ALBERT AINLEY

Practical Loomfixing

A BOOK
of Instruction and
Information on Woolen
and Worsted Loomfixing
Weaving Etc.

ALBERT AINLEY

1907

PROVIDENCE, RHODE ISLAND

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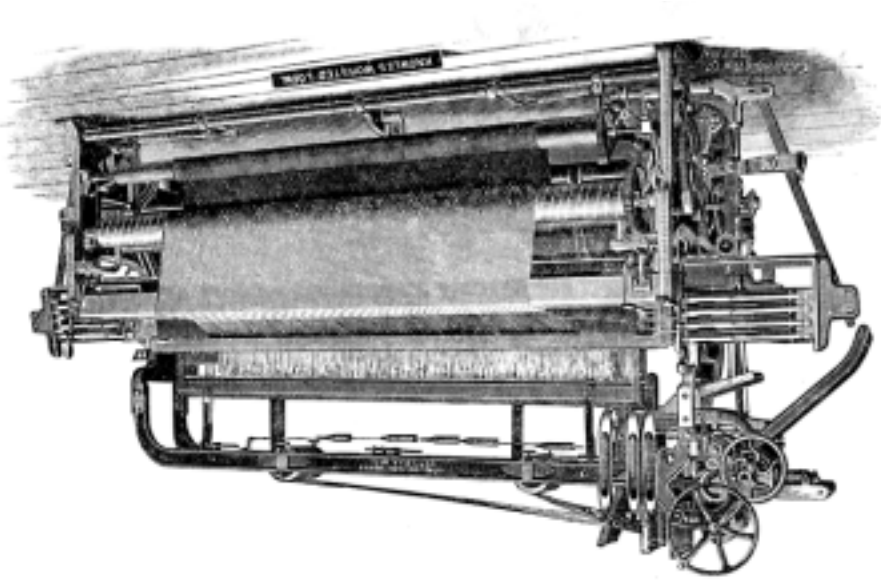
JOHN CRAY
Printer
Olneyville, R. I.



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PREFACE.

High speed, complicated work and the natural tendency of everyone to want a little more than they are getting has forced loomfixing to a science which cannot be attained without a good deal of study and education in that line. In order to satisfy the demands of the times a loomfixer must obtain all the knowledge he can possibly get about his business, as modern conditions will not wait for a man to learn altogether by his own experimenting. Even old experienced loomfixers who rely too much on their own ideas and experience get into a deep rut of their own making, so to speak, so that their intellect becomes dwarfed and their brain forces weakened to such an extent that in a remarkably short time they become practically a back number.

The matter of making a loom to run, the shuttles to go back and forth and the different motions to work in harmony with each other call for but a small part of the necessary skill and knowledge of a good loomfixer; it is now far more a matter of adjusting them according to the needs of the work that it may run to the best advantage and with the least possible loss

of time. Also to prevent troubles from occurring rather than to remedy them after they have occurred.

It would have been an easier matter to have made this book twice or three times as large as it is than it was to reduce it down to its present size without detracting its contents. The matter in general is given straight, and left to the reader to summarize on and argue out for himself the why and the wherefore of it. A lengthy discussion on the various subjects may be an enlightenment to some, but to the average mind would undoubtedly do more to confuse than to enlighten. Loomfixing in all its details can never be taught, as its problems are as numerous and varied as the features of the human race. The best therefore that we can hope to accomplish in this line is to give sufficient instruction and information to enable one to understand his business enough to be able to work intelligently in solving the many difficult problems which do from time to time crop up; thereby not only facilitating a more correct solution in general but saving a good deal of the otherwise necessary time, labor and expense of experimenting.

That it will fulfill well its mission and be a great benefit to the industry in general, but to the weave room in particular, has been the untiring aim of

THE AUTHOR.

THE BELT

There has been much controversy as to which side of a single belt should be run next to the pulley and which end first. In America the custom is to run the smooth side next to the pulley; in other countries the reverse is the case. It makes very little, if any, difference as far as the pulling power is concerned. The writer has run them for years both ways and, therefore, ought to know. I do think, however, that when the rough side is run on the pulley, the belt will last about twice as long.

Put the belt on so that the lap on the inside will lead; outside to follow.

A good heavy single belt is good enough when not a very long belt is needed, but for looms driven by a long belt I prefer a double one, because it is more rigid. A long single belt is too springy and helps to cause backlash in the loom.

BELT DRESSING is sometimes needed on open belts. Clean the surface of the belt with a piece of cloth before applying belt dressing. If you prefer to use card clothing to clean the belt with, use it very lightly on the belt, just enough to take off the loose fibres and dirt.

THE FRICTION PULLEY

The friction pulley plays an important part in the running of a loom. If it is in good condition and properly adjusted, it is far ahead of the tight belt pulley. But if it is neglected and in poor condition, it becomes unreliable and a poor thing. The leather on the friction pulley should be kept dry and free from oil. When it gets greasy it slips just when it ought to stick. If a friction pulley slips, it does so at a critical moment, just when the loom is in the act of picking; because this is where the greatest strain comes in. Thus to slip at this point causes a weak pick and often makes the loom bang off. When the leather is not badly soaked with oil, the surface of it can be scraped fairly clean so that it may last and be in fairly good condition for years. But if the leather is soaked through with oil and grease, the best thing that can be done to it is to re-cover it. When a friction pulley newly covered is fitted on to the shaft, it should be put into a lathe and faced off. By so doing you ensure a flat, square fit against the disk of the belt pulley; that is very essential.

HOT FRICTION COLLARS. The shipping collar on the belt pulley does in some cases heat up quickly, even when there is not too much friction on. The cause of this is usually in the rocker guides which operate this collar. It will

be noticed that when the loom is running, the collar will be jumping up and down all the time, more on one side than on the other. The projection of it, which fits in between the forks of the guide, get worn down more on this side than on the other one, which is comparatively still; it also wears down the forks of the guide so that ultimately the pressure on the friction all comes on one side of the collar bearing. This causes the collar to bind on the neck of the pulley and get hot. The remedy for this is to file either the collar axis or the guide; enough to produce an even bearing.

The belt has a far greater pulling capacity on looms equipped with the friction pulley than with the tight belt pulley. In the latter case, not more than two-thirds of the belt gets onto the driving pulley, which, by the way, has a flat or straight surface at that. But in the former case the full width of the belt is on the pulley all the time. This, with a slightly rounded surface, gives it a good grip.

Have the countershaft bearings renewed when they get worn down enough to need it. A steady running countershaft does a good deal towards making the loom run smoothly.

Set driving gears as deep as possible, not to bind.

THE BRAKE

Some people say the brake is a good thing; others say it is a nuisance. But if I was buying a thousand looms there wouldn't be one without a brake. They do, however, add a little to the repairing expense and give the loomfixer more work, but they are a great advantage to the weaver, save waste and increase the production materially.

THE BRAKE BAND, like the friction pulley, should be kept dry and free from oil, and be made an even fit around the pulley. If it is in good condition and shape, it will stop the loom right on the pick, before the harnesses have changed. If it does not do this it is no good.

THE PICKING MOTION

This motion is the most prodigious part of a loom. Though extremely simple in its construction and not in the least complicated, one can never figure out the power of the stroke or find by calculation the right position of its various parts. The manipulation of its various adjustments is and always will be more or less an experiment. Its object is the carrying of a thread of yarn from one side of the loom to the other; and yet it is safe to say that it takes more power and force to do this than it does to run the rest of the loom. No definite rule of setting the various parts of the picking motion to the best advantage can be given. Like a problem in mathematics, the best way to do it is to try it in different positions until you find the right one, or at least a good one. Usually in setting the various parts of the picking motion I should, as a starter, PROCEED AS FOLLOWS:

Set the picking rolls all alike and put good ones on; no hollow surfaces. See that they are all the same size. Set the shoes both alike, about the same position as you set them on the other looms. Set the picking arms as far for-

ward as they will run without striking the lay sword when the lay is pushed away back. Set the power straps to the same position on the pickerstick on both sides. Adjust the length of the sweep sticks so that they will bring the pickersticks up to about two inches from the bumper. Set the pick to commence with the crank at top center. Try it now and see how the power is. Get that right by raising or lowering the power strap, as the case demands. If the power is altogether too weak on both sides, you may set the shoes forward a little on both sides; otherwise do not change either of their positions just yet. Having got the power right, try the sweep again and make both sides come up to the same distance, two inches from the bumper. Then see how the pick starts on both sides. If one side starts all right and the other about an inch or two of the stroke late, what would you do? The natural impulse would be to set the picking roll forward on the side which was picking late, in order to bring it up to the right time. This however is wrong, because, having set the picking rolls all alike in the first instance, you would be trying to effect a remedy without touching the cause. The right course to take in this case is to let down the shoe shaft at the back. This will enable you to shorten up on the sweep stick enough to make it start as soon as the other side does, without increasing

the length of the stroke. Whenever you find it necessary to put on a new shoe, always look the shoe shaft over, to see if it is bent or twisted in any way; if it is, either get a new one or have it straightened.

