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PROCEEDINGS OF THE INSTITUTE

LANCASHIRE SECTION

Meeting at Technical School, Leigh, 29th October, 1919.

Mr. FRANK ARROWSMITH in the Chair.

LOOM PROBLEMS

By W. WILKINSON.

THE subject of investigation and research is so important at the present time that anyone connected with the textile industry is avoiding a duty if he does not concern himself about it in some direction or other. The Textile Institute is doing a good work in encouraging interest throughout the industry. The Textile Schools are willing to render any assistance, and they hope that the apathy between the Schools and the Industry is gone for ever. The newly-formed Cotton Research Association has a great task in hand, having almost an unlimited scope when all its avenues for research are considered. The Industry also feels that every nerve must be strained to raise the efficiency of each department and each machine in order to increase the production and quality: also to reduce the waste to a minimum.

Speaking in general terms, it is the practice in the textile industry to deal with the problem after it has taken a concrete form, rather than to prevent it from arising, and, in many instances, the investigations are not carried out to find the real cause so much as to remove the responsibility from one department to another. Investigation should aim at prevention, and the only way in which fully effective investigation can be secured is by a combination of effort on the part of spinner, manufacturer, and finisher.

Loom problems are so numerous and varied that it is essential to concentrate on two important points for our subject, viz.: (1) the strain placed on warp yarn during weaving and its effect on the woven fabric, and (2) the hand-threaded shuttle. The latter problem is selected owing to the fact that "shuttle-kissing" will most certainly be abolished in the near future. I note that an attempt is being made in the Blackburn district to provide 20% of the looms with hand-threaded shuttles, or "other means than suction by the mouth," this year. In this matter, it is by no means certain that we have an ideal shuttle under existing conditions. It is common knowledge to those in the mill that a successful overlooker has, in some degree, mastered two loom problems—correct manipulation of the warp in the loom, and the traverse of the shuttle. The successful manager and overlooker for the future will be required to attain a greater degree of proficiency, and to take a deeper interest in the problems of the loom, if we are to retain our position in the cotton industry of the world.

In making ordinary plain cloth, the first consideration should be the attainment of a perfect fabric. The

nearer we get to perfection in the production of the ordinary plain fabric, the easier will be the attainment of excellence with regard to the more complicated products. The factors that influence "strain on the yarn" include: (1) The mechanism employed; (2) size of shed formed; (3) tension on the warp threads; (4) position of the warp line; (5) number of ends and picks per inch; (6) the weave of the fabric; and (7) the nature of the materials from which the fabric is being produced.

As to the mechanism employed, with the exception of the plain roller motion, for the plain fabrics, there is no fixed policy as to the shedding mechanism to be employed for other fabrics within the range of tappets. Favour towards certain mechanism varies as between different districts. It seems as though familiarity with a particular motion, rather than highest efficiency, is the deciding factor. Yet there must be a best among tappet shedding motions for ordinary cotton fabrics. The tappet motion nearest the ideal for a given range of fabrics ought to be established, and this forms one of the first problems which should be tackled.

In connection with the size of shed formed, tension of the warp threads, and warp line, the point of greatest importance is the position and tension of the threads when the reed forces the weft to the fell of the cloth. It is not generally known that a high percentage of yarn breakages and cloth faults is caused by imperfect conditions and settings when the reed is at the fell of the cloth. If the overlooker paid greater attention to this point, many of the loom problems would be simplified. It is impossible to state ideal settings and exact tension without due consideration to the fabric that is being woven, and the amount of elasticity and strength of the yarns from which it is woven. On that account, it is essential to supersede rule-of-thumb methods, so prevalent in the mills, by a more scientific application of the underlying principles, and the result is bound to be increased efficiency and a more perfect fabric. To demonstrate this more clearly, a number of samples are submitted: an ordinary printer; cotton poplin; fine cotton poplin; and Moreen. All may be termed plain cloths, and at least they are all plain weaves.

In the case of the printer fabric, the counts of yarn, both warp and weft, are medium, and the ends and picks are normal. There are two ends per space of the reed, and the settings must be made to separate each thread from its partner at the beat-up, and give an equal distribution of warp yarn to prevent reedy cloth. The warp line must be above the plane in which the two sets of threads cross, and the shedding timed, say, at $2\frac{3}{4}$ in. from the fell of the cloth on a 5 in. sweep. With medium sheds and reasonable tension on the warp, this type of cloth would not be difficult to make.

