# SHORTCUTS

## AUTOMATIC TAKE-UP & LET-OFF.

The main problem in weaving uniform (that is not pattern) fabrics is the uniformity. Whether it is yardage, place mats, towels, or anything else which produces long stretches of solid fabric we have hard time to maintain always the same number of picks per inch. And if we do not, we have "jisps" particularly visible when looking at the fabric against the light: horizontal bars of alternately thick, and loose weaving. It does not take much experience to notice that the jisps correspond closely to the "bore" or the length of warp moved forward each time. The shorter the bore the better the uniformity.

There is nothing mysterious about this phenomenon. As we keep weaving we start with a comparatively sharp angle of the shed (fig.1), and finish with a much wider angle (fig.2). Also we start with a low

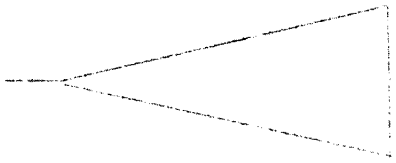

Fig.1

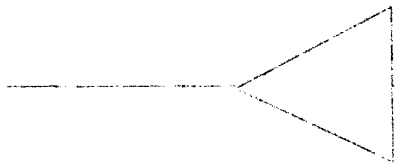

Fig.2

tension of warp, and as we progress this tension increases, because each warp end is being interwoven with weft, and some of its length is being lost in this process.

Thus the conditions are completely different at the beginning and the end of each bore. No wonder then that the fabric also looks different, unless the weaver compensates for the ever changing conditions by an ever changing rhythm. This necessity of compensating is a sound challenge for the weaver, and makes handweaving what it is: a very exacting craft.

Yet, if one could weave always in the same place, that is at the same distance from the reed, never stop to move the warp forward, and never worry about adjusting his weaving technique to the changing dimensions of the shed, and to the tension of warp, then he could better concentrate on the perfection of his rhythm.

In the English of the 18-th century, the action of releasing the warp from the warp beam was called "the Let-Off", and the action of winding the cloth on the cloth beam: "the Take-Up". No shorter or better expressions had been invented since.

The problem then is to make both: the let-off and the take-up automatic. This problem has been solved a number of times in a number of different ways. Most of them require a very complicated set-up with exchangeable gears with carefully calculated ratios, such as used now in power weaving. Fortunately there are also much simpler solutions, quite adequate in handweaving. We shall describe the simplest of all.

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The automatic warp motion requires two entirely independent mechanisms: the let-off, and the take-up. The let-off releases the warp at the rate needed. The take-up winds the fabric on the cloth beam as the fabric is woven. Both mechanisms must work in such a way as to maintain an even tension of warp, and the point of beating must be always at the same distance from the harness.

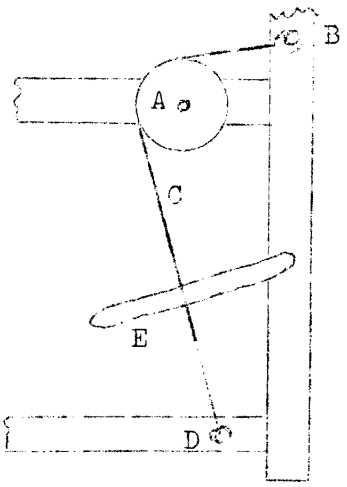


Fig.3

The let-off is shown in fig.3. One end of the warp beam is round (A) or rounded up if necessary. No particular precision in doing this is needed. A 3/8 bolt is set in the loom frame at B, some 6" from the warp beam. Now we take about 5 yards of heavy sash cord, double it up and pass the center around bolt B. The double cord is now wound around the warp beam two or three times (an experiment will show which is better), and finally attached to another bolt (D) in the lower part of the loom frame. To adjust the tension of this cord (C) we have a flat stick (E) inserted between the two strands of the cord. We twist the cord by turning the stick E until the desired tension is reached, and then prop it against the frame.

A new cord must be stretched before it will keep the tension for any length of time. We twist the cord quite tight, and leave it under tension for a day, or even longer.

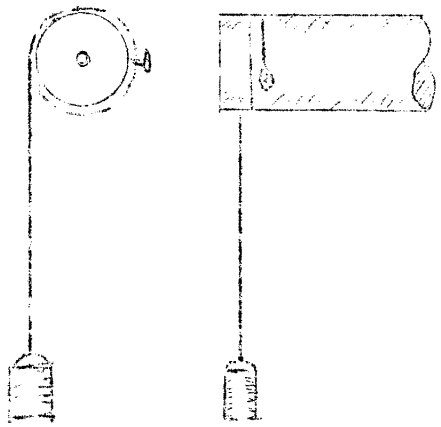

Fig.4

The take-up mechanism is simply a length of cord wound around the cloth beam, with a weight at the end. This weight exerts a steady pull on the beam, thus winding the woven fabric. There is one practical difficulty however: the space required for the weight to sink. If we suspend the weight directly from the beam, it will sink only to the floor, that is about 18", which means that we shall have to stop weaving every 18" to reset the weight. This of course is better than moving the warp every two or three inches. The mechanism is shown in fig.4. The cord has a loop at its end, and this loop is loosely hitched to a screw in the cloth beam. The cord is wound twice around the cloth beam.

The weight should be adjustable. It can be made of a tin can with a wire handle suspended from the cord. It is filled with small pieces of scrap lead, or better with shot. About 10 lbs is enough for normal weaving; less for narrow warps.

If we own a basement or cellar under the weaving studio, we can drill a hole in the floor exactly under the end of the cloth beam, and suspend the weight in the basement. Then we shall wind the cord 6 times around the cloth beam, which corresponds to about 2 yards of uninterrupted weaving.

Another solution is to fix a small pulley to the floor back of the cloth beam, and another pulley to the ceiling above the loom, and still farther back. The cord is wound around the beam as before, then it goes through the pulley in the floor, and from then to the pulley in the ceiling. The weight will hang from the latter pulley. When planning this sort of a take-up, one must be careful to run the cord in such a way that it won't touch any part of the loom. A piece of yarn should be first stretched in exactly the same position as the planned cord, using thumb tacks or scotch tape instead of pulleys.

To reset the take-up, we grasp the cord with the left hand and pull it until the weight reaches its highest position. Then with

the right hand we remove the loop from the screw in the beam, wind the cord around the beam, and attach once more to the screw. Then the slack is released, and the weaving can proceed.

Now we must make two stops for the beater. They consist of two 3/8" bolts, about 3½" long (the exact length depends on the thickness of the loom frame). We drill two holes in the upper horizontal sides of the frame, one on each side, so that the bolts, when inserted in the holes from the inside will touch the two swords of the beater at the same time. But the shock must be reduced by using rubber bumpers. These may be made of short pieces of rubber hose, or of two solid blocks of rubber as in fig.5. The stops should be at such a distance from the harness, that the beater will stop to make a shed 6 to 8 inches long. Several holes may be drilled in each side of the loom so as to make the shed adjustable: shorter for single linen, longer for cotton, etc.

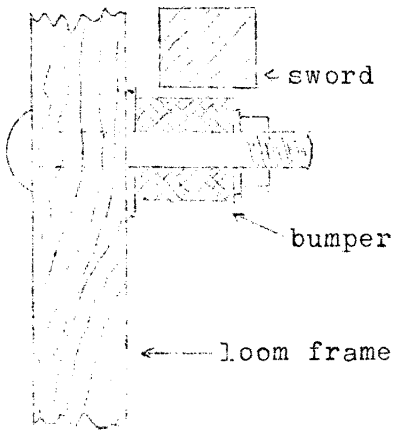

Fig.5

Weaving with an automatic warp motion requires little training. At first one has a tendency to beat too hard. There is no harm in it, except lost effort and noise. Then gradually one learns to beat so that the beater hardly touches the stops.

The tension of warp has two meanings now: when we open a shed the tension depends only on the weight used in the take-up mechanism; but in the moment of beating the tension depends entirely on the braking action of the let-off. Since the two tensions are independent we can weave very tight fabrics (large number of picks per inch) on a very slack warp, and vice versa. Yet in all cases the beating itself remains the same: that is the purpose of beating is to bring the beater in touch with the bumpers. As long as this condition is observed the changes in beating do not affect the fabric.

On the other hand the importance of the rhythm is here as great as in normal weaving. The correlation between beating and changind the shed will still control the drawing-in of the fabric, and the quality of the edges.

About the only disadvantage of the automatic warp motion is, that correcting mistakes is slightly more difficult. If we unweave one inch of the fabric and then start weaving again, we shall have a gap of one inch. Thus after unweaving we must move the warp back by turning the warp beam (nothing to release!), and then pull it forward with the beater to the normal position of weaving.

The take-up mechanism does not require any attention except for resetting, and for adjusting the weight if this is required. But the let-off needs watching. The cord stretches, or contracts with the changing air humidity, and this may affect the fabric. The best remedy is to impregnate the part of the cord which is not wound around the beam with hot paraffin wax. It can be painted with a brush dipped in very hot wax.

With long warps there is another problem. The braking action of the let-off is always the same, but the diameter of the warp on the warp beam slowly decreases. This results in a corresponding increase of tension. Therefore every few yards the brake should be slightly released.

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As we have stated at the beginning of this article the automatic warp motion described here is the simplest possible. Mechanically minded readers will find plenty of small improvements to be made in this set-up. For instance a better control of the let-off: instead of a stick twisting the cord, a bolt or screw; easier method of resetting the take-up, etc. But this implies of course a well equipped workshop.

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When working with any automatic warp motion we must of course release the normal brake or ratchet on the warp beam, but there is no need to release the ratchet on the cloth beam.

If for any reason we must use the loom in the normal way, we release the tension of the let-off, put on the normal brake, and remove the stops. The take-up can be removed also.

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PLEASE SEND US YOUR COMMENTS ON THE AUTOMATIC LET-OFF AND TAKE-UP.

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