Having got everything in a systematic condition as prescribed, and the power regulated right, turn your attention to the pickers, shuttle binders, etc., and see that they are in good condition and shape so that there will be no undue strain in pushing the shuttles out of the boxes; also see that the pickers are kept pretty well oiled. Do all these things intelligently, keep a good sweep on your looms, and you will eventually begin to realize that your labor has not been in vain and that the general condition of your looms is fairly satisfactory.

PICKERSTICKS SPLITTING

Where there is much trouble with pickersticks splitting, plenty of cushion should be used in the pickerstick bumpers. Do not have your looms picking harder than is absolutely necessary. Study the preceding subject so as to get a good pick on your looms. Of course, pickersticks should be made of the best of material and they should have a rivet through them at the bottom.

BANGING OFF

The continual banging off on a loom is liable to cause serious results, such as breaking the driving gears, loom frame, protector castings, crankshaft, etc. It is therefore important that there be no delay in remedying the cause of the trouble, whatever that may be. Any of the following defects are liable to cause a loom to bang off and continue to bang off until remedied: Friction pulley or the belt slipping; a poor adjustment of the various parts of the picking motion, or condition of the same; shuttle rebounding or not getting well in; flat places on the picking rolls; backlash; and, of course, weak power. If the trouble is only spasmodic the cause of it is usually easily located and remedied. It may be that a change in the atmosphere has affected the shuttles and boxes, particularly so if they are not kept clean. In this way they get sticky or gummy, so that the shuttles do not get well in; thus they bang off on the next pick. Have the shuttle binders as near all the same shape as possible. See that the sweep comes up to about two inches of the bumper. Make sure that the friction pulley and belt are doing their work properly; you

can tell this by the way the loom starts up. If it starts up sluggishly, either one or the other is slipping, and you may depend on it that if either one slips at all it will do so when the loom is picking.

To find out which one is doing the slipping take the shuttle out of the box and start up. Hold the shipper handle on with your hands and watch the belt pulley on the loom. If it stops you will know that the friction is holding more than the belt; otherwise the friction is slipping. Do not be hasty about putting on any more power; do that as a last resort when you are satisfied that everything else is as well as it can be made or as well as you can make it, and that the power in general is weak. Continual running with too much power goes a long way toward putting a loom on the bum.

Where there is much backlash, looms will bang off in spite of all remedies. There is always more or less backlash at the loose end of a long line of slender shafting.

THROWING THE SHUTTLE CROOKED

The following defects are liable to make the shuttle go crooked and in some instances, fly out:

Excessive jar on the lay.
Picker rod at a wrong pitch.
Lay end or shuttle boxes out of line.
Obstruction in the shed.
Shuttles sticking in the picker.
Skip boxes on an unsteady box motion.
Crooked reed or otherwise out of line, etc.

If the trouble is chronic, look to the lining up of the lay end and to the pitch of the picker rod. Instructions on the former are given in another part of this book. If the inside end of the picker rod is farther from the shuttle tip than the outer end is, it will cause the picker to throw the shuttle crooked. They sometimes get that way by the wearing out of the hole which holds the inner end of the picker rod. This hole may be packed or filled up where it is worn, but so far I have never found this to be reliable. I always prefer to pack the casting which holds the outer end of the rod, in such a way that the inner end of the rod will be drawn

toward the boxes. This makes a permanent job of it and is easily done. The way to do it is to pack this casting out with a thin piece of leather, tapered off, on the inner edge. Gouge out the picker, or put a new one on after making these alterations.

If the trouble is of recent origin I should look the reed over carefully to see if there are any bumps on it. See that the shed is not too high; that the shuttles are striking the picker in the center and that the latter is not in bad shape.

I had a peculiar case of this kind one time. The weaver came after me and said his shuttles were going crooked to beat the band; they started all at once and he could do nothing with them. Of course I went to see what was the matter but for a while could do nothing as everything seemed to be just as it should be. It was a five shuttle job and it seemed as though they were all going crooked. It seemed to me the strangest thing I ever saw, but I realized that I had to solve the mystery whatever it was. I took two or three shuttles out of the boxes and looked them over but they were all right. Started the loom up again but it would'nt run two picks, so having done everything I could think of, to no avail, I sat down and stared at it. Finally I got up again and looked the rest of the shuttles over, and there sure enough the blind fool had one of them stuck in the wrong way. He did the same

thing again a few days afterwards, but it didn't take me long to find it the second time.

Always look to see that the reed and reed cap are tightened up and that the reed sets solid in its proper place all the way along.

SHUTTLE FLYING OUT

This is a serious matter. It should and does call forth all the concentrated mental energy possessed by the loomfixer while it lasts, to remedy the cause. It is hardly any use here, to mention the causes of shuttles flying out that are accidental, such as a break in some part of the loom. In these cases the cause is at once apparent and it suggests its own remedy. But when a loom is running at a high speed, on work which calls for a difficult box motion there is liable to be some scientific fixing up and adjustments needed. All parts of the loom having any bearing on the motion of the shuttle boxes should be fixed up and adjusted in such a way that the motion will be steady and reliable. The gears on the upright shaft and those which mesh into them should be set as deep as possible, not to bind, also every connection with the same should be made just as rigid. The position of the eccentric gear has a vital effect on the motion of the boxes. Loomfixers differ in their opinions as to the best way to set them where this trouble is concerned, but I never yet knew one of them go back to any other way after trying the following system.

Turn the crankshaft to top center; set the oblong driving gear to one tooth short of the fastest motion. You will understand by this that the fastest part of the motion is the largest place on the gear on the driving shaft; this part to be in connection with the driven gear. Then set the headmotion with the last tooth on the box motion cylinder gear perpendicular. That is the way they should be when the clutch is locked. This gives the steadiest and most reliable motion to the shuttle boxes, and has helped a good many loomfixers out of their difficulties with skip-boxes in this line.

Skip boxes should be avoided as much as possible because, although they can be made to run, there is always more risk where they are concerned. When skip boxes cannot be avoided they should be confined as much as possible to drops from third to first, and jumps from second to fourth. All others are difficult ones to handle. Shuttle flying out is sometimes a difficult problem to solve and remedy, particularly so when the loom runs right along and shows no signs of anything wrong while the fixer is around. I often heard an old time weaver tell a story of a loom which had this habit in a bad way. It would go all right so long as the fixer was watching it but when he wasn't around, the shuttles had a great faculty for going astray. Several times did the weaver bring the fixer to it but

the latter could never find anything really wrong with the loom; and after watching it run a while would go away again, after of course telling the weaver that there either was nothing the matter with it or something to that effect. Finally he told the weaver he didn't believe the shuttle flew out at all. However, when he turned his back to the loom to walk away, the weaver quickly placed his hand on the shuttle race in such a way that it caused the shuttle to fly out and hit the fixer in the back. Thereupon, he, the weaver, stepped up to the fixer with the remark, "now then you b—— will you believe now." "Yes," the fixer says, "I will believe it now," and he went to work and fixed it. Loomfixers having trouble in this line should look up the preceding subject; that is, Shuttles going crooked. Some of the things mentioned there may just as easily make the shuttle fly out as go crooked; particularly the pitch of the picker rod.

PICKERSTICK REBOUNDING

Once in a while loomfixers are bothered with a pickerstick which rebounds a little. This of course is a risky matter because it occurs while the boxes are changing and is therefore liable to cause the shuttle to fly out. It is sometimes a difficult matter to rectify and I have seen instances where the fixer has had to take the pickerstick off and put on another one to overcome the trouble. However, the best remedies I have ever seen for this are as follows: Give the pickerstick more space in the lug strap. That is to say, cut an inch or more off the end of the sweep stick at the end where it connects with the lug-strap and lengthen out the latter by punching the holes nearer the ends. This gives the stick more space to work in. Block the picking arm so that the end of the sweep stick cannot bump against the picking stick. Be sure you have enough spring on the picking stick to pull it back.