Let us now examine the particulars for the cotton poplin in this fabric. The abnormal number of ends per inch and a fine warp interweaving with a thick weft form a rib across the piece, and the crossing warp forms the space between the ribs. The conditions essential to the successful production of this fabric are entirely different from those in the case of the printer, although both are plain weaves. Instead of two threads per space of the reed, it would be necessary to place four threads in a space. Then again, the counts of healds per shaft would be very fine if only four shafts were used, and, for this reason, it is an advantage to employ six or eight. Also, the densely-crowded warp would probably stick when crossing, and produce choked sheds. To overcome this difficulty, the warp ought to be controlled by four sets of tappets instead of one, as in the general arrangement, in order to relieve the congestion of the warp threads when crossing, and also to allow the warp to stand in different planes when the beat-up takes place. To perform this successfully, the dwell of the tappet must be increased to allow a perfect shed to be formed when the shuttle travels from box to box. The contraction in width is so small that temples may be discarded; also, the low number of picks permits a high production when the correct manipulation of the warp is carried out. To carry our investigation still further, suppose we require a very fine poplin, known in the trade as a "silk poplin." The fineness of the warp, together with the high number of ends necessary, often allows the dents of the reed to separate the threads at the beat-up, and the cloth is bare or reedy. To prevent this, the principles explained in the foregoing sample must be carried out with a greater degree of accuracy in order to make a perfect cloth and obtain the maximum production.

In the Moreen cloth, the warp is coarse and the ends per inch few, in comparison even with the printer, but a high number of picks of very fine weft are inserted, so that the main consideration in this cloth is the weft. The clean, crisp cord across the piece is the feature in the poplin. Whilst in this cloth the cord is down the piece, and although the weave is plain, the loom problems are entirely different, and the setting should be made to counteract the excessive amount of contraction in width, and also to produce a well-defined cord.

The cotton Venetian is a texture of high quality, and presents many problems to the overlooker. Broken picks provide one of the commonest faults in the weaving of these fabrics, and, although the quality of the weft is often the first point to be raised in this connection, the real cause is almost invariably an imperfect shuttle and a faulty traverse.

Another fault in Venetian cloths is "looping," which gives rise to serious complaint. There are instances where a shearing machine, to remove the loops, forms part of the plant. In other mills, looping is avoided, and there is no need for shearing. Looping is a defect where the weft is lifted by the warp threads, due to faulty shedding, faulty tension on the warp, and, in many instances, to the timing of the sheds not being the same on all the changes of the shed. Tappets may give different times of changing on the different lifts, which alter the strain on the warp for a certain shed,

and, in many cases, this causes the throwing up of loops. Another cause, however, has reference to the warp: if too brittle or hard, the tendency to this fault will be the more pronounced. Elimination of the loop fault has been secured by special attention to sizing, and there is less difficulty with yarn of a nice, soft feel. Another matter for consideration is the dwell given to the tappet. By increasing the dwell period, and consequently increasing the speed of change from one line to another, the tendency to lift up the weft is reduced.

In five-end sateens, the fault of "fiveing" is a common problem and is generally caused by imperfect shedding, with the resulting unequal strain on the warp. One of the sheds places a greater strain on the warp and allows the fell of the cloth to give way, and so the five picks to a repeat are separated from the adjacent picks by a small crack or space.

The hand-threaded shuttle problem is most interesting. There is general agreement respecting the abolition of "shuttle-kissing," but judging by the number of patents granted for an alternative, the problem is more complicated than the aspiring textile experts, in this connection, have reason to believe. If threading the shuttle were the only difficulty, it is almost certain that the pioneers of the power loom would have solved the problem long ago. To thread the shuttle is to place the weft in a suitable position for unwinding during the traverse of the shuttle from box to box, and the following are points for consideration:—

- (1) The shuttle which carries the weft is moving across a plane at a high velocity; also the plane on which it travels is in motion. Again, the shuttle passes between two lines of warp threads, and very often the lines are not uniform owing to imperfect shedding.
- (2) The shuttle is drawn quickly from rest, and stopped suddenly after arriving at its destination.
- (3) The unwinding takes place from varying diameters of the cop and from different points of the shuttle, and if by some scientific photographic process we could note the positions of starting and stopping the unwinding, it would be found to be so varied that it is almost impossible to have uniformity in regard to the tension during the unwinding.

All these adverse conditions are factors which must be taken into consideration, and if we have not found an ideal shuttle under the old system of threading, the problem is far more complicated with a hand-threaded device, and the ideal shuttle for the new system will not be produced unless the unwinding of the weft is primarily considered. This is another important problem for the research departments of our Textile Schools.

In connection with loom problems, my idea is that our technical schools require attention from the standpoint of equipment. There ought to be means for experiment apart from commercial conditions. I suggest that every technical school should be furnished with experimental looms, and each part should be distinctive. The studies of the mechanism should be progressive, commencing with the frame itself. Each piece of mechanism, the shedding and the picking mechanisms, for instance, should be considered apart, and the loom should grow as the study proceeds. Each

part should be distinctively painted. The consumption of power by each part should be considered. In regard to quality of production, the technical school should be able to set the pace for the manufacturer, and a beginning should be made in the production of perfect plain cloth. Such a loom as I have indicated would not only serve for the training of young students but would be useful for advanced studies. Faulty setting could be demonstrated, and the differences marked as between running under unsatisfactory and ideal conditions.

