Machinery and Appliances.

INDIA MILL, DARWEN: CONVERSION FROM WHEEL GEARING TO ROPE DRIVING.

Engineers: Messrs. John Musgrave and Sons, Limited, Bolton; Rope Maker: Mr. Thomas Hart, Lanbeth Rope Works, Blackburn.

The traveller from Manchester to Blackburn who chooses the western route via Bolton, in passing through Darwen will, if on the look-out, have his attention arrested by a lofty, square, octagon tower, faintly recalling to his recollection the Victoria Tower of the Houses of Parliament at Westminster. If he be a stranger and enquires from some one better informed, he will learn that the structure is the chimney of the handsome mill close to which it stands, and that this is the celebrated India Mill, regarded as a model for architectural beauty and every excellence that could be introduced in a cotton mill of that time it was erected, which is about twenty-one or twenty-five years ago. And so far as could be seen at that time, it well deserved that reputation.

It is a well-kept firm, that of Messrs. Eccles Shorrock and Company, which has since ceased to exist, but the founder of which was long known as one of the most shrewd and successful cotton manufacturers that the first half of the century had produced. The disastrous days of the cotton famine, however, came on during the time the erection of India Mill was proceeding, and pressed them heavily. The mill, however, was completed according to the original contract, and no money was spared to make it everything that could be desired.

It was well fitted with boilers, engines, and gearing on the then best known principles. After being furnished with machinery and run for a few years, it was disposed of about 1873 to a company, which has worked it ever since.

Not much success had attended the working of the mill by its builders, and it fared no better in the hands of its new proprietors. The latter had acquired it at an unfortunate period for the Brazil trade, and the mill did not do well, being on the coast, just on the eve of a considerable change in the method of transmitting the power from the engine to the machinery. The trying times of the cotton famine had led people to carefully overhaul each part of their establishments in order to effect every possible economy. In this process it was inevitable that the wastefulness, the cost of lubrication, the dirt, the noise, the breakages, and the risks of various kinds incident to the working of wheel gearing should come strongly into view. Previously to this time the exigencies of the manufacturing industries in the United States had led to the extensive adoption of belt driving in that country. Efforts were then being made to introduce this system into England, and there were being attended with some success. The quality of leather necessary for main driving belts and the high cost, together with several disadvantages not necessary to enumerate, rendered its general adoption unlikely; whilst on the other hand it hardly promised adequate compensation for the change. But parallel with the development of belt driving in America, a new system was invented in England which would, if anything, be more acceptable, to be revived, by Messrs. Combe, Barbour, and Combe, the eminent machine makers, of Belfast—that of transmitting power by ropes, and several small installations were put down by that firm in the north of Ireland, we believe mainly in the south mills there. An analogous requirement existed in connection with the Dudden jute trade, and this method was introduced into that district. As observed in a review in our last issue a small installation of the system was seen in the neighbourhood of Dudden, by Mr. William Bamber, cotton-spinner, of Bolton. This gentleman was so struck with the merits of the system that he at once determined to adopt it in a mill then being rebuilt after a fire. Messrs. Musgrave and Sons, the eminent engineers of Bolton, performed the work, and its merits were so great that Mr. Bamber was thoroughly well satisfied with it in every respect. The attention of the trade was drawn to the new system in an article in a technical journal by Mr. Richard Marsden with the result that its merits began to be widely discussed, and rope driving plants became in demand. It goes without saying that it was at first opposed as much as possible by engineers, and all sorts of trouble were prophesied as likely to fall to the lot of those who were fortunate enough to adopt the system. The best of our knowledge Mr. Goodfellow, engineer, of Hyde, was the first to make known his readiness to supply customers with the new system, and to advise the facts. It was soon afterwards adopted by other firms, and quickly became the most popular system. For the past twelve years hardly any other present boilers with new ones to stand the higher pressure. The cylinders are 23 in. and 24 in. diameter, with a stroke of 6 ft. and the engines make 54 revolutions per minute. The cylinders are fitted with Corless valves, actuated by Messrs. Musgrave’s latest patent valve gear, that of the high pressure cylinders being controlled direct by the engine, which is capital. This is in connection with the Higginson patent mercurial regulator by which it is fitted, of maintaining an absolutely uniform speed under varying loads. The crank shaft is of Siemens steel, the neck being 17 in. diameter by 34 in. long, and the frame of hammer iron and are fitted with Siemens steel pins. Each engine is provided with a separate air pump of the usual vertical single acting type, driven by rope talk by means of wrought-iron levers. The condensers are of Messrs. Musgrave’s improved injector type. The frame are of very massive proportions—in fact the engines throughout constitute a very substantial job, and are pleasing to the eye. The flywheel is 30 ft. in diameter, prepared for 30 ropes of 14 in. diameter. The speed at which the ropes travel is 5,100 ft. per minute. The wheel is 12 ft. in diameter, and has two bosses and a double set of arms 24 in. in diameter; the total weight of the wheel being 65 tons. The arrangements made enable the engines to be erected ready for work before the mills were prepared, they having been in the course of erection for eight weeks, very little overtime being worked. After stopping the mills the gearing alterations were carried out in the course of 20 days, no Sunday time being employed. When it is borne in mind that his time included the taking out of the old gearing and shaf ting (75 wheels and 360 ft. of shafting, including up-rights), and revolutionising the whole of the driving arrangements—much cutting of solid ashlar walls being necessary—it will be admitted that the time taken was exceedingly short, and reflects great credit upon Messrs. Musgrave and Sons. It is perfectly safe to state that this is the largest conversion that has been done in the world. Messrs. Musgrave and Sons supplied the list of HP plans and quantities for the alterations, including those for the engine-house, which is in character with the architecture of the mills. The engines and gearing are in perfect working order. During the time which the engines have been running, though they have been too short to enable the reduction in the coal consumption to be ascertained, the conversion has proved highly satisfactory in every respect. Before the alterations the boilers were employed, with two firebeaters to keep them supplied with fuel; now only four boilers are needed, and one firebeater is sufficient.

