Machinery and Appliances.

IMPROVED COMBINED PROGRESSIVE STEAM-DAMPING, GAS-DRYING, AND STRETCHING MACHINE.

MESSRS. J. H. RILEY AND COMPANY, BURY.

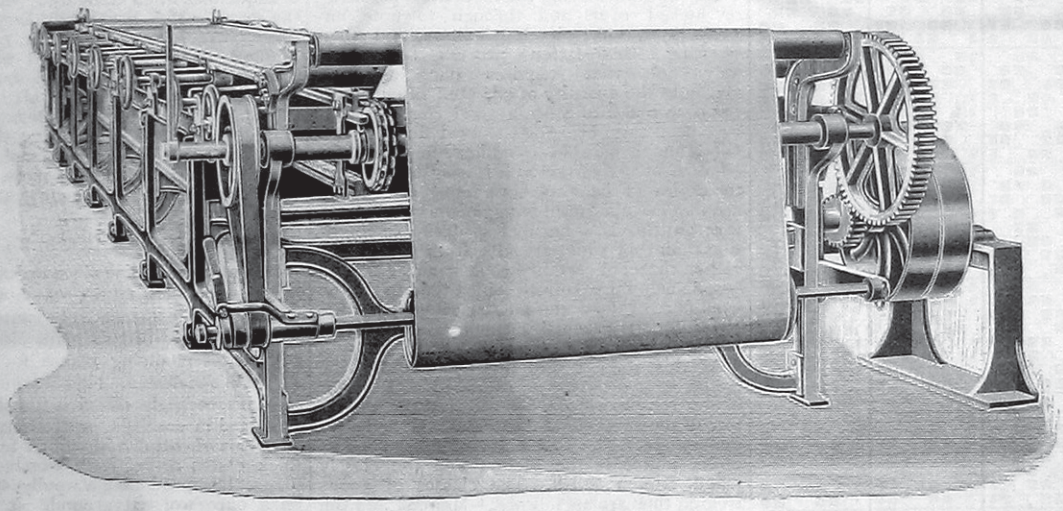
In the finishing processes necessary to giving the final touches to most classes of textile fabrics, in order to render them presentable and attractive to the public and the sale profitable to the manufacturer and the merchant, a tentering or stretching machine is, in most cases, an indispensable part of the plant. It is unnecessary on the present occasion to do more than state that these machines are a development of the simple tentering frames still to be seen in the fields in our woollen manufacturing districts, especially in the localities where flannels are mostly produced. In fabrics other than those composed of wool, and in which shrinkage, but no true felting, takes place, it has been found by experience that the width can be restored much more quickly than it can in woollens, without any injury to the article submitted to the stretching process. It has been found too that resort may be had to artificial drying, which proves a very economical process in enabling work in all departments to be greatly accelerated. The same may be said of damping, if such be required, and these can each be conducted separately from the other, or in any desired combination: thus a fabric may be simply stretched, or stretched and damped, stretched and dried, or finally damped, stretched, and dried at one operation—indeed, any or all of these as required. Of course, machines to do this did not spring up like mushrooms in a night, but have resulted from successive additions to the simple tentering frame referred to above.

The machine to which we wish to direct the attention of our readers on this occasion is one of this class, and embodies all the latest additions to this kind of machine, and independent improvements in details. It is, as stated in its descriptive title, an improved combined progressive, steam-damping, gas-drying, and stretching machine. It is a machine which, as is well known, plays a useful part in the finishing of fustians, calicoes, muslins of all descriptions, flannelettes, and other cotton fabrics, and in fabrics of wool: flannels, woollens, worsteds, etc.