BOBBIN SPLITTING

Most of the problems in loomfixing are easy to solve when you have discovered the cause of the trouble but this is an exception in that it is easy to see the cause but often enough difficult to effect a remedy.

The cause in practically every instance is, the shuttle going crooked; not necessarily sideways but up and down, same as if it was a rat running through the shed. Of course if the shuttle boxes are too high or low, or the shed too high, there is undoubtedly the remedy for it, but we are now considering obstinate cases where no direct remedy is apparent. In the first place, notice how the shuttles strike the picker and if the latter is badly worn down put on a new one. See that the shuttle boxes are perfectly in line with the picker race and shuttle race. Also see that the shuttles strike the picker in the center of the head. If they do not do so, it does not necessarily signify that the boxes are out of line; it may be that the headmotion is set too early and that the boxes move too soon. Or it may be that the picker is crooked. Whatever is the cause, it must be fixed so that the shuttles will strike the picker right. Some fixers advocate

putting on a stronger spring in the shuttles in order to hold the spindle down more rigidly. Also planing the bottom of the shuttle in order to make them lay flat and thus take the rocking tendency out of them.

Use your own judgment about these things.

Take the jar out of the lay as much as possible by making all the connections a snug fit. Such, for instance, as the crankarm connections, crankshaft bearings and driving gears. The picker should not lift the shuttle much, nor depress it any, as it throws it.

The worst case I ever had of bobbin splitting was fixed after all other remedies had failed, by setting the picking motion to commence one tooth later.

SCREWS BREAKING IN THE PICKERSTICK

This, as is commonly understood, has reference to the power strap screws.

The cause of them breaking off seems to be the jumping up of the lug strap at the end of the stroke of the picker stick or after it has passed the center of the stroke.

This does not occur much, as far as I am able to ascertain, where the picking motion is in good easy condition. Some loomfixers are never bothered with it much, though I have seen others have to take off a picker stick because it was so full of broken screws they could not put another one in.

It seems to me the best way to remedy this would be to look the picking motion over and try to get a better stroke on it; also shorten up on the sweepstick enough to get all the sweep you need, with the picker stick stud as near to the loom as the slot will allow. If, however, you cannot remedy the matter satisfactorily this way, put on a different power strap; one in which you can use two screws.

THE SHUTTLE BINDER

The secret of good binder bending lies in knowing how to get the right amount of surface on the shuttle, from the right place on the binder. The art of accomplishing this to the best advantage can, like the work of a blacksmith, only be learnt by continual practice, and experience with results. The amount of surface needed to properly check a shuttle, and the best place to have that surface, depends on various conditions and circumstances.

For instance, if you are weaving shoddy filling and the bobbins are wound so soft that the yarn knocks off them, you will need to give the shuttle as much of a gradual check as you can. To do this you would have to bend the binder nearer to the entrance to the box than you would under more favorable circumstances because, the sooner you begin to check the shuttle the more time you have to bring it to a stop. But in this case it will not stand as much surface because it would be liable to stop the shuttle before it could reach the picker. A light shuttle will not stand as much surface as a heavy one. A loomfixer one time called me over to one of his looms because he couldn't understand why the shuttles would sometimes stop before they

got away in and up to the picker.. He had power enough on, and he showed me he had hardly any spring at all on the binder except what he got from the protector rod. The fact of the matter was, he had in, a set of very light shuttles but his binders were shaped to give them as much surface as though they were heavy ones. He, like most loomfixers at that time had one system of shaping his binders and this he used in all cases. However, I shaped his binders over, enough to take a little of the surface off the shuttle; that is to say, so that it would not lay quite so flat against the shuttle when the latter was in the box. I then tightened up on the binder springs, just enough to keep the binder closed when there was no shuttle in the box. It was all right, his shuttles would go in after that and stay there.

The nature of the stock you are working on and the amount of oil the weaver uses around his pickers have a good deal to do with the checking of the shuttles and you have to shape your binders accordingly. As a general rule the binder should be shaped so that when the shuttle is going into the box it will begin to open out the binder at the commencement of its full width surface or a little ahead of that, and gradually open out the binder until the shuttle at its full width reaches the farther end of the full surface of the binder or a little before that so

that when it reaches that point there will be about one and a half inches of surface bearing on the shuttle. Thus when the shuttle is well in the box the binder will be open to its full extent but not to bind against the pin. If it is found necessary to have the binder bearing hard against the binder pin in order to prevent the shuttle from rebounding it is a sign that there is not enough surface bearing on the shuttle. If the shuttle fails to get well up to the picker when the binder is reasonably free there is either too much surface bearing on it or the surface is too far away from the picker. When a shuttle binder is bent so that the surface is too near the picker, that is, too near the rear end of the box, it has a great tendency to cause the shuttle to stick in the picker. The remedy therefore for this is to ease up on the binder at this point and put the surface on a little nearer the entrance of the box. It will readily be seen by this that the shaping of the shuttle binders is one of the important points of loomfixing. An unproperly shaped shuttle binder may cause the shuttle to fly out on account of it sticking in the picker. It may cause the loom to bang off by not checking the shuttle properly. It may cause the filling to kink and a lot of other things.

However, I think there is enough said on this subject to give the student his ground to work on in learning the art of shaping them.

FILLING KINKING

Kinks, either in the warp or filling, are slack places in the yarn which has been taken up all in one place thus forming a loop on the surface of the cloth, sometimes on the back but more often on the face of it.

Several remedies are applicable for filling kinks, namely reducing the picking power tightening up on the shuttle binders, increasing the tension on the filling as it passes through the shuttle eye, and closing the shed quicker or earlier. But before applying any of these remedies, the conditions of each point should be studied so that the right remedy may be properly applied; bearing in mind that although a wrong one may cure the specified disease it is sure to cause another one.

HOW TO PROCEED: First, start the loom up and watch the shuttles as they go into the box. If they go in nicely and stay there they are all right; but if they go in with great force and perhaps rebound a little, that is the point at which the first attack should be made. Take off a hole of power if the force will stand it, even if you have to overhaul the whole picking motion

to do so. Then turn your attention to the shuttle binders so as to stop all rebounding of the shuttles.

The next step is to see how the cylinders are set. As a general rule their best position is about four teeth ahead of the box motion on the bottom cylinder and two teeth ahead on the top cylinder. But if the filling is kinking on the knots etc., it is advisable to close the shed a little earlier than that by setting the cylinder a little more ahead.

The next step is to look at the tension of the filling. This point especially calls for good judgment. In extreme cases you want as much tension as the filling will stand comfortably but it is injurious to overdo this. Put new brushes in your shuttles and the tension will be more elastic, and be very particular to have the tension as near alike on all the shuttles which run on the same kind of filling, bearing in mind that one shuttle with a light tension may cause the filling to kink.

KINKING AT THE SELVEDGE. Weaves with a tightly woven face and a loose back have a tendency to kink the filling at the inside edge of the selvedge. In this case set the top cylinder back even with the box motion and hold the warp down at the side, about an inch lower than its ordinary level, by means of a piece of

wire bent over it and attached to the loom brace, back of the harness.

WARP KINKING. Setting the harness cylinders back, say about even with the box motion or one or two teeth ahead of it, and weaving with it good and tight is generally a sufficient remedy for warp kinking. But if it is kinking only on the back, you may lower the whip roller a half or three quarters of an inch below its ordinary level, to advantage.

POSITION OF THE WHIP ROLLER

On some kinds of light woven goods the position of the warp roller is used to cover up reed marks. And there are cases of heavy goods where by experimenting with it, one may be able to gain some advantage in overcoming trouble with certain kinds of unequal conditions; such for instance, as goods woven with a very loose backing warp. In this case, by setting the roller down to a lower level than its regular position, the slack threads, which, by the way, are raised probably once in about eight picks, are drawn a little tighter, thereby preventing them from floating on the back as they would otherwise be liable to do. But as a general rule, in mens wear goods the best position is where it will give an equal tension to both sides of the shed. This statement will bear a little thinking over, because, a position which will give an equal tension to an even weave would give an unequal tension to an uneven weave. If you are weaving, say a three harness weave, two down and one up, the threads which are raised would be considerably tighter than those which are down because the felt of the cloth would be drawn

considerably lower than it would be with an even weave. Therefore to counteract this condition the whip roll would need to be raised enough to give both an equal tension and vice versa. A line from the fell of the cloth to the whip roller should pass through the harness, with the shed wide open, at an equal distance between the upper and lower sides of the shed.

