

A DAY AT A COTTON MILL.

ABOUT five miles from Huddersfield, in a valley at the foot of the backbone mountains of England, stand the Meltham Cotton Mills, the village of Meltham being half a mile higher up, upon the very edge of the wild moorlands which stretch, with little interruption, from thence into North Britain. The scenery in the immediate neighbourhood of the mills is very varied, and presents many features of woodland beauty, which are heightened by the contrast of the black and savage moors, which come sweeping down to them from the neighbouring hills. The valley is well cultivated, blooming with corn-fields and rich pastures, and made merry with babbling brooks and the song of birds. All the region round about the mills, and, indeed, for many miles round Huddersfield, has been reclaimed within the last sixty years. Manufacturing enterprise has changed the entire face of the country, and seated its large human population upon lands formerly covered with bog and heather, and inhabited only by grouse, and the weird fires over which Will-o'-the-wisp presided as king. Factories have sprung up, outrivalling the stories of eastern palaces and oriental splendours which many of us loved to read in our youthful days;—factories, shooting up skyward, lighted by innumerable windows, range above range, and containing within them wonders such as the eastern world never dreamed of in its wildest flights of fancy; machinery, doing the work of men without hands or feet; making broad-cloths and cotton fabrics, silk and fancy goods, to clothe naked backs in all quarters of the globe; whilst thousands of men, women, and children have little else to do but superintend its operations.

Nearly the whole of the population of the village of Meltham, and its environs for several miles, is employed in the Meltham Mills. These mills consist of an enormous pile of buildings, which stretch their huge length along the valley, and have a very imposing appearance as you come suddenly down upon them from the "Isle of Syke," and those vast moorlands, before alluded to, which lie on the plateaux of the adjacent hills. There is nothing flimsy and weak about them; all is solid and massy, as if they were erected, like the old Saxon castles, to endure for ages. One magnificent chimney shoots up in the foreground, high above them, the top of which is visible at a great distance. A beautiful church, founded and endowed by James Brook, esq., deceased, who was one of the most gentle and beneficent of men, stands on the slope of a hill, as you enter the village, not far from the noble hall, and almost within the precincts of the park, where one of the proprietors of the mills resides. The parsonage-house, surrounded by trees, and overlooking the valley, is situated within a short distance of the church, and a handsome school-house not far off—where the children belonging to the mills are educated—complete the external features of Meltham Mills, and the neighbourhood.

We will now conduct the reader through the mills themselves; and that he may have as clear an idea as we can convey of the process which the raw cotton undergoes before it is finished on the spools, we will commence at the COTTON STORE, that is, the room where the cotton is stowed in bales as it

comes from the plantations. We will then follow it through all the stages of manufacture, until the process is completed.

Imagine, then, a large room, in the lower part of the mill, filled with these long and tightly-packed bales, the growths of the southern states of America, of the West Indies, and of romantic Egypt. In those remote regions, sundered by prodigious distances, hundreds of slaves have toiled under burning suns to produce this cotton, that hundreds of freeborn men might convert it into threads at Meltham Mills! And here it is at last, stowed carefully away for this purpose, after witnessing many painful scenes where it was grown, and enduring many stormy tossings during its voyage, which, if all could be written in detail, would make the cotton manufacture the saddest of histories. Let us examine, however, some of the bales, and think as little as possible of their antecedents. See, here is a specimen of Egyptian produce, and a very poor material it is. Take hold of it, and pull it to pieces. Do you not see how short the fibre is, and how full of dirt, chips, and gins, is the whole batch! It seems impossible ever to convert it into twist fit for the delicate fingers of a fair lady to handle; and yet I have no doubt it can and will be done. We shall see by what process hereafter. In the meanwhile let us try another bale. Here is a handful of what is called "Sea Island Cotton," and what a contrast it presents to the other! Mark how beautifully white it is, and how fine, long, and silky is the fibre. This is the prince of all cottons, and the material which is chiefly used in the mills. You see, however, that it is not free from many admixtures of dirt and chips; and now we will witness, in another room, the process by which it is cleaned.