The machine consists of a strong skeleton frame, which is made any length, according to the requirement of the user. It is made in sections, coupled together by a cross rail, which of course determines the width. At the front end of the machine—the one at which the cloth is delivered after its passage through—is the driving gear, consisting of fast and loose pulleys mounted upon one end of the driving shaft, the driving power being derived from a line shaft or a small independent engine, as circumstances may dictate. Upon this shaft are mounted two chain wheels, one at each side. At the back or opposite end of the machine is a similar shaft carrying two corresponding chain wheels. Upon these wheels the endless chains are mounted. They travel in a grooved trough which is covered with a cap, the trough and cap being secured together by small bolts, which are easily and quickly put in and out of their positions, and in connection with which there is no risk of stripping the threads as when screwed holes and bolts are used. The length of the trough is six feet, and upon one end an ear or projection is cast for the reception of the earless end of the next length or rail. Of the two ends a swivel joint is formed, which will allow movement in either direction to admit of adjustment of the sides to the requirement of the cloth or the style of its finish. The upper portion of the trough rests upon cross angular rails, the lower being supported upon brackets pendant from the upper. This trough constitutes the stretching frame of the machine, the cloth being held in as will shortly be described. The machine we inspected was composed of seven sections, each section being 6 feet in length, thus giving a length of 42 feet, or about 45 feet over all. The width of the stretching frame is controlled by means of adjusting screws, which are cross screws having right and left-hand threads. These can be operated independently or in combination. For separate adjustment each screw is supplied with a small hand wheel. Running the length of the machine frame and attached to its side is a horizontal shaft about 1 inch diameter, which carries bevel gearing effecting a connection with each screw. This shaft can easily be connected with the chain wheel shafts and so made to operate all the adjusting screws at once, or such as may be desired by first disconnecting the remainder. By means of these facilities it is easy to give either a straight or serpentine finish to the fabric under treatment. The endless chain is constructed of links of about 2 inches in length. Each link is furnished with a brass of the same length, which is fitted with a double row of pins for holding the selvages of the cloth.

The arrangements for steaming consist of three separate boxes, lined with lead, and which extend across the width of the frame. Each contains a perforated steam pipe that blows the steam downwards, which rises again in vapour and moistens the cloth. These boxes are furnished with copper slide covers, which can be opened either partially or fully, according to the width of the cloth under treatment. Each box is furnished with separate plug taps, which are fed by a service tap of good construction equal to the work required from it. This can be worked separately.

A short distance beyond the steaming boxes the frame of the machine is cased and furnished with a wood bottom to form a drying chamber, the bottom being supported on the cross-rails. Within the box are arranged seven lengths of 1 in. piping, each furnished with a plug stop tap to regulate the supply. On each length are fitted 13 Bunsen burners about 15 in. apart and cross pitched. In all they occupy a space of about 13 feet by 6 feet, thus giving 78 square feet area of drying surface. The pipes are supplied with gas by a cross feed pipe, the gas being automatically turned on and off by the starting and stopping of the machine. A bye tap, unaffected by the stopping mechanism, supplies the jets with sufficient gas to prevent the extinction of the lights when the main supply is stopped.



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At the batching or plaiting end of the machine are mounted two rollers, the first being a retaining roller, keeping the cloth upon the pins until the chain is carried down, and the pins thus withdrawn. The second delivers the cloth to the batching roller or the plaiting apparatus, with either of which the machine may be fitted. The batching bar carrying the box roller is driven by means of a clutch connection from the first chain-wheel shaft.

The chain wheels are controlled and adjusted to the width of the cloth by means of the adjusting screws through a projection from the trough, which works in a groove on the boss of the chain wheel, giving it a lateral movement on the shaft derived from the adjusting screws. At the starting end of the machine there are arrangements for tightening the chains.

The fabric is put into the machine by two girls, who extend it to its width and pass it along brass guides to the circular revolving brushes, which press it upon the pins. These brushes are mounted upon small horizontal

projections from standards or vertical pillars, upon which are coiled presser springs, pressing the brushes down so that they force the cloth upon the pins. The cloth is then carried first over the steaming boxes, next over the drying chambers in succession, and then to the batching end, where it is batched or plaited. The fabrics treated are placed into the machine and pass upon the pins at easy tension upon their width, and are stretched in the passage to proper requirement, and as they approach the doffing end, the tension is eased off to effect easy delivery.

The machine is entirely automatic, needing only a couple of girls to feed it. It is well constructed and finished, and in every respect deserves the attention of the trade. The makers will be pleased to answer any enquiries that may be made, on being addressed as above.

Bleaching, Dyeing, Printing, etc.

PAPERS ON BLEACHING.—II.