India Mill contains 81,000 spindles, and the power is transmitted from the 30-feet rope to 15 five-feet pulleys by 30 Lambeth cotton roves, 13 in. diameter, made by Mr. Thomas Hart, of the well-known Lambeth Kepery, Blackburn. This business establishment, one of the oldest, if not the very oldest, of its kind in Lancashire, having celebrated its centenary in 1889, was naturally called upon at an early period in the revolution in the driving system, as one of the most likely to supply the best ropes to meet the requirements of a new method of driving. The consideration Mr. Hart gave to the subject led to the invention and construction of the Lambeth driving rope, so many of the works in Lancashire are using that name and being situated upon an estate belonging to the Archbishop of Canterbury.

The Lambeth rope is designed upon and

THE TEXTILE MERCURY.

January 10, 1891.
with due regard to strict scientific principles, and the requirements of the purposes for which it is intended. These purposes demand a maximum of tensile strength, and suppleness or flexibility. The first is needed in order that the yarn may not be strained, and the latter, with the object of the great strain involved in transmitting the amount of power they are called to deliver to the machinery in connection with which they are used. The warp, as well as the weft, is therefore of a length, so that the strength of the fabric materials is not increased by torsion, much as the popular belief may run to the contrary. The strength of a single fibre of any material appears to be by any given amount, and the strength of any number of them may be the multiple of the number, so long as the fibres are laid parallel to one another. But should they be twisted and then twisted, and their united strength will be found to be much less. We need not go into an explanation of this fact; those who are curious upon it may find it fully given and discussed in Dr. Bowerman’s work upon the Cotton Fibre, and a condensed statement of the same in Marsden’s “Cotton Spinning.” With the full knowledge of a weight of 0,7272, it was shown that the weight of cotton threads of the yarn parallel to form a strand. These were not twisted, in order that their tensile strength should not be reduced. The warp and weft were put upon a twisted cord of cotton yarn which, not having to bear any strain, but only to act as a shield or guard to the core strand, could be made as firm and compact as was necessary, provided the yarn be composed of good quality. It is, therefore, a simple matter to make the grooves in which it has to work. This covering, it will thus be seen, thoroughly preserves the working part of the strand—the core—from the friction of the yarn wound upon it. It will be equally obvious that it does not interfere in the slightest with its flexibility. Three or four of these strands are next combined, by laying on a cardboard wall, and the diameter required is readily obtained. Necessarily at this point little twist is needed.

The accompanying illustration is a very accurate representation of the Lambe rope. This rope will work for years in a position where it is exposed to the sun, and in the ordinary construction would be almost pulverised by the alternate bending around the pulleys and the straightening out again. In tests that have been made it required a rope that was just as much as was the diameter required in the cardboard wall. A rope of this kind was not made, as it would have broken, and it would have been necessary to use a cardboard wall, and the diameter required was readily obtained. Necessarily at this point little twist is needed.

Bleaching, Dyeing, Printing, etc.

ALIZARINE DYES ON WOOL.

Much has been said about the alizarine dyes. Some parties who have never used them are contemplating making a change, and others who have used them in a limited way are frequently adding to their list of colour. The wool il impression is that there are now so many colours of the alizarine dyes that it is practicable for a mill to run on them alone.

Mr. Blackiston, the late President of the Royal Society of Arts, writing on this subject, says—I have had occasion to write in these columns some anticipatory remarks to these on the subject of the alizarine dyes, and now I think that for resistance to light and the hot and severe steaming on the modern weaving looms, I have not found anything else that I have used. I wish now to call the attention of dyers to the advisability of testing fibres or stocks of wool upon a thorough and common-sense manner before they pronounce them satisfactory. It seems to me that the refting, but, if I fear, colour to the conditions under which it will be used after leaving the dyehouse, not only in its further progress through the mill, but outside of it, in the made-up garments on the wearer’s back. A certain colour made by a given rule may be all right for one stock, but, if not so desired, when made up into a garment and exposed to the various changes in the weather, may not be satisfactory.

Colours to be used in goods for men’s wear should be made as thoroughly fast to changes caused by exposure as is consistent with the quality of the goods. And I am not sure that it would not be the beat way to make all colours as thoroughly fast. We all know how badly a faded coat looks, and some of us how it feels, on a man’s back. The fact that the fabric is a good quality and the grade of stock, and of course, does not help the value of the colour, or rather the want of colour.