Observe that curious machine, which those men and boys are feeding with the dirty cotton; samples of which we have just seen. It contains two eight *cutchers*, or blades, which revolve 1600 times per minute, and the cotton is fed into these, and held fast by two pairs of rollers, the blades striking against it at such a distance as enables them to open up the cotton, and separate the larger chips and foreign substances which are mixed with its fibres, and these fall to the bottom of the machine; the cotton, thus partially freed from its incumbrances, is now carried forward to another roller, and undergoes a further cleansing, until it is finally driven down into a great basket at the end of the machine, and carried off to receive a more complete and satisfactory dressing. This is the first process in the manufacture. And now mark that, although vast quantities of this dirty, dusty cotton are constantly subject to this operation of cleaning, there is neither dust nor dirt in the room. The air is quite clear and healthy. Where, then, does the refuse go? By a very simple and beautiful contrivance, it is all driven up a pair of tunnels, running from the machine into a cylinder placed in the roof, and is carried thence into a chimney outside the building. This is effected by means of a very ingenious contrivance of fans, which has saved many thousands from premature graves; the process of cotton dressing being formerly as inimical to human life as the trade of the Sheffield grinders.

Let us now go to another machine, and witness the second process of cleaning, which consists in

taking out all the small nips and shorts from the long cotton. This operation is performed pretty much in the same manner as the former, the cotton being fed in by rollers, and placed upon huge cylinders or combs, by a series of cylindrical brushes; the combs are then carried round one by one, and brought under the action of a *beater*, holding fast all the long fibres, whilst the *beater* frees them from the shorts, when they are stripped off on the other side, to be ready for further use. This machine answers the same purpose as the *combing machine* used for wool.

We now come to the *blowing machine*, where we see numbers of men engaged in subjecting the cotton to a third process, similar to that which it underwent in the first machine, only this blowing Boreas being much larger and finer set, the opening is more minutely done. The cotton is now delivered, you will observe, in the form of a *web*, and wrapped round a roller, freed from most of the dross that was originally mixed with it. The rollers are then carried to another machine, where they are doubled three together, and passing through another eight *cutcher*, are again formed into a web, and wrapped round a roller, being made by this process as even in every square inch as possible, so that they will fill the card equally without choking it. See what piles of these rollers stand there, in their white jackets, ready to be carried to the *card room*; and from thence to be doubled upwards of thirty-five millions of times, and twisted and twirled by remorseless spindles, before they have been tortured into twist, and made ready for the market. Let us follow them.

Open that door in the side wall; but be careful, or you will tumble down—down thirty feet below. What see you there? A square tube, running from top to bottom of the mills, with a moveable floor exactly fitting it, which rises or falls as required by means of ropes and pulleys. See, the floor is now far down below where we are standing. Give the signal. Lo! up it rises, with a man to direct its movements. Now it is on a level with us. We step upon it, and in a few seconds are carried to the *card room*.

What a strange and wonderful sight bursts upon us! The room runs the whole length of the building, and is full of machinery, which really looks alive, and seems as if it could talk. What a roar of wheels and humming of spindles salute the ear! and how complicated is the work going on here! Yet all is accurately and beautifully done, without confusion, without rest or haste. Hundreds of hands, most of them girls from fourteen to twenty, are busily engaged in their several departments, watching the machinery, feeding it, and instantly joining the broken ends of cotton. Not a moment is lost; every eye is vigilant, every hand active. Let us see now what they are doing with the cotton rollers, specimens of which we saw below.

The machine to which they are now put is called a *breaker*; it consists of rapid rollers, and a large cylinder covered with card sheets, with moveable tops. These sheets contain thousands of sharp iron teeth, so nicely and accurately set that they catch every fibre of cotton, and separate them from film, laying them longitudinally to each other. A smaller cylinder of the same description is placed