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BLEACHING OF COTTON.—*Continued.*

Cotton is bleached either in the form of yarn or in the finished pieces. In the latter case the method depends very largely on the nature of the fabric: it is obvious that fine fabrics, like muslins or lace curtains, cannot stand the same rough treatment as a piece of twill calico will. Then, again, the bleaching process is varied according as to what is going to be done with the goods after they are bleached: sometimes they are sent out as they leave the bleach-house; again they may have to be dyed or printed. In the first case the bleach need not be of such a perfect character as in the last case, which again must be more perfect than the second class of bleach. In the case of cotton piece goods at least three kinds of bleach may be recognised:—

1st, Market or white bleach.
2nd, Dyers' or printers' bleach.
3rd, Madder bleach.

As the madder bleach is by far the most perfect of the three, and practically includes the others, this will be described in detail, and the differences between it and the others will be then pointed out. A piece is subjected to the madder bleach when it has afterwards to be printed with madder or alizarine. Usually in this kind of work the cloths are printed with mordant colours, and then dyed in a bath of the dye-stuff. This stains the whole of the piece, and to rid the cloth of the stain where it has to be left white it is subjected to a soap bath. Now unless the bleach has been thorough the whites will be more or less stained permanently, and to avoid this cloths which are to be printed with alizarine colours are most thoroughly bleached. The madder bleach of the present day generally includes the following series of operations:—

1st, Stitching.
2nd, Singeing.
3rd, Singeing wash.
4th, Lime boil.
5th, Lime sour.
6th, Ley boil.
7th, Resin boil.
8th, Wash.
9th, Chemic.
10th, White sour.
11th, Wash.

The above is the general routine, but it is more or less varied in different bleach works, some of which variations will be pointed out later on. These operations will now be dealt with in detail, as carried on in a modern bleach works, although some brief reference will be made to older methods, partly because it is always interesting to look back on old methods, and partly to shew the progress that has been made in bleaching, especially from a mechanical point of view.

1st. Stitching. In all modern methods of bleaching the pieces are fastened together by stitching into one long rope, which is passed in a continuous manner through all operations in which such a proceeding is possible. This stitching is done by machines, the simplest of which is the donkey machine, whereby the ends of the pieces which are to be stitched together are forced by a pair of cog wheels working together on to a needle carrying a piece of thread; this is then pulled through, and forms a running stitch, a considerable length of thread being left on each side so as to prevent as far as possible the pulling asunder of the pieces by an accidental drawing out of the thread. The donkey machine is simple and effective; being small, it is very portable, and may be moved from one part of the works to another as occasion may require, but is not so quick in its working as the more modern machines.

Birch's sewing machine is very largely used in bleach works. It consists essentially of a Willcox and Gibb machine fitted on a stand so as to be driven by power. The pieces are carried under the needle by a large wheel, the periphery of which contains a number of projecting pins that, engaging in the cloth, carry it along. There is also a contrivance by which the pieces to be sewn can be kept stretched: this takes the form of an arm with clips at the end, which hold one end of the cloth while it is running through the machine. The clip arrangement is automatic, and just before the end passes under the needle it is released and the arm flies back ready for the next piece; it is however not necessary to use this arm always. This machine gives a chain stitch sufficiently firm to resist a pull in the direction of the length of the pieces, but giving readily to a pull at the end of the thread.

The Raver and Lincoln machine is an American invention, and is much more complicated than Birch's. It consists of a sewing machine mounted on the periphery of a large revolving wheel. This carries a number of pins which, engaging in the cloth to be stitched, carry it under the needle of the machine. Besides sewing the pieces together, this machine is fitted with a pair of revolving cutters, which trim the ends of the pieces as they pass through in a neat and clean manner. There is also an arrangement to mark the pieces as they are being stitched. Like Birch's, it produces a chain stitch.

Both machines are efficient and work quickly, and so far as the quality of the work is concerned one machine is perhaps just as good as the other.