FILLING CUTTING

There are times when this is a very troublesome problem to solve.

In the first place, size up the broken end and see how far it will reach into the shuttle box. To do this correctly you will have to open the shed for that particular pick and draw it out tight. By so doing you may be able to get some idea as to where it is being cut. If it reaches only to the temple, look to the temple and see that it does not strike the reed or the shuttle race. If it reaches to the mouth of the shuttle box the chances are that it is caught between that point and the shuttle as the latter is going into the box. In this case see that the boxes are level with the shuttle race, that there are no sharp edges where the shuttle can reach; that there are no pins or eyes sticking out of the shuttles and that the shuttle goes fairly straight. I have often found it a good thing to plane the groove a little lower at the opposite end of the shuttle to where the eye is, as this is the point where it seems to catch the filling. If the filling is cut further in the box and there is no apparent cause for it, take notice which box it is in. If

it is always in one particular box change the binder into another box. If the cutting follows the binder you will know that that is to blame and should be able thereby to easily locate the cause. But if it still keeps on cutting in the same box as before, look out for sharp edges on the box and for burrs on the picker. Sometimes filling that has been wound over, flies around, a good deal in the shuttle and gets lapped over the edge of the shuttle and caught between it and the binder. This is because it has been wound the wrong way, or against the twist. It is pretty hard to remedy this kind of filling cutting and as a general rule weavers have to put up with it when it comes this way. I have however, often overcome this defect by sticking a few bristles into the inside of the shuttles in such a way as to keep the filling from flying over the side of it

THE HEADMOTION

This may fairly be considered the complicated part of a fancy woolen loom. Its many adjustments need to be understood in order to keep it in working order. But to have parts adjusted to the best advantage for the particular work in the loom, requires a good deal of experience and a thorough knowledge of its many combinations.

In giving instructions on these points it is hardly advisable and certainly not necessary to go into detail in describing the many parts of a headmotion, as any ordinary weaver knows which are the cylinders, the vibrators, levers, gears, jacks, the lock-knife, chain cylinder, etc. A little talk however, on certain points may help to improve the general knowledge of the loom. It will be noticed that on the lighter style of looms, the "Cassimere" and "Gem" looms for instance, the headmotion is driven from the crank shaft, while on the heavy worsted looms its drive comes from the lower shaft. Why this difference? I have asked a good many loom-fixers this question but found few if any who could give an intelligent answer to it. The fact of the matter is that the lower shaft is better fit-

ted for carrying a heavily loaded head motion than the crank shaft is because, at the time the headmotion is getting in its work there is practically no other strain on the lower shaft. But in case of the lighter looms, although the headmotion is in operation while the lay is beating in the filling they are both driven from the same shaft because it is more convenient to do so and the work is usually of such a light nature that the loom will very well stand it.

THE OBLONG AND ECCENTRIC GEARS

These gears for driving the headmotion are very useful in humoring the motion for the accommodation of difficult movements of the shuttle boxes and for quick or slow shedding. Far better results are obtained from them than from the straight drive. Why some overseers prefer the latter I do not know unless it is because they do not understand the value of the former. Another item depending on the whim or wisdom of those who order the looms, or of their advisors, is the system of a crank shaft drive. Some perfer a "two to one gear" while others like the equal gears the best. The latter type is a more powerful loom but the former type has other advantages of equal merit.

Where a great amount of goods are made with plain filling it is very convenient to have looms of the "two to one" style of driving gears because there is a chance to take off a picking roll on each side of the loom and thereby save much wear and tear of the picking motion. A faster speed is thus made possible.

We will now begin the tedious work of discussing the adjustments of the headmotion.

SETTING THE ECCENTRIC OR OBLONG GEAR. Turn the crank shaft to top center, the point at which the loom should begin to pick; loosen up the eccentric gear which drives the headmotion, and turn it to about one tooth short of the fastest point; tighten it up at that point. The fastest point is the largest side of the driving gear. This gives you the best position at which to set this gear for any and all purposes. It starts the boxes on a slow motion and increases the speed at an easy rate so that at a pinch they will take a jump from first to fourth and back again even on an old and badly worn loom, without any trouble. It is also the easiest for the shedding as it changes the harness on the slow motion. I have often changed this position for such things as filling kinking but cannot say that I ever derived any benefit from such experiments, so I invariably had to go back to the old one.

SETTING THE BOX MOTION. Having set the eccentric gears to their right place we will now proceed to set the box-motion cylinders. With the crank shaft at the top center, and the headmotion clutch in its locked position, the last tooth on the box motion cylinder gears should be perpendicular. That is to say, the last tooth on the top cylinder should be straight down, the bottom cylinder tooth straight up, or nearly so. If there is any difference at all the lower cyl-

inder should be slightly ahead, though this rule is not a cast iron one. It is sometimes advantageous to have the upper cylinder slightly ahead. To get these cylinders in this position, loosen the bearing on the upright shaft and jump it over as many teeth at the bottom as you may find necessary. Do not begin to materially change the eccentric gears, having got them all right they should not be disturbed. There are other ways of setting the box motion but having found this the most satisfactory way I will not confuse the reader's mind by bringing them in.

RESETTING THE HEAD MOTION. Nine time out of ten, when a headmotion is found to be out of time it is because the eccentric gear has slipped, the cause of which was probably something having got caught in the headmotion. In this case, just turn the crank shaft to top center, loosen up the two screws in the eccentric gear and turn it until the last tooth on the box motion cylinder comes perpendicular. Tighten up the screws again and it will be where it belongs. In this, as in previous cases the clutch must be connected.

SETTING THE CHAIN CYLINDER. In doing this, let us imagine that we are working on some old loom where, for some reason or other there are no setting pins in the gears and that the cam which operates the lock knift, though

originally a fixture has been made moveable.

In setting the chain cylinder a soft ended set screw is used. This fits into a small hole in the cylinder shaft. Thus, if the chain gets caught up in such a way as to block the cylinder, the soft end of the screw is cut off so that further breakage is avoided.

SETTING THE LOCK KNIFE. Turn the cylinder around until the first tooth begins to connect with the vibrator gears. At this point the lock knife should have just got to its closed position. The cam which operates the lock knife can be driven around, if necessary, sufficiently to the point, with a hammer.

SETTING THE REVERSE GEARS. Remove the driving and reverse gears from the lower cylinder shaft. Turn the cylinders to the position where the lock knife is out and the finger in the center of the cam or slightly above the center. Then turn the chain cylinder to the point where the vibrators are just crossing from one position to the other. That is to say, in a half way position. Then put the two gears on, with the key-way opposite that in the shaft. Thus the reverse key may be pushed in or out without moving any other part.

LEVELLING UP THE SHUTTLE BOXES. Each of the four boxes as they are called for should set level with the shuttle race. They

are regulated to do this by means of the adjustable bolt in the long lever and by the extension arm in the short lever back of the head-motion, to which the lifter chain is attached.

Go about it in the following manner:

Get the first box even with the race by means of the check nuts on the rod which passes through the box rod tube and attached to the lifter chain. Then turn to the second box. If it comes too high, lower the connection in the long lever. If it does not come high enough, raise this connection enough to make it do so. Then turn up to the third box. Shortening up on the extension arm will make this box come higher; drawing it out farther will not raise the box as high. It may be necessary to go over this performance two or three times before you get them all even.

Having got the first, second and third all right the fourth one should naturally come right. If as is sometimes the case, when the lifter chain gets worn down, the fourth box comes up too high, it can be prevented from doing so by setting up the collar at the bottom of the box rod as high as it will go, then, after loosening up the setscrew which holds it to the box rod, compress the latter down enough to bring the fourth box even with the shuttle race. Then get the other boxes up to the same level by means of the check nuts as previously mentioned. It is sometimes

difficult on old looms to get the second box high enough, on account of the chain being worn down more at this point. This, of course, may be compensated by attaching a piece of wire around that particular link, but I usually prefer to either turn the chain around so as to give it a good side to wear on, or take a link out of it. The latter is often the best way, but take it out away back, near the lever.