in front of the large one, and set so close to it that it draws away the cotton in regular proportions as fast as it is fed into the machine. It is finally drawn away from this cylinder by means of a comb, and delivered in a long tin case, in beautifully white streams about two inches wide. It is then carried to the *lap machine*. From twelve to twenty-four cans are placed behind a pair of rollers kept down by levers and weights; and the cotton is spread out like the warp of a web, and rolled firmly upon another roller, in order to go through another process of carding, called *finishing*. The finishing cards contain about 700 teeth, or points, to every square inch, and the fibres are here thoroughly and finally separated. They are then carried off in a long thin web through the delivering roller into another pair of rollers, when each inch of cotton is drawn into lengths of two inches, uniformly from end to end. The cans are all filled with these long streams, which have been delivered into them by the *finisher*; and here, close at hand, is another machine ready to receive them. This is called the *drawing frame*, and you will observe that it contains four separate divisions, each alike. Six of the cans are placed against the *frame*, and six ends, one for each can, are put into the backmost roller in the first division. You will notice that there are four rollers in all, at small distances from one another, each of them, from the back to the front, going round a little quicker than its neighbour; so that the front roller will revolve six times for one revolution of the back roller. The consequence is, that every inch of cotton taken in by the back roller is drawn into six inches by the front roller; so that the six ends put in behind come out in the form of one end in front, of the same thickness and weight as each of the six ends; or, in other words, as one single end, as it came from the cards. This process is carried on through all the four divisions; and after passing through them all, and being doubled 186,624 times, the cotton is still of the same thickness and weight as it was at the beginning of the doubling and drawing operation.

But mark what a change has taken place in its appearance. When it was put into the cards it was coarse and rough, with the fibres pointing in all directions; but now it has assumed the lustrous appearance of silk, every fibre lying smooth and straight, and all in the same direction. It is now in a fit state for further operations. You will observe that it is in one endless length, but still thick enough to bear its own weight. Now before it can be drawn much finer, some means must be adopted to make the fibres hold together. In its present state, there will be about 100 yards to the pound; but it cannot be drawn out to eight or ten hundred yards unless some means can be devised to make it hold together. How then is this to be accomplished? Let us go forward to the *slubbing frame*, and the difficulty will be solved.

A row of cans stands behind it, filled with cotton in the state we have described above. The *frame* has three lines of rollers for the purpose of drawing the riband, or stream of cotton, out into a "*roving*." A series of "*flyers*" is also fixed upon revolving spindles, with *bobbins* upon these spindles to receive the rovings. As the cotton is delivered from the front rollers, it passes through the *flyers*, and is wound round the *bobbins*, receiving at the

same time its proportionate quantity of *twist* by the revolution of the flyers. The bobbins are regularly carried up and down by mechanical contrivance, so that the rovings are uniformly laid from end to end of the bobbins, at equal distances to suit their diameters.

Take a bobbin from the frame, and examine it. It is so soft that you can press it flat with your fingers; but it is so equal and level, that every part of it contains nearly the same number of fibres! And now listen to this astounding fact. The roving on this bobbin has been doubled 746,496 times since it left the *bag*, and it is eight times smaller than when it left the *cards*. You will see that there is no more *twist* put upon it than is just necessary to keep it from separating, and straining its parts by its own weight; and this twist is the sole secret of keeping it together, which was the difficulty that startled us, when it left the *finishing* machine. It is now about one *hank*, or 840 yards to the pound.

The bobbins are now taken forward, and put through a similar machine to the last, but smaller and finer in its parts. As the rovings are getting finer, the bobbins are made lighter, and smaller in proportion. The rovings undergo here another doubling, two of them being made into one, which is then drawn out by rollers four times longer than the former; and after this process is accomplished, it is put through a third and fourth, growing finer and finer as it advances, until it passes through the last frame in the card room, when every pound is made into thirty hanks, containing 25,200 yards of roving, which has now been doubled no less than 3,981,312 times!

It is now ready for being spun into fine yarns, and we must follow it, therefore, from the card room to the spinning room. As it is too much of a toil to climb the long range of steps to the next room above, suppose we mount the "*hoist*" again, and make the steam horse pull us up. So here we are in a room filled with *spinning-jennies*. These machines differ considerably from the former, as the yarns are here finished, and receive all the twist necessary to fit them for any purpose they may be wished to be applied to. The "*rovings*" are here also doubled into the rollers, and drawn out to ten times their original length. They are built upon spindles, and then doffed off by the hand of the spinner. It is scarcely fifty years since yarns were spun only by hand, one thread at a time; but now one man, assisted by three boys, can keep 1200 or 2000 spindles going at once, each spindle producing a thread! Look at those before you: how smooth they are! how level! the fibres all twisted firmly together, making the thread strong and elastic. Here is a cop finished, and just taken off the spindle. It is solid and hard, containing 3000 yards of yarn, and weighs about one-third of an ounce!