What is important in sewing the ends of pieces together is to get a firm, uniform stitch, that lies level with the cloths without any projecting, which would catch in the bleaching machinery during the process of bleaching, and this might lead to much damage being done. The thread used should be as uniform as possible, and free from knots, as these have a tendency when the cloth passes through the mangles and calenders to cut it; for the same reason no knots should be tied in the pieces of thread with which the ends of the cloths are sewed. Should it be necessary to mark the pieces so that they can be recognised after bleaching, the best thing to use is printers' ink. Gas tar is also much used, and is very good for the purpose. Coloured inks do not resist the bleaching sufficiently well to be used satisfactorily. Vermilion and Indian red are used for reds; yellow ochre is the fastest of the yellows; there is no blue which will stand the process; and Guignet's green is the only green that will at all resist the process; umber will serve for brown. All these colours are used in the form of printing ink.

The next operation is a very important one, which cannot be too carefully carried out, that is:—

2nd. Singeing.—For printing bleaches the cloths are singed. This has for its object the removal from the surface of the cloth of the fine fibres with which it is covered, and which would if allowed to remain prevent the designs printed on from coming out with sufficient clearness' giving them a blurred appearance. Singeing is done in various ways—by passing the cloth over a red-hot copper plate, or over a red-hot revolving copper cylinder, or through a coke flame, or through gas flames, and more recently over a rod of platium made red hot by electricity.

Plate singeing is the oldest of these methods, and is still largely used. In this method a semi-cylindrical copper plate is heated in a suitable furnace to a bright red heat; the cloths are rapidly passed over it, and the loose fibres thereby burnt off. One great trouble is to keep the plate at one uniform heat over the whole of its surface; some parts will get hotter than others, and it is only by careful attention to the firing of the furnace that this can be obtained. To get over these difficulties, Worrals introduced a roller singeing machine, in which the plate was replaced by a revolving copper roller, heated by a suitable furnace; the roller can be kept at a more uniform temperature than the plate. The singe obtained by the plate and roller is good, the principal fault being that if the cloths happen to get pressed down too much on the hot plate or roller the loose hairs are flattened down and are not burnt off as they should be. With both plate and roller, the cloths are singed only on one side, and if both sides require to be singed a second passage is required. Both systems still retain their hold as the principal methods in use, notwithstanding the introduc- of more modern methods.

(*To be continued.*)

*FORMATION AND FIXATION OF PERMANENT DYES, GENERALLY TERMED FAST COLOURS, UPON COTTON.**

(*Continued from page* 83.)

We next pass to the third range of prints, often termed best fast work. Here we have five and seven colour effects, and it will be apparent to you that some of the colours are not produced by alizarine, but all such colours are fixed to withstand the soap or clearing baths. And I think you will agree that such work could not be produced before the introduction of the coal-tar colours. And their application in dyeing and printing has brought into play a higher standard of chemical skill in every progressive print works, and in the hands of the chemist few articles lend themselves to the various requirements of both dyer and printer with so many advantages as the alizarine and anthracene products. And there is still a wide field, connected with the use of these articles, unexplored, which is capable of yielding new products and new dyes in combination with other coal-tar products, for forming fast colours upon the fibre.

It has long been known that the heaviest coal-tar products yield the fastest dyes, that with some special exceptions, just as the molecules increase, so is the density of the product increased, and the permanency of the basic dyes produced from such products, but this principle is not maintained in the production of acid dyes, in which such basic products have of necessity to be converted into the di- and tri-sulphonic acid salts. Therefore if we compare for a moment some properties of the lightest and heaviest products derived from coal-tar, which are largely converted into colour, we may start with pure aniline, which unites with hydrochloric acid by mere contact, and by a little pressure it will unite with methyl alcohol, forming methyl and dimethyl aniline, which, by conversion, becomes green and violet. You will observe that the light aniline oil from which the fugitive dyes are produced is ever ready to unite with acids, or with methyl alcohol, whilst anthracene, from which alizarine is made, the heaviest body obtained in the distillation of coal-tar, is so firm in its celibacy that before it will unite it must be forced into solution in hot concentrated sulphuric acid. Those of you who can appreciate the difference in permanence betwixt the alcoholic colours and those in which the fixed acids are required to penetrate, will see that the heaviest bodies yield the most permanent dyes, and in support of this view I place before you dyed and printed specimens of a very fast bright red, which I produce upon the cloth from two heavy coal-

*A paper read by Mr. James Sharp, F.C.S., before the Society of Dyers and Colourists.