

TEXTILE MACHINERY AT THE PARIS EXHIBITION.

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We now come to the consideration of the larger textile machines shown in the Exhibition, and which naturally fall into two principal classes, spinning and weaving. Nearly all the machinery exhibited is that employed in the manufacture of the two materials, cotton and wool. The following exhibitors show practically the whole series of machines employed in the industry of cotton spinning:

- Messrs. Brooks and Doxey, of Manchester.
- Messrs. Dobson and Barlow, of Bolton.
- Messrs. Platt Brothers and Co., of Oldham.
- The Société Alsacienne de Constructions Mécaniques, Mulhouse, Germany.
- Messrs. John Jacob Rieter, of Winterthur, Switzerland.

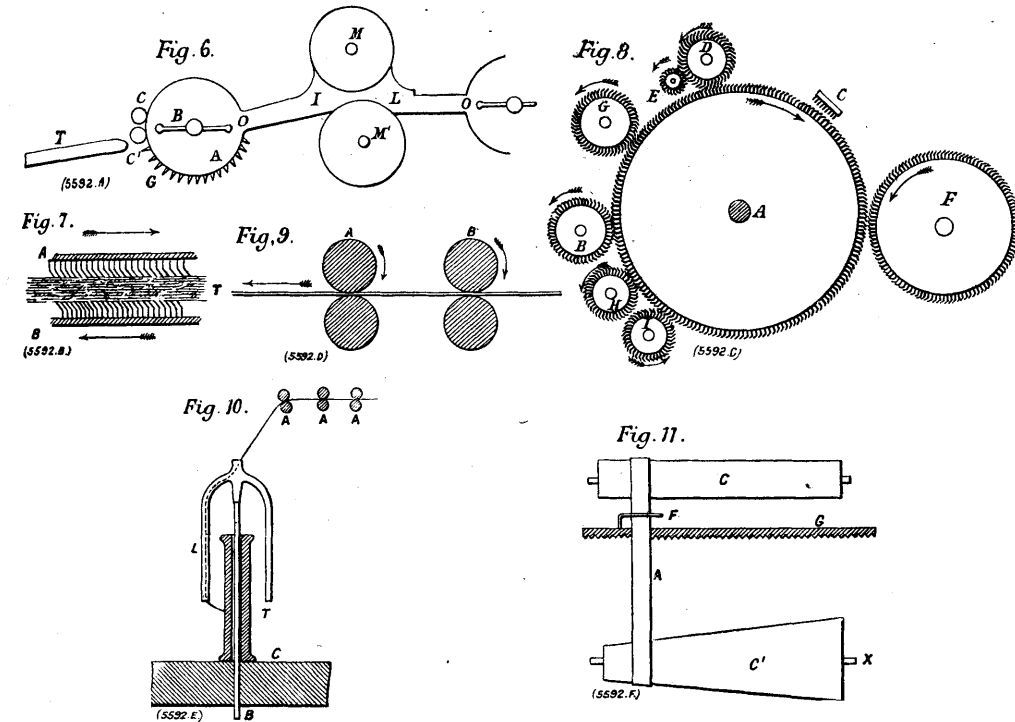
On the other hand, for wool weaving, we have to

familiar to those acquainted with textile machinery, the processes that are followed are, we think, none the less interesting or novel to most of our readers.

In the treatment of cotton, the first of the series of machines to be examined at the Exhibition is the breaking machine. The purpose of this machine is to thoroughly agitate the compressed cotton as it is taken from the bales, so as to loosen the mass, and partially to separate from it foreign bodies, such as dust and other impurities, which are unavoidably packed with it. The best type of the machine is to be found in the exhibit of Messrs. Brooks and Doxey. In this machine the cotton is treated in a twofold manner at the same time; first, by shaking it more or less violently by means of a revolving beater B (Fig. 6), to detach the heavier impurities; second, by passing it between open rollers, where it is subjected to a powerful current of air, which aspirates the dust and lighter particles not thrown off by the revolving beater. Fig. 6 shows diagrammatically the arrangement. The raw