BOX JUMPING. A good deal of the unsteady motion of the shuttle boxes which is sometimes seen on old looms is caused by the backlash of the various parts of the loom but sometimes aggravated by an unusual combination of adjustments in the headmotion. The remedy lies in overcoming as much of this backlash in the headmotion as is practical by making each one of the many connections to fit as snugly as possible. See that there are no loose keys, setscrews, gears or locking pins around. If there are any worn out gears, have them replaced by new ones. Sometimes on heavy work, if the upper harness cylinder is set three or four teeth ahead it makes the boxes work unsteadily. I saw a first rate loomfixer get pretty well stuck one time with a case of box jumping. The loom would run, but he didn't like the unsteady motion of the boxes. He worked on it a good many hours, apparently to no avail. Finally he called me over to take a look at it Well, about the

only thing I could see was that the upper box motion cylinder was about one tooth later than the lower one. These things are not adjustable, but I had him cut a piece of the tooth off the top gear on the upright shaft in order that we could set the top cylinder one tooth earlier. This we did, and it did the trick completely.

There are several other things which will make the boxes jump, such as shuttle sticking in the picker. The remedy for this is to ease up on the shuttle binder, or shape it to bind farther from the picker. See that the slides are square with the shuttle race and that the boxes work freely. See that the rocking iron does not bind on the box rod tube. It is easier to obtain a steady box motion with eccentric driving gears for the head motion than with the concentric gears because they can be set to accommodate the needs of the case. By starting the movement on the slow speed and increasing as they get into place a nice steady motion is obtained.

BENDING THE BOX ROD. In cases where the shuttle boxes do not set level with the picker race it is usually advisable to make them do so by bending the box rod just a little, as near to the top as possible. A very little alteration will generally be found sufficient. To do this most expediently, its angle should be marked on the

floor or bench so that you can tell just how much you have changed it before putting it into the loom.

It is seriously wrong to try to make the boxes set level by adjusting the guides because in that case they do not have an even bearing on the supporting arms and are therefore liable to bind on the slightest provocation.

LINING UP A LAY END. The Lay End is fastened to the race board by four bolts and is calculated to lay perfectly in a straight line with the same, but in my practice I prefer to line it up, slightly inclined towards the reed, say about a quarter or three-eights of an inch at the length of the reed space. There should be just enough packing under it so that when the shuttle boxes are just right for the picker race they will be level with the shuttle race.

A new beginner at loomfixing should have some older hand to help him the first time he attempts to line up a lay end. When a lay end is broken and it is necessary to put in a new one, remove the reed cap, take out the reed, remove the cloth from the sand roller and lift cloth roll up on the top of the loom. Take out the picker rod, etc., and loosen up enough of the plate to get the two upright bolts out of the way. Then disconnect the crank arm and what other small matters which may be in the way, and the course will be clear.

PUTTING IN A NEW VIBRATOR COMB.

Sometimes something will get caught up amongst the vibrators, bending three or four of them all out of shape and breaking a few teeth out of the inside comb, thus making it advisable, if not necessary to put in a new one. This can be accomplished without taking out all the vibrators, have often done so myself; but do not now consider it the best way, nor always the quickest.

Although these combs, like most things about an up-to-date loom are made to a standard fit, shape and size and are usually "just what the doctor ordered," we sometimes find it necessary to do a little filing and fitting at some point or other. Therefore to make a first rate job of it, it is far better to take out all the vibrators. When the comb is securely placed, test its setting by putting in one vibrator at the front and one at the back. When these vibrators are down, resting on the comb or the levelling bar attached to it, they should be just low enough for the back lock knife to get in comfortably over the tips. A comb that has nothing the matter with it but broken teeth can be made just as good as new, if not better, by putting in some wire teeth in place of the broken ones.

HARNESS SKIPS

Harness skips are caused in an almost unlimited number of ways, but usually the cause is easily located and remedied. Nevertheless once in a great while one will run up against a tough proposition even in this line. I remember once in the Washington Mills having a case of this kind that for almost a whole day had the best of me, though it would only be fair to say that though nothing I did during that time remedied the trouble, it all worked towards putting the headmotion into good condition. It was a thirty harness warp and it seemed to me I had about exhausted all my resources trying to make it go without skipping, all to no avail until at last, thinking that perhaps the fulcrum or arbor of the vibrator levers was worn too much on the top or may be bent a little, I turned it half way round. That did the trick and to my knowledge I was never bothered with the harness skips again on that loom.

Perhaps the greatest cause of harness skips that go by unnoticed on the loom is worn out chain stuff. Each sinker and raiser get worn a little on the side so that in the aggregate there is space enough to let the edge of some of the

latter get under the wrong lever and thus hold it up when it ought to go down. The remedy for this is to put rings on the bar to fill up the vacant space.

A fool may remedy a defect after it has occured but the wise men are those who prevent them. It is good policy every time a chain is put onto a loom, to see that no raiser can be made to catch on the wrong lever. A good many harness skips can be avoided by so doing. Sometimes the lock-knife finger has either slipped or got worn down so far that it does not push out far enough to clear the tips of the vibrator levers, thus it may hold some of them up which ought to go down. A broken raiser on the chain may run a long time and make a good many skips before it is discovered.

A slight crookedness in one of the levers or connectors may cause them to bind, just enough for the instant of the change, and there is a skip right away. The remedy for these things is too apparent to need any comment. The trouble in these cases is to locate the cause. I have, however, often remedied cases of harness skips, when no cause for the same was apparent, by taking out the vibrator that was doing the skipping and changing places with it and the next one. If there is a skip only half way across the cloth it may be that the harness gets caught on one end or that the vibrator springs back

again. In the latter case a little more spring on the follower is a good thing.

Of course, such things as broken teeth on the vibrator gears or cylinders, broken connectors and a whole lot of other things will make harness skips but they are too apparent to need to be mentioned here. Much more might be said on this subject but it seems to me, what has already been described is sufficient to give any loomfixer a good foundation to work on. If, while the student is looking up some of these things, he finds a cylinder loose or half of the headmotion on the floor he may reasonably suppose that there lises the probable cause of the trouble.

The vibrator levers should be very carefully trued up to the gauge so that they will set perfectly even in the loom.

CHAIN DRAFTING

In drafting a filling chain three things in particular should be considered and looked out for. Firstly. Avoid, as much as possible, obnoxious skip boxes, such as jumps from the first to the third and drops from the fourth to the second. I have often seen these skip boxes used when there was no necessity for them whatever the only excuse that could be given would be that of ignorance. Some overseers prefer to use the same box on both sides of the loom when not more than four shuttles are called for. That is to say, if the first box is called on one side it will be the same on the other side, both sides working alike. Of course, I have nothing to say against this if the overseer prefers it but when such a system is used, there can be no excuse for running the fancy pick in the top box as is often the case. When the system of balancing the boxes, running them up on one side and down on the other, is used, of course, it is different; a jump on one side will mean a corresponding drop on the other. A loom can be adjusted to take all the skip boxes that can be put into it but even after the fixer has done all he

can to make it as safe as possible there is always more risk where they are used than with a single movement; and particularly so when the skip is to an unlimited point, the second or third box. The second point of consideration is to avoid blind picks as much as possible. They cause a good deal of waste, hinder the weaver as well as make his work very unpleasant, and injure the production. Thirdly let each color have its own individual box as much as possible, as it will be less complicated to the weaver and will not keep him guessing near so much as if the shuttles were running first into one box and then into another, etc., etc.

A full course of instruction on chain drafting would fill a book but if you look out intelligently for the three points herein mentioned and arrange your shuttles accordingly you will not go far wrong. Where one point must be sacrificed for the benefit of another, conditions must be taken into consideration. For instance, if the work is of a very dark color and in a dark loom, I should run the shuttles in the top box just as much as could be practically done so, even though it did cause lots of skip boxes and other complications. But when the work can be easily seen I should use the middle boxes if an easier motion could be obtained thereby. The movement of the boxes to the first or to the fourth are, or can be blocked at those points and are

therefore safer to use as the destination of a skip.

The chain builder should be instructed to throw out all badly worn chain stuff as they are a menace to the safety of the loom and to perfect cloth. He should also have some sort of a conveyance to carry long chains from his bench to the loom because, by dragging them on the floor they pick up so much dirt that it is injurious to the whole business.

PUTTING ON A NEW PICKER

The length of time that a loom picker will wear and the satisfaction it gives in general depends a good deal on the way and manner in which the incidental work of putting it on is performed. It is of course, well understood that there are good pickers and poor ones; and that no amount of skill or science on the part of the loomfixer can make a poor picker wear as well as a good one. But a good picker may easily be put on to last two months or less than one day. I have seen one side of a loom wear out six pickers in as many days, each of which would easily have lasted two months if properly attended to.