DISCUSSION.

The CHAIRMAN said he had listened to a most interesting lecture. When he heard the lecturer say that at Blackburn 20 per cent of the shuttles were to be of the hand-threaded type, he concluded that they were greatly in arrear at Blackburn. At a mill in a small place like Eccles, it had been found possible to eliminate shuttle-kissing altogether. With regard to fabric faults, looping might be caused by lumps on the yarn.

Asked as to which particular style of tappet he preferred, the Lecturer said that although he had no information from complete test, yet his fancy was towards the cross-rod shedding motion for a given range of cotton fabrics.

In reply to a question as to drag on the weft, the Lecturer said he considered that drag was often put on when it was not required. Often enough, drag was the first thing to be resorted to, whereas it should be the last. He believed there were cases where drag was essential—where the material was of a slippery nature.

On the motion of Mr. HILL, seconded by Mr. ATHEY, a hearty vote of thanks was accorded to the Chairman and Lecturer.

SOUTH OF SCOTLAND SECTION

Meeting at Technical College, Galashiels.

Mr. JOHN HUTCHESON in the Chair.

COSTINGS

By A. WADSWORTH.

THE present is not, perhaps, the most obvious time to be talking to members of the woollen trade about costings. There is, however, a large amount of truth in the saying that "the seeds of adversity are sown in the years of prosperity." However that may be, the far-sighted business man is using these prosperous times to perfect and improve his organisation so that when the lean times come in their turn he will be prepared. Difficult times are the well-organised firm's opportunity.

With regard to organisation generally, let us first clear the ground by means of a few truisms. We are all in business to make profits. Profits in industry are made from three causes—good buying, good selling, and good organisation. Good buying and selling are of greater importance than organisation. The best organisation in the world will not make profits if the buying and selling ends are consistently inefficient, but good organisation can materially assist both buying and selling. Other things being equal, the best organised firm will make the biggest profits.

Costing is an important part of organisation. Every manufacturer has some method of estimating his cost; otherwise, he would not be able to carry on his business. There is a story of a manufacturer—it may be apocryphal—who was asked how he fixed the price of a certain cloth. "Well," he said, "Bill Smith next door sells the same cloth at 10s. a yard and he runs a motor car, so I guess I can sell at the same price." I should hesitate to recommend that method of estimating cost. The manufacturer's difficulty is that, in many cases, he is never sure that his estimated costs are accurate, and, in addition, generally speaking, he has no means of knowing how the actual costs compare with the estimated costs. He gets his balance-sheet at the end of the year or half-year and from that sees the general result of the business during the period; but, even then, he does not usually know whether he has made a big profit on some lines and a loss on others.

The method of costing most suitable to the woollen industry is the process method, by which the cost of each process is ascertained and a proportion of this cost added to each unit going through the process. I intend to deal with methods of finding costs in a general way only—for obvious reasons.

RAW MATERIALS: The important thing in dealing with raw material, particularly up to the yarn stage, is to follow it carefully through each process—sorting, scouring, dyeing, carding, spinning, and so on, keeping records of the weight in and weight out of each process. This is done as part of the normal organisation in the majority of establishments. The recording of the additions to the original cost of the raw material by the losses in each process is a simple matter calling for very little addition to the existing records. To the raw material cost so obtained is added the applicable process cost, which gives the cost of the product at any stage. The necessity of keeping these records with a view to the prevention of undue losses and waste should be obvious to everybody, considering the present price of wool. It is advisable to add to the original cost of the raw material a provision for financing during the process of manufacturing. This will be covered by an average percentage varying with the time taken in manufacture, but, generally, it is about 2 per cent. This ensures that each unit bears its due proportion of the cost of financing in accordance with the value of the raw materials used.

WAGES: The wages cost is probably the simplest part of the cost to arrive at. Piece-work rates are in operation in many of the processes and these give the wages cost at once. In other processes, where time wages are paid, the total wages of the process divided by the production gives the cost per unit. Wages of a general nature, such as office staff, engineers, mechanics, watchmen, etc., are best dealt with in expenses.

EXPENSES: The expenses part of the cost is the most difficult to obtain. It is necessary to get into the cost of each pound of yarn or yard of cloth its due proportion of the expenses of running the business. There is no rough-and-ready method of doing this which is at all exact. You cannot accurately recover the expense part of the cost by means of one flat percentage on either material or wages or both combined. The most satisfactory method is a detailed and accurate departmentalisation of the expenses of the business so that the