the teeth of the combs (cards) are inserted, and the points of which are placed so as to be opposite one another; the combs travel in reverse directions, as indicated by the arrows, and the filaments naturally follow the movements of the two surfaces. But, in consequence of this movement, the surface A, meeting the points of the surface B, is obliged to part with a certain proportion of the filaments which had accumulated between the teeth, and a similar action goes on with surface B. It thus follows that there is a constant exchange of filaments between the two surfaces. In carding machinery it is, of course, necessary to replace the flat surfaces as A and B by cylindrical surfaces, but the principle remains the same, except for the modifications due to the action of centrifugal force developed by the rapidly revolving parts. Fig. 8 is a diagram which will serve to show the arrangement of the principal organs of a carding engine, the direction in which the points of the combs are bent as well as the direction of rotation. The centrifugal force developed by the considerable speed of the main cylinder A, to which the fibres are brought by a travelling band, throws these filaments against the point of the fixed comb C, or against the rollers D E, which may be considered as fixed, although, as a matter of fact, they revolve slowly. The comb on the large cylinder A tends always to take back these filaments, and the necessary exchange is thus effected between it and the cylinders G B H I; only the heavier parts, as well as dust, seeds, &c., remain fixed at the bottom of the stationary combs, or flat cards, which have to be cleaned from time to time. In the theory of carding, which it is not possible here for us to consider, what is called the carding point is any point on the card, where the fibre can be held by one of the organs and combed by the other; this is the arrangement which is seen between the main cylinder A and the doffing cylinder F, and speaking generally between all the organs, the combs of which are pointed in opposite directions; the more carding points there are in a machine, the more thoroughly the work is done. The most complete carding machine shown at the Exhibition is certainly that by Messrs. Brooks and Doxey, in which is to be seen the Edge apparatus for grinding the points.

On leaving the carding engine the cotton which by this time has been thoroughly cleaned and properly laid as regards its filaments, passes to another series of machines. These are the drawing frames; they are exhibited by almost all the manufacturers mentioned above, and they carry the process of manufacture forward to a very important stage. The purpose of "drawing" is gradually to transform the crude and more or less irregular band, or sliver, of cotton coming from the carding machine, into thinner and homogeneous ribbons, thus fitting it for the subsequent process of forming into the complete thread. The problem to be solved is as follows: Having a ribbon of a given thickness and of definite length, to transform it into another and smaller ribbon of a greater but equally definite length. There must evidently be a fixed relation between the new length of the ribbon and its thickness, and it will be at once seen that if the length obtained is double what it was originally, the thickness will be one-half. In the spinning industry the word "drawing" represents the ratio between the length obtained and the original length. Fig. 9 is a diagram serving to illustrate the process, &c. Thus A and B are two pairs of parallel rollers with the axis of each pair in a vertical plane; these rollers are caused to revolve in the same direction, the pair B having only half the velocity of the pair A. If a sliver from the carding machine is passed between these rollers, the fibres taken by A travel at a velocity double to those which are affected by B until a new series of fibres is fed to A. By this means an extension of the ribbon results due to the sliding and pulling out of the fibres one over the other, and, of course, there is a proportional reduction in the size of the ribbon. If, for example, this latter had a length of 100 metres and a cross-section of 2 square centimetres; its length, after passing through the drawing frame, will be 200 metres, and its section 1 centimetre. In order that the operation may be effective, it is necessary that this section of 1 centimetre should be absolutely invariable throughout the whole length of the ribbon; in other words, that the same number of filaments should exist throughout. As a first condition, it is essential that the distance between the two pairs of cylinders should be greater than the length of the fibres being



separate the machines for combing and those for carding. These two specialities are represented by some important firms:

- Messrs. Platt Brothers and Co., of Oldham (wool combing).
- Celestin Martin, of Verviers, Belgium (carding machinery).
- Société Alsacienne de Constructions Mécaniques de Belfort, France (wool combing machinery).
- Société Anonyme de Construction de Machines de Lure, France (wool combing machinery).
- Alexandre Père and Antoine, Haravcourt, France (wool carding machinery).
- Joseph Erban, Bielitz, Austria (combing machinery).

All of these manufacturers occupy extremely important locations at the Exhibition, and the displays are the more interesting because, in most cases, the raw material is side by side with the machines, and the various processes are shown by which the staple is converted into the finished product. This latter stage is not reached until the cotton or wool has passed through many transformations; and it may be safely asserted that throughout the whole range of mechanics there is no more beautiful, complicated, or perfect machinery than that which has been gradually developed into its present condition for the textile industries. It is impossible, of course, to attempt anything like a complete description of the machines exhibited; in many cases they are of the standard and accepted types; in other cases only small novelties of detail have been introduced, and these can scarcely be explained without the assistance of drawings and elaborate description. The most useful course we can adopt is, therefore, briefly to trace the textile material through the various phases of its manufacture, indicating here and there where novelties of construction have been introduced; and though such a general investigation may take us over ground

cotton, spread out on an endless travelling band T, is brought forward to the two grooved cylinders C, C', which seize it and feed it forward into the cylindrical trough A. Here it encounters the revolving beaters B, mounted on the shaft passing through the centre of the trough. The heavier impurities are very rapidly separated by this operation, and fall through the grid G, which forms the bottom of the trough. Beyond this beating cylinder are two iron-framed drums M, M', covered with fine wire cloth. By the action of a fan connected with these drums a powerful draught is constantly maintained. The beaten cotton passes from the trough, and is fed between these drums from I to L. During its passage the dust is withdrawn into the wire cloth-covered cylinders, and the cotton, after reaching L and passing beyond the influence of the fan, falls into a second system of beaters similar to that already described.