This is not meant to discredit loomfixers in general but, the idea that any one is good enough for a loomfixer. Up-to-date loomfixing calls for the greatest intelligence that can be obtained.

When a new picker is put into a loom the first thing to be looked up is the condition of the pickerstick where it strikes the picker. This should have a nice, broad, smooth, even surface, even if it is necessary to put on a new stick to obtain this. If this matter is neglected it will soon wear out the back of the picker. The same result will be produced if there is too much leather packing on the picker rod.

Take particular notice how the shuttle strikes the picker. It may, from various causes, strike it away off from the center, in which case the hole made by the tip will quickly work outward to the nearest side and is thus put out of business. A good careful loomfixer will attend to all these things in a skillful manner but a poor one will put the picker on and let it go. Things which will make the shuttle strike the picker in the wrong place: The shuttle boxes not being properly set in line with the picker race. The shuttle raceboard having too much packing under it, or not enough, necessitating the setting up of the shuttle boxes, too high or too low as the case may be. The box motion may be set too early either in the upward or downward motion, or both. In the latter case the shuttles may make

TWO HOLES IN THE PICKER

The remedy for this is to set the box motion a little later, and perhaps it may be advisable to get the shuttles across a little quicker or earlier. An old worn down set of shuttles will strike the picker considerably lower than new ones would. In this case I should bend the picker to accommodate the circumstances of the case.

Having got the picker on in good shape, turn your attention to the picking of the loom. If it is not an easy pick, such as is produced by a properly graded stroke, the excessive strain at its worst point may cause the picker to crush the grain of the pickerstick and thus produce a rough surface which will quickly wear out both the picker and the stick.

A discussion on the picking motion will be found in another part of the book.

Always oil the picker rod and race before starting up with a new picker, and talk to the weaver occasionally about the advantages of keeping the pickers well oiled

SHUTTLES CHIPPING

Shuttles chipping on the top is caused by them striking against the top or upper side of the shuttle box as they are going in; but what makes them do this is the question. Of course if the boxes are too low or rough, or if the shed is altogether too high they will cause this; but these things are easily apparent. A cause for this which is not particularly apparent, or which one may not suspect would do it, is, when one of the boxes is just a little too high. Even one sixteenth of an inch will sometimes be enough to throw up the shuttle against the top, and thus cause it to splinter. Study the "bobbin splitting" subject for this trouble.

SHUTTLES TURNING OVER. In ninety-nine cases out of a hundred, the cause of this trouble will be found to be, the shuttle box being too low. The only exception I ever had to this rule was a case where the loom needed a new picker. If anything else should be needed I should look to the reed and to the shakiness of the lay, or perhaps to the shape of the shuttle itself.

FANCY SHUTTLE WORKING OUTWARD

This has reference to the shuttle which carries the fancy or checking filling. It often stays so long in one box that with the vibration of the loom and other circumstances combined it works itself outward or away from the picker about an inch or two, thus sometimes causing the loom to bang off.

The principal reason for this is undoubtedly the fact that the binder is pivoted at its farthest end and loose at the entrance to the box and that it pinches the shuttle at its pivoted end. An effective remedy for this is to shape the binder so that it will bear on the shuttle nearer to the entrance of the box and keep a good spring on it. This can perhaps be done to such an extent that it will have a tendency to work the shuttle towards the picker, but it is not wise to overdo this.

THE FILLING STOPMOTION

Before beginning a discussion of the various adjustments of the broad loom filling stopmotion, perhaps it would be better to give a general description of it so that the reader will more readily understand what is said. In the first place then, there is a frame work casting made to fit and attached to the center of the lay. This frame work carries the brass barrel to which the feeler wires are attached; the rocking arm and pin for operating this barrel, and the lower socket lever which holds the knock off dagger.

This dagger is nothing more nor less than a small elbow shaped piece of forged steel, but as it is commonly known as the dagger, we will, for convenience sake give it that title here. The socket lever is connected to the rocking arm by an upright connecter about four inches long. There is also a light piece of flat steel wire attached to the lower side of the frame casting, one end of which may be adjusted to rest on a projection of the socket lever so as to act as a steadier for it.

There is another frame work casting which is attached to the breast beam by means of two

bolts. This fixture carries the dagger slide, the knock off finger (No. 8) and the sliding guard for the same. It will readily be seen by look ing into this thing on the loom, how the No. 8 connects with a finger from the shipper rod or another one which runs paralell with it under the breast beam; the former where there is no brake, the latter where a brake is used. The frame work attached to the lay is a fixture; everything it carries has got one set position so that directions for setting these are unnecessary. The frame work attached to the breast beam however is adjustable to different positions so is everything connected with it. We will therefore begin by setting this frame work.

Bring the lay forward to the point where the dagger comes up to the finger No. 8, then set the frame casting just high enough to touch the dagger, no more nor no less, when the latter is down to its lowest point. Thus when the feeler wires are held up by the filling and warp threads, the dagger will clear the No. 8 casting by an eighth of an inch or more. Next, push the lay away back and adjust the slide which raises the dagger and thereby, the feeler wires. Set this slide high enough to lift the wires three-eighths of an inch above the top of the shuttle, and far enough back to give a space of about half an inch between it and the most forward point of the finger No. 8.

Sometimes the connector is a little too short so that it is difficult to get the wires high enough; in this case it can be lengthened all that is necessary by hammering on it, without heating at all. When this is found to be advisable you will need to readjust the frame casting again as it would be too high for the dagger after the connecting rod had been lengthened out.

SETTING THE NO. 8 FINGER: On looms with the brake attachments, press the brake lever down with your foot. Adjust the finger which lifts the No. 8 so that it will hold the latter up to about one eighth of an inch short of the limited position or of its most forward possible point.

On looms without brake attachments, the best way is to disconnect the friction lever, or throw off the belt. Then pull the handle on and set the No. 8 finger the same as above. Once in a while a fixer runs up against a loom which breaks a good many of these No. 8 castings and it does seem as though there are yet a good many loomfixers who do not understand the cause of this. Many remedies have been tried for this ailment with varying success but the real cause in most every instance is, the plunger, which lays between the end of the protector trigger and the upright brake rod, is too short. Thus the No. 8 cannot be pushed back far

enough to release itself from the dagger without straining something. But if you put in a new plunger about one eighth of an inch longer or more if the space will allow, you will be able to get a greater motion on the No. 8 finger so that it will easily release itself from the dagger.

BROKEN PICKS: Sometimes a loom will quite frequently let broken picks go by, the cause of which is hard to locate; everything being apparently as it should be and always doing its work all right whenever it is tested. There is, however, a cause for such defects though often hard to locate. It may be that the filling has broken off, left a long trail from the shuttle and caught on again; the long trailer not having got past the wires before the dagger had gone over the knocking off point. If this is evidently the case I should set the knocking off finger back half an inch or more and shorten the wires.

In cases of this kind I should set the breast beam stand a little higher as close to the dagger as it will go without stopping the loom unnecessarily; also put a substantial pressure on the dagger from the steadying spring, and file or grind the dagger good and square so that it will not slip up and ride over the No. 8 finger.

Sometimes the upright brake rod is very hard to release; in which case the dagger may slip before it has done its work. In this case it may

be set to release itself easier by setting the "catch" a little shorter into the step in the upright brake rod. All these things may not be necessary but they all tend towards the same object.

STOPPING TOO OFTEN: Another kind of a stop motion trouble is stopping without any apparent reason. This, however is not always the fault of the stopmotion. It may be that there is not enough tension on the filling to hold it tight under the wires. Or it may be that it is catching on the picker etc. The most difficult case I ever had of this kind was caused in the latter mentioned way. It caught on some obscure little burr on the picker and held on to it just enough to throw the fiilling off the end of the wires and, letting go again left no trace that it had caught at all, only the fact that the loom had stopped. I finally located it but it was a slick one. The general remedies for the above trouble, in addition to those suggested by the causes just mentioned are as follows: Lengthen out the feeler wires as far as they will go without touching the end of the slot. Set the No. 8 well up to the limit and the frame casting which carries it a little lower than you would under ordinary circumstances. See that the brake rod does not release itself too easily; the same with the lock lever on the shipping motion. Get a clear open shed by

making it larger or by keeping the warp tighter etc., and see that the protector does not strike on the trigger at all.

