigation, were sanitary inspection of factories rendered more efficient than in the present state of the law it is. Meantime their principal bearing on the specific object of our inquiry is, that if an atmosphere is bad, it is better and safer to work in it for nine hours than for ten.

For the above reasons we are prepared to recommend that the demand for a reduction of the hours of labour be conceded.



But a further question may be asked, viz., for whose benefit is this concession to be made? For the persons protected by the Factory Acts, or for the workers generally? Though the demand, as preferred by the association of workmen, is made professedly (and, we have no reason to believe, insincerely,) in the interest of the former class, it is quite obvious that as factory labour is a continuous series of operations accurately adapted to one another, diminution of labour in one part of the mill must involve similar diminutions in the whole. If the women of the card rooms or the children of the spinning rooms are away, there can be no occupation for strippers, grinders, spinners, and overlookers.

We are strongly impressed with the feeling that if the hours of labour are to be shortened, the additional hour of rest should be given as far as possible in the interest of women and children. We think it should be given not at the close but at the beginning of the day.

The present system of going to the mill at an early hour before breakfast is attended with evils on which those conversant with factory life are almost as unanimous as on the question of infant mortality. Any one who will take the trouble of rising on a winter morning to see the work-people trooping to the mill often from great distances can imagine the effect on young unfed children, and on mothers who must do beforehand what time allows to make the children whom they leave at home decent and comfortable, and who have perhaps a baby to carry out to nurse. If the mill opened later, the workers could begin after a comfortable meal taken at home in peace, instead of having to eat it in the mill or to run to a neighbouring cottage after an hour and half of labour. And the period of leisure so obtained would be at an hour of the day when it could not be spent in increased debauchery, an objection which we have often heard made to the demand for an afternoon hour. We found this plan in actual working in some few of the mills which we visited. Thus in the West of England it is by no means unusual in winter to work from 8 a.m. to 6.30 p.m. with an interval for dinner only. And in Belfast we found a factory in which similar hours were being worked. The manager said he had reason to be satisfied with the plan in itself, but that it was so inconvenient to the hands to work different hours from those of other members of their own families, that it would probably be abandoned.

Our intention then in recommending this change in the working hours is to couple with it the proviso that the working day should commence after breakfast.

2. With regard to the age at which children should begin to work, we have the less hesitation in expressing our opinion, that many of the most influential employers of labour are prepared to advocate a change in this respect. We have the authority of the executive council of the Bradford Employer's Association for saying that, a reasonable time for the change being given, they would be prepared to raise the age of admission to the Factory in the first place from 8 to 9, and subsequently from 9 to 10. Other employers of experience and influence in other districts have held similar language. We think this conclusion, which reflects credit on the largeness of view, and the humanity of these gentlemen, borne out by the statements which we have already made with regard to the principal condition of children in factory districts.

3. Nor, still regarding the question of health alone, and speaking irrespectively of all economic difficulties that may be found, can we hold altogether different language with regard to the proposal to raise the age of full-time children from thirteen to fourteen. The result of our investigations with regard to flat-foot, would seem to show that even half-time, especially in the large towns, has a tendency to produce this affection, the amount of which steadily increases with age from 8 to 12. We were not in a position to examine in the same way, children of a more advanced age. We are disposed, however, to believe that if it should be found practicable to defer for another year their admission to full-time work, such delay would be physically advantageous to them.

4. We can see no reason why the children in silk throwing should be employed for full-time at an earlier age than in other textile manufactures. Their work does not appear to us lighter than of children occupied in the spinning of silk (to which the exemption from the ordinary Factory Act does not apply), or in the woollen and worsted trades.

5. It does not appear to us impracticable, and if practicable, it certainly appears desirable to make some arrangements by which mothers of young infants shall either be employed for half-time, or be excluded for a time from the factories altogether.

A list of women who have borne children during the past month might be circulated by the various local Registrars to the manufacturers of the district, who would then become responsible for avoiding to take into their employment any of such women applying for work within the period that might be defined.



The objections to half-time in piece work, and it is by the piece that most grown up women are paid, is that it would be necessary to place two women successively at the same machine; if weavers, for instance, at the same loom; and that it would be difficult in case of faults in the work to detect which of the two was responsible.

But in reply to this objection it may be urged that there are many instances where two men are joined together in piece work, and divide the earnings. Two cotton spinners for instance not unfrequently work a pair of mules in this way; the payment being made by the employer in proportion to the work done, without any attempt to discriminate between the merits or defects of each.

An instance even more in point, is afforded by the lace manufacture. There by a special modification of the Factory Act the machine is allowed to run twenty hours consecutively. Two men join at the same machine, working alternately for five hours each; and they are paid collectively according to the work done, both being jointly responsible for defects. These instances seem to show that the principle of adults working half-time at piece work offers no insuperable difficulty. If the alternative of complete exclusion from the mill were preferred by employers and workpeople, the object aimed at, the protection of infant life, would be even more perfectly attained; though the opportunity of working half-time might be advantageous to mother and child at a time of need.

In any case the evil is so great, and the cause of it is so unanimously recognized that we cannot but think that some attempt to remove or mitigate it urgently calls for consideration.

We have the honour to be,

My Lords and Gentlemen,

Your obedient Servants,

J. H. BRIDGES.

T. HOLMES.

April 7, 1873.

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TEXTILE MANUFACTURES.

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REPORT

TO

THE LOCAL GOVERNMENT BOARD

ON

PROPOSED CHANGES IN HOURS AND AGES OF  
EMPLOYMENT IN TEXTILE FACTORIES.

BY

J. H. BRIDGES, M.D., AND T. HOLMES.

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Presented to both Houses of Parliament by Command of Her Majesty.

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