When this last-named stage has been completed, the cotton is practically pure, and the fibres are well separated; it then passes between two cast-iron rollers, where it is condensed and compressed, and thence issues in a form of a thin sheet or lap, which is rolled around a wooden or iron spindle. These rollers, when a certain amount of fibre has been wound upon them, are taken to the second machine of a series for the next operation, that of carding.

The carding engine completes the cleansing process; it also lays the filaments parallel, condensing them, and changing them into a homogeneous ribbon. The means employed for this purpose consist in principle in passing the sheet of filaments between combs, the general arrangement of which is indicated by Fig. 7; as is well known, the combs, or cards, consist of bent and finely-pointed wires set closely into some suitable backing material. Fig. 7 shows that a certain quantity of fibre T is fed between the two surfaces A and B, in which

treated, in order that no one filament shall be held at the same time by the two pairs of rollers; moreover, the distances between the filaments ought to be, as far as possible, equal to one another. In order to arrive at this result, it is necessary to facilitate the arrangement of the fibres from the commencement of the work, and to carry the drawing operation through all the progressive stages; on this account a certain number of drawing frames are required, which gradually reduce the cotton to the desired degree of fineness.

To secure a proper lay of the fibres, the doubling frame comes into use; this effects the combination of a certain number of ribbons; if six ribbons, or slivers, are thus combined, and the drawing process is carried on six times, the resulting ribbon will have a section equal to that of the original ribbon and its length will be six times as great. It will be easily understood that by these additions, proportional to the extension produced by drawing, the inequalities which may exist in a ribbon are either compressed or smoothed out, and that the ribbon, when finally completed, will be the more homogeneous and regular the oftener the doubling operations have been repeated.

The drawing frames are the most simple of all the machines employed in the cotton industry. They consist of pairs of rollers (generally four pairs), which are driven continuously. Each of these pairs is formed, first, of a lower grooved metal cylinder, which is driven direct in any convenient manner, generally by gearing; second, of the upper or pressure cylinder, which is held against the face of the lower cylinder by counterweights; this cylinder is also of metal, but it is covered with cloth, in order to maintain the soft and yielding adhesion to the cotton as it passes between the two rollers. After having passed through the series of operations in drawing and doubling, the cotton ribbon is found to have been brought to a suitable condition of regularity and homogeneity; but it is still far from being fine enough for conversion into thread, because for an average number, or count, the finished length must be from 180 to 200 times the original length. In order to reduce it to the necessary degree of fineness, the doubling process may be suppressed; but in order to remedy the defects in uniformity which a ribbon, if less gradually reduced, may present, the roving frame is used; Many remarkable examples of this machine are shown among the exhibits of all the English and German makers. This machine consists in principle: First, of a series of feeding rolls A (Fig. 10), which operates in the same way as the drawing frame; second, of a spindle B which is driven at a high speed; on this spindle is placed the wooden bobbin T, supported by the rail C. The rail rises and falls alternately, the amplitude of its movement being equal to the height of the bobbin T. Around this latter is wound the yarn coming from the drawing rollers. To reach the bobbin, the cotton yarn has to pass through the hollow arm of the flyer L, fixed to the upper end of the spindle B. Although not shown in the illustration, the bobbin is driven, as well as the spindle, at such a speed that a tension is kept on the yarn from the time it leaves the last roller A until it is wound up. The eye of the flyer being in a fixed position, as the bobbin T rises and falls vertically, the thread is wound around the bobbin for its whole height. In this simple operation a difficulty has to be provided for; the draw roller has a constant speed, whilst the diameter of the bobbin T steadily increases, owing to the yarn being wound upon it; so that at a certain moment the difference between the speeds of A and L and that of the circumference of T, would be such as to cause a rupture of the filament. To provide against this, a special mechanism has to be introduced which reduces the speed of the spool T as its diameter increases, so that a constant and uniform ratio of speeds shall be maintained between the various parts. This regulation is obtained in a number of ways; it will suffice to indicate the general principle. The mechanism which drives the bobbin T (the diameter of which is always variable) transmits the movement by means of a belt A (Fig. 11) driven off the parallel cylinder C to the cone C₁; a rack G fitted with a fork F is so connected that it shifts in proportion to the increase of the diameter of the spool, and drags the belt towards the larger diameter of the cone; as the drum C is parallel, the speed of C₁ and consequently of X, through which the movement is transmitted to the spool, increases gradually.

(To be continued.)