The most wonderful, however, of all the machines in these wonderful mills is the *self-acting spinning-jenny*, which performs all the operations alluded to above without any help from the hand of man. We must look at it, and so mount our steam horse again, and rise to the next room. There it is at full work, no one helping it—the dumb machine doing as it were both the thinking and the labour. How cunningly it is devised! how admirably it

performs its duties! It never makes a mistake, and is never wearied; but continues to work all day long in the same precise, accurate, and methodical manner. It has taken twenty long years of thought and toil to bring it to the state in which you behold it. All the motions are performed with an exactitude that no manual labour can equal. The yarn is spun, twisted, and rolled on the spindle; the cop is built in its proper form; and all these operations are carried on by the agency of that shaft which you see, and its dependencies.

Let us now follow the cops to another part of the works. Look you, here is a large iron chest, or rather a great cistern, piled with baskets full of them. What is going to be done with them now? We shall see. The doors are suddenly closed, and the cistern is thus made air-tight. A man near by turns a tap, and there is forthwith a rushing and roaring of steam as it penetrates into the cistern, and through every fibre of the yarns, softening and moistening them, so that they will not double up and kink when they are made into twist. They are now taken out, and are ready for winding on the bobbins, whilst they are yet warm and moist. We shall not, however, pause to describe this process. One hundred bobbins are filled at once, each of the same length, when they are doffed off by the girls, and put into a basket to be further dealt with. The operations seem endless, and no one would imagine that it required so much trouble and skill to make a spool of cotton. There is no time for reflection, however, and we are hurried along by the never-ceasing machinery to the next process, by which the yarn is turned into thread.

This is carried on in a large room, containing 13,000 spindles, which are superintended by young girls, whose pleasing faces, picturesque dresses, and active movements, increase the animation of the scene.

After undergoing this process, the bobbins are carried to the *reeling room*, to be made into *hanks*, which is done as follows. The machine consists of a long-spoked cylinder, fifty-four inches wide, with spindles attached, upon which the bobbins are placed, perpendicularly to the reel, so that they turn round and unwind as the reel revolves. The ends of the thread are fixed to the spokes of the reel, which carries the thread along with it during its revolutions, and forms it into a hank or skein, with any number of threads in it which may be required, the number being regulated by an *index* placed on the axle of the reel, so that the reel may be stopped at any moment.

The hanks are now taken to the *bleaching works*. Many hundredweights of thread in hank are scattered in piles around the room, according to the different stages through which they have passed in their progress towards bleaching. See, here is a batch of brown thread, just as it came from the hank reels. It is now thrown into a huge caldron full of boiling water, with soap and potash dissolved in it. It remains there until nearly all the colouring matter in it is discharged, when it is taken out, well washed, and afterwards put into a large vat filled with water and chlorine, where the colouring matter is changed by the acid. After steeping for some time here, it is again

taken out, washed well, and put into a solution of sulphuric acid and water. It is afterwards washed with pure soap and water, so that every brown speck is taken out of it; and, as a final process, it is drawn through a vat of clear spring water, mixed with the extract of indigo, so that the white ground may appear clear and brilliant. It is now subjected to *hydraulic pressure*, freed from all superabundant fluid, and carried from thence to the *stove*, where you see it hanging upon poles until it becomes dry, being literally "white as the driven snow."

We must now follow it again to the mills, where it will have to be regularly ironed. This is done partly by machinery. There are two powerful dressing machines, with triangular pipes attached, filled with steam, and two rollers moving perpendicularly up and down. A number of girls, busily engaged in their various occupations, are near it; and one amongst them takes hank after hank of the thread, and puts them over the end of the pipe and roller. The latter moves upwards and downwards as before described, stretching out the thread from the pipe, until every crease in it is drawn quite smooth, and the whole hank is made straight and lustrous. It is now passed over to a table in the same room, where it is separated into smaller heads, neatly doubled up in hank, and packed in parcels of ten pounds weight each, when it is ready for the market.