Now, the principal test to be applied to a colour, after it is tried in the workshop, is to subject it to all the changes of this changeful climate—the heat of the sun’s rays by day and by night, the rain and wind, the moisture of the dew by night, the wind, the gases, in fact every change and condition of the atmosphere which can destroy the beauty of those colours which can be subjected to all the changes of this changeful climate—of the sun’s rays, of the rain and wind, of the moisture of the dew by night, and even of the gases, in fact every change and condition of the atmosphere which can destroy the beauty of those colours which can be subjected to all the changes of this changeful climate.

From the first the claim has been made in a general way that the alizarine dyes were fast to the light in general, and in many cases to acid and alkali tests. The claim, so far as the changes caused by the work in the mill, which I believe to be as good a test as to light or the weather test ought to be qualified. There is a little difference in the appearance of a colour under a lamp, and the same colour exposed to light and atmospheric changes. Some colours will change as much when exposed out of doors a few days as they when exposed to the light for a few weeks. Hanger the colour to be tested in a south window will do very well for a test, but for a weather test the whole of the surface should be on a board or something out of doors in such a place as to get the sun’s rays on it all day long, and in vertical or the nearest possible.

Some dealers and some writers in trade papers claim that alizarine blue is as fast to light as any other dye, and that it should not be much to make the acquaintance of a dealer or dyer who has such a blue. I have used several brands and I find that they are as good as the others in this respect, they all being unsatisfactory. I have before me a sample of wool dyed with alizarine blue, about the middle of the season, and the brown overcoat. It looks well, and stands the wear and tear through the mill in good shape. A piece of the same fabric is also made up, and with a south exposure, so that it gets all the sun-light that it can, and has remained in the first order. As the sun can pass through fabric in a week, the change is considerable, while at the end of thirty days it looks quite faded. Take another example of the same lot of wool and give it the outdoor exposure; here the change will be quite rapid; in three days it is very perceptible, and the falling away of the dye being quite in evidence. At the end of ten days it would be difficult to convince one that it was originally blue.

Thetheory of the dyer when he views his handiwork after having been dealt with by the kind and gentle forms of nature. In view of these facts the constantly reiterated claims for this colour in regard to stability to exposure are not only false, but very alarming. How different the staying qualities of a variety of months of exposure will not change it as much as does the alizarine blue.

Let me give you a record of observation in regard to some other of the alizarine colours which I have used and tested by exposure to the weather. Such records I think some suggestions to others in regard to testing the colours which they may be using. To me the results have been a surprise, and I believe they will be so to others, and on account of the claims which have been so persistently made for these dyes. Of the colours which I have tried the blue fades the most, while the red and orange shades stand the best, and brown and yellow come close together as to staying properties.

Two shades of alizarine orange, one a little fonder of the other, were tested in samples with alum and tartar, the samples, after an exposure to the weather test for five days, showed no perceptible change. Alizarine orange is no longer the colour that it was, and the colour seems a little fuller, but there is no little change that it is hardly recognisable. The same samples of alizarine blue, which also showed a very little change after ten days exposure a darker colour, with less bloom. Alizarine blue in light shades after ten days looks like very grey green, full shades, as in navy blue, the body of the colour seems to stay, but the sample has lost in bloom. Alizarine brown, in light shades show very little change after ten days’ exposure. Galleine, light shades change considerable, but in full shades the blue does not change at all showing very little change after ten days’ exposure. Alizarine brown, in light shades show very little change after ten days’ exposure.

The colours the mordant has been bichromate of potash and tartar, except for the orange, where alum was used. The formula and directions of the makers were strictly followed.

PRINTING INSOLUBLE AZO-COLOURS ON THE COTTON FIBRE.

It is well known that up to the present time no one has been successful in fixing the azo-colours on the cotton fibre in a condition to resist soaping. From the time when the azo-dyes were first made and tried, they have had the favour of the wool dyer, they have resisted every mordant, organic and inorganic, to fix them on the cotton fibre, and the conditions have been often sufficient to remove them, and to disassociate the most intense metallic precipitate. The problem is not a new one, and Koehlin has brought the question a step nearer solution by the discovery that mixed oxides, as for example alumina and magnesia, fix all of the many colouring matters, such as Galleyanine, much better than a single oxide, giving shades faster to washing. Koechlin treats the fibre with a mixture of alumina and magnesia salts, and fixes these by passing through a solution of zinc in soda, whereby a kind of bond of alumina-magnesia is deposited on the fibre.

The results are not altogether satisfactory, the shades lacking the necessary fastness to soaping, but it is possible that the process may be made useful to a mordant will be found which will fix the azo-colours on cotton. This method of making the fibre fast to soaping would have to take the only way to get through the colour that it is to be printed. Turning now to the subject of producing the azo-colours direct on the fibre, the method suggested by Messrs. Longstock and Company, which dates back to the past year or two, is the subject of a patent which is to be submitted to that of developing the colour direct on the fibre.