FEELER WIRES TEARING THE CLOTH

I have seen several loomfixers stuck with this ailment. The wires would for some, to them, unaccountable reason, stick up through the cloth and tear a hole in it; and do this often before the fixer could by his various blind experiments effect a remedy for it.

The cause of the trouble is the fact that the dagger slipped over the top of the rear end of the guard thus causing the wires to jump up as the lay way receding. Then, if the ends of the wires are at all sharp or ragged they hook right onto the cloth and jab clear through it.

The remedy for this is to file a good square step on the rear end of the guard so that the dagger can push it away back without slipping over it. Then file the ends of the feeler wires, round and smooth so that even if there should happen to be a slip up on it, they will not pierce the cloth.

WEAVING SOFT BOBBINS— YARN SLIPPING OFF

Sometimes the filling bobbins are wound so soft that it is very difficult to weave them on a high speed loom; the fixer has therefore got to resort to extreme measure to make them weave at all. When this is the case he should first make a complaint to the overseer and then adopt the following remedies for the trouble. Reduce the picking power to its lowest possible limit to be practical.

Shape the shuttle binders to give the shuttle a long check on the side of the loom where the bobbins knock off at. Some of the old timers will tell you to put a short check on the opposite side. Study the subject of the Shuttle Binder in the earlier part of this book.

Put a soft wad of cloth back of the picker. Get a nice pick on the loom and make it throw a straight shuttle.

SETTING THE TEMPLE

There is no greater evidence of a careless, slovenly and incompetant loomfixer than a generally careless way of setting the temples. Even if the work does not make the careful and intelligent adjustment of the temples an absolute necessity it has a bad effect and looks bad to see them set otherwise. It annoys the overseer though he may not always call the fixers attention to it.

The temples should be set about as close to the cloth as you can get them without crowding the listing threads; as close to the reed as possible without touching it; and as low as possible without touching the shuttle race. I never yet found any advantage in having them point in any degree towards either the reed or the breast beam; but in a parallel line with them. Set them thus and they will work well and look well.

On light delicate work where there is any evidence of temple marking, all the rings may be taken out except the two larger ones. Set these to take hold of the selvedge only.

On heavy work where it is difficult to hold

the cloth out to its full width, you will need all the rings in, and the barrel set up as close to the cap as it will run. Be very particular to have everything just so.

On exceptionally tight weaves a poor temple will sometimes cut the threads in the cloth. If this trouble cannot be overcome by straightening out the spikes in the rings I should advocate changing them and putting in some good ones.

The bearings need a drop of oil once in a while. It is best to attend to this when the warp is out so that the cloth will not be oil stained. See that the rings work freely.

PUTTING IN A NEW WARP

In the first place, before the old warp comes out, take a look at the loom while it is running and see if there are any loose bearings, gears, picking cams, bolts, setscrews, keys or other fittings which can be better fixed while the loom is empty. If there are, have them fixed before putting in the warp. Oil up such places as are difficult to get at with the warp in the loom, also places which if neglected may cause a lot of trouble. Do not depend too much on the weaver. If the warp is on the floor waiting for the loom, get as much of the rigging for it ready as possible so that there will be no unnecessary delay in getting the loom going again. Keep the spare rigging which is kept on the loom, tied up orderly and in good shape. If you find a wire or harness strap too long, do not tie a knot on the latter; get a shorter one or cut a couple of inches off the wire, and point it before making another hook on it. Have the harnesses all nicely evened up at the top before going under the loom to hook up the lower straps. Be exact about having the lower straps about the same tension. If the

loom has a worm gear take up, put on the right gear before lifting in the warp, or at least before tying it up, as it is more convenient then and there is less risk of forgetting it.

After getting the warp tied in, everything hitched up, an inch or so woven and all the threads put in, see that the harness cylinders are set somewhere near right for the work if you know the kind of weave it is going to be. If it is work on which there is a strong tendency for the filling to kink, set the cylinders pretty well ahead. Have the shed to close when the reed is at least two inches from the fell of the cloth, a little more in extreme cases. But if the greatest trouble is poor yarn, do not have the cylinders set more than two or three teeth ahead of the boxmotion. Take a look at the shuttles and see that there is nothing radically wrong with them. Of course the weaver ought to do this but they do not always know enough. Some weavers need a good deal of looking after.

After a couple of yards or so have been woven just take another look at the loom and the work in it. See that the bottom shed is not bearing hard on the shuttle race nor too high. This is an important point, particularly on delicate work. See that the temples are set good and doing their work right. See that the heddles are divided right at the hooks so that there

will be no unnecessary wearing or chafing of the yarn. This, in a good many cases, and particularly on piece dyes causes the goods to look streaky or shady after they are finished. Carelessness in these things often lays heavily on the mind of a conscientious overseer; neatness is a pleasure to everyone.

Care should be taken in the first instance, when the reed is put into its place, to have it squarely in line with the warp. If the latter is beamed, even a little to one side, the reed should be set accordingly. Some weavers have very little conception of the amount on weight required on their warps. Often the warp is started with a great deal too much weight on it; far more than is needed after the thing gets straightened out. Thus if the weaver doesn't know enough to regulate it for himself it is to the loomfixers interest to draw his attention to it and at least get him right at the start. Both the loom and the work goes better with a reasonable tension than when the yarn is overstrained.

UNEVEN WEAVING

Uneven weaving may be the fault of the loom, of the yarn or of the weaver; but whatever may be the cause it is usually up to the loomfixer to either effect a remedy or give an account of it.

In order to locate the cause, one must very often study the case closely and sometimes for a long time. Like a good many other loom troubles the cause of this may be extremely unusual. As an instance of this I will mention a case which came to my knowledge some time ago where the immediate cause of the trouble lay in another loom; now laugh.

It seems that in this case the floor was not solid; that the heavy picking of the next loom to this one made the floor shake or spring a good deal. The work was a light delicate fabric which did not require much weight. Thus if the loom was stopped for any length of time the shaking of the floor danced the weight levers enough to materially slacken up the warp and cause a light place.

Of course it took some time for the loomfixer to discover all these things as the weaver did

not tell him that it was only after the loom had been stopped a few minutes that it started up with a light place. It will therefore readily be seen that the loomfixer could have stood by that loom for hours and it would never have made any light place while he was watching it. This goes to show what a problem a man will sometimes run up against.

The remedy in this case was to take the weight hanger off the shaky side of the loom and put on a light spring in its place and fastening it down to the floor.

The cause of uneven weaving, when it is the fault of the loom will, in nine cases out of ten be found to be in the letting off arrangement. It may be that the cloth around the beam heads needs renewing. Stove polish rubbed on to them is a good thing particularly on light work. It may be that the beam is crooked or the arbor bent sufficiently to cause the beam head to run untrue. In this case when it is empty it should be sent to the machine shop and trued up. Sometimes on very heavy work it will be found that owing to the ratchet head on the beam having been put on in a rough state, the teeth not having been filed clean, the catches have jumped a tooth or snipped one or two of them off. This results in a light place.

The remedy in this case is, if the teeth are not too far gone, to file them down good and

clear also the points of the catches. You will have to take the shell off the beam head to do this. If the ratchet gear is damaged beyond redemption it should be taken off and a new one put on in its place. See that the teeth are all clear before putting it on.

If the cloth is woven uneven, showing light and heavy places at regular intervals, at what may be considered once every round of the warp beam; the chances are that the beam is binding at some point. This is evidence that it is not running true. Relieve it the best way you can until the warp comes out and then have it trued up. If it is weaving uneven at irregular intervals and nothing about the warp beam can be found to account for it, turn your attention to the take-up motion. If the sand roller is all run down it is liable to slip on very heavy work, thus making heavy places.

On the worm take-up, the gears at some point or another get disconnected, worn down or forced out of gear enough to jump a tooth once in a while in which case they need fixing.

When the ratchet take-up arrangement is used there is more or less uneven work made by the weaver "pumping," particularly if the work is going bad. Then again, if the filling is poor and breaks often some weavers show poor judgment in letting back on the take-up after finding the loose pick. This defect occurring several

times in succession will show up uneven where there is much contrast in the warp and filling colors; particularly so if the warp is woven very tight. Everything that has a tendency to cause uneven weaving will do so to a greater extent when the warp is kept much tighter than is necessary. It should be the beating up of the filling which causes the warp to let off, and not the pulling of the take-up. Excessive weight on the warp produces the latter effect.