The process by which the thread is wound upon spools, or balls, such as are purchased in shops, is also a very interesting one; but we have already gone sufficiently into detail. We may remark how gratified we were to observe the care taken to give the public exact measure, a notice being posted up to the following effect:—"NOTICE.—Winders shall pay one shilling for every bobbin that has two lengths less than ordered, and sixpence for every bobbin that has more than ordered. Those who are habitually guilty of these irregularities shall be discharged."

Such is a sketch of this wonderful process of cotton-spinning. It would have been easy enough to have written a lighter and more dashing article about it, but the object has been to describe the manufacture, and to convey some idea of the complicated machinery used in it. Little do the ladies of England imagine, as they sit at work in their quiet parlours or magnificent drawing-rooms, at sewing or embroidering, how many thousands of persons are employed, how many hundreds of thousands of pounds have been expended in machinery, to provide for them the material of their occupation.

The general appearance of the hands—men, boys, and girls—employed in this manufactory we found very satisfactory, both as regards health and dress. As regards the schools attached to the works, we never saw pupils better trained. Their qualifications varied from simple addition up to algebra; and there were pupil-teachers in the schools who were really master of the first four books of Euclid. Their geographical and historical attainments were equally creditable. The whole scene was well calculated to disabuse a visitor of the error once prevalent, that there is a necessary connection between manufactures and moral and intellectual degradation.

THOUGHTS FOR THE CLOSE OF THE YEAR.

OPPORTUNITY is the flower of time. The ancients painted it as an old man, bald behind, but with a lock of hair in front—implying that the present moment should be seized as it passes, and diligently improved. Standing lately in the hall of the London Post-office, near the hour of the despatch-box closing, we watched with interest the loads of letters and newspapers which poured in. A crowd gathered around; faster and faster came the stream; every eye was fixed on the dial-plate, and, as the last note of the clock striking six rung across the lobby, the receiving-box was closed with a loud crash that echoed through the hall. At that moment a cab drove up in haste; a young man, with a large bag full of letters, stepped out. He was a minute too late; the opportunity had gone, and his chagrined looks told the disappointment which he felt.

Too late! too late! Oh! if it be thus with the things of time, what must it be with the things of eternity? Look up, dear reader; see how fast run down the grains of time from the sand-glass of life. Few, perhaps, may remain. Flee, then, now to the Saviour; repent, and believe the gospel. Ah, what must it be to awake in another world, to find the gates of heaven closed, time over, the sand-glass run down, and the soul not saved!

"What would lost souls," says a writer of the seventeenth century, "give for a little of that time they had on earth? If the Lord, by divine and extraordinary dispensation, would but grant them one month's time to come hither again, and to make a new trial, do you think they would not prize the grant? Would they not esteem that little golden season of grace at a high and mighty rate? Would they not embrace every opportunity to flee to the Saviour, lay hold of heaven, and escape the unquenchable fire? Oh, yes! If you would tempt them, saying, Come spend this hour in sinful pleasure, would they not answer, *Alas!* we have but one month's time to live here in this world, and then we must either return to the regions of despair, or, if we improve our time well, ascend to heaven. Shall we trifle away this time of trial and season of grace in offending God? Shall we cast away our souls again to gratify you? Oh, God forbid! Avoid Satan; avoid all temptations! Welcome now all those messengers of heaven that will bring us the glad tidings—the offers of Christ and his salvation. Let not one hour in the sand-glass run down till we have fled for refuge to the Saviour, and cast ourselves in faith upon his righteousness and atoning sacrifice. Let each hour, then, be spent in doing good—in heartfelt prayer—meditation—in hearing God's word; but let not one be spent in sin. Thus would they prize and improve the time, because they know its worth by woful experience. Oh! it is so precious, that all the earth, if turned into gold, could not buy one minute of it."

"Life is the season God has given,
To flee from hell and rise to heaven;
The day of grace flits fast away,
And none its rapid course can stay."