In weaving extremely light work, and particularly samples, I have always found it a good thing to use only one friction band as there is less liability and cause for it sticking and letting off in jumps where one band is used than with two bands. It is the sticking and not the slipping of the bands which causes it to let off uneven. The better it slips the more evenly it will let off.

A soft twisted bobbin, particularly where a light warp is woven with dark filling, will make the cloth shady. As many shuttles as is practicable should be used in all such cases. On very light work where the cloth roll is actuated by a ratchet gear care should be taken not to have the cloth tighter below the sand roller than it is above it.

The weight levers should be set to swing freely. That is to say, not to be set up too high

nor down low enough to rest on the beam head. About half an inch above the beam head is what I should judge to be about right.

HOW TO HANDLE BAD WARPS

When a warp is found to be weaving badly, every effort should be made to humor it by relieving the strain on the yarn at every point; that is to say, make a special effort in this line, even though the fault may be entirely in the yarn. The first thing to do is to study the nature and location of the breaks, and proceed to use all the intelligence at your command to overcome the defects or minimize the results as much as possible. If the threads are broken mostly in front of the harnesses and have the appearance of being cut, look to the springs underneath the shuttles and see that no part of them can possibly touch the shuttle race, and that there is nothing rough or ragged on the shuttle race. If the broken threads are not a clean cut but have the appearance of having been torn down and carried across the warp, there is undoubtedly some splinter or rough place on the shuttle or a bad shuttle tip. This can best be discovered by pushing the shuttles one by one through the mass of warp threads. You will thus soon find out which one is catching on the threads and where the defect is. But do not stop when you have found one defective

shuttle, try them all. If the threads break in the harnesses look out for defective or broken heddles near where the broken thread is. If the threads break or come apart back of the harnesses the chances are that the yarn is too poor to do its work. It may be that it has been spoiled in the carding or spinning and thus is uneven and twitty. But even in this case a little coaxing will often help it to go better. At the same time, the overseer should endeavor to determine the nature of the defect and report the matter so that it may be speedily remedied at the fountain head. It is better to remedy the cause even in this intance, than the effect. Too much coaxing has a bad effect. However, the cause being there, we will see what can be done to the loom to humor it as much as possible. In the first place, if the yarn is soft and short of twist it will be better to set the harness cylinder back pretty late; say about one tooth ahead of the box motion. Do not weave it any tighter than is absolutely necessary. Caution the weaver about leaning on the warp when putting in a thread and about handling it roughly when he is looking for the heddle. By vicious handling, he can easily undermine the strength of a good many threads so that they will come down before they are woven in. A good deal depends on how the weaver handles his work. As an instance of this I will mention a case I had

in the Weybosset Mills with an Armenian weaver who had a poor way of handling his work. The yarn was certainly defective but with the best adjustments I could give the loom, and by careful handling, it would go fairly well. This I demonstrated to him several times after he had come to me so completely stuck that he didn't seem to be able to get a bit farther with it. After weaving enough to get his knots through the reed and the places he had spoiled in tieing them, it would go fairly well just so long as I ran the loom, put in the threads etc., myself but after leaving him, in two or three hours he would be stuck again. Thus it was purely a case of poor handling.

I always found it good policy in cases of this kind to set the harness cylinder in such a position that, with the lay at its most forward point the shed will be about half an inch from being wide open. Thus it will be just opening to its full extent as the reed recedes from the fell of the cloth.

Some special weaves need special remedies. For instance, if the threads on one harness stick to the threads on another harness and do not separate well, it is a good thing to put a lease rod between them. When running on a plain or cotton weave, there is a great tendency for the threads on the alternate harnesses to twist and stick together and break the thread

that goes between them. The best remedy I have so far found for this is to have a much deeper step on the back or rear harnesses than on the front. More so than is usual for ordinary work.

For instance if eight harnesses are used I should start with the first harness on the first notch on the jack and go one higher for every harness. Thus the eighth harness stepping so much more than the sixth and the sixth so much more than the fourth, etc., etc., keeps the threads apart, thus preventing them from breaking those which go between. In all cases see that the shed does not bear down on the shuttle race.

In the case of mercerized yarn and other fancy threads which either have more work to do than the rest of the warp, or are not strong enough to do their work, if they are drawn in on one or two separate harnesses, these harnesses should be made to take a much shorter step than the rest of the harnesses. This relieves the strain somewhat and it causes the threads on the other harnesses to be a protection for them on the shuttle race. Have the mercerized threads raised high enough for this purpose.

BUILDING UP A SECTION

Theoretically, and in a few words, this means whatsoever thy hands finds to do, do it well.

But what a sermon on loomfixing could be preached from this text. In practical work it means, doing a good job and doing it to last. It often means the doing of a good many things that you were not called on to do.

The first question which presents itself is, what constitutes a good condition? A lot of looms which are practically new? Not by any means. These with a few months of poor fixing may be in worse running condition than a loom ten or twelve years old. It is the intelligent shaping and adjustment of things and the care they receive which gets them and keeps them in good condition; it is the lack of these that puts a loom in such condition that it is always needing a fixer.

Before proceeding with suggestions as to the line of action best adapted to produce good results, let us for a few moments take a casual glance at a section of looms which are in poor condition.

Half of the adjustments are at the limit of

the leeway allowed them. The lifter chains are botched up with wire in order to get the shuttle boxes even with the race. A number of the harness wires are badly pointed; a condition intolerable to most good loomfixers. Harness straps or wires are too long; a knot is tied on the strap to shorten it; slovenly work. On some of the looms the harness strap pulleys are wobbly, the arbor and pulleys being worn particularly at the front end. Their position should have been reversed months before. That is to say, the rear end of the arbor and pulleys put to the front, and kept oiled. The vibrator levers are irregular, there is a tendency for harness skips when the chain is not just so. Some of the looms have a great tendency to bang off, even with an abundance of power. It is plain to be seen that something is dragging and is therefore laboring hard throughout the whole picking motion. Neglect to keep the picker properly oiled is probably the most fruitful source of this. The brake on a good many of the looms are greasy or otherwise in such poor condition that they do not act quick enough to stop the loom right on the pick.

The friction pulleys are as bad as the brakes. This, and the picking motion are of the utmost importance to the running of a loom. The shuttle binders are so unskillfully shaped that a slight change in the atmosphere or speed will

either cause the loom to bang off or the shuttles to stick in the picker. The headmotion gears and other things are in a much worn down con dition, so much so that it would be difficult to decide where to begin to improve matters without going through the whole business. Picking arms and other things running loose, things which should be fixed as soon as discovered. These are things typical of a section in poor condition.

HOW TO IMPROVE LOOMS IN POOR CONDITION

In the first place, you will not need to go hunting for trouble, just keep your eyes open and it will come to you. But when it does come, go for it for all you are worth and do not let up until it entirely disappears.

A weaver comes after you to put on a new picker for him. While you are putting that picker on you will probably see a few other things which need your attention. Attend to them while you are at it. Fix them up good, all you see needs it. Put a good wad back of the picker, good leather bumpers on the picker rod. Do not start the new picker with a badly worn picker strap. If the pickers-tick is badly worn, either fix it up or put on a new one; give it a good bumper to strike against. If you see any place which needs oiling have it oiled.

Thus when you leave that loom you will have the satisfaction of knowing you have done a good job; the weaver will take notice thereof and, to a certain extent govern himself accordingly. You take an interest in his loom and he

will do likewise; if he does not, make him do so. Follow this line of action in everything you do. This, of course will require a great amount of perseverance, and will, if the section is badly run down to start in with, be uphill work for a long time.

Look out and have some good leather on hand for the heel straps on the pickersticks. Always use the best you can get for this purpose; not only because it will last longer but because it is liable to make a smash when one breaks. The two most essential points to the good running of a loom are the driving and the picking motion. If either of these are in poor condition you may expect the loom to run unsatisfactorily. Whenever you experience any difficulty in this line a continued study of the case should be made until the problem is thoroughly solved.

ODDS AND ENDS

A picker in a certain condition may cause the shuttle to turn over, fly out or split the bobbins. This is when the hole is too low down. Adjust the box support so that the shuttles will not strike the picker too low.

When you put in a set of new shuttles always oil the spindle fittings up good; it is probably the only time they will ever get oiled.

Light pickerstraps should be put on double; heavy ones single.

Put the leather bumpers on the picker-rod in such a way that they will neatly fill up the space between the rod and the raceway. They will last longer, and the picker will last longer and be more satisfactory while it lasts.

Do not be fixing one loom and thinking about another one at the same time. Let the loom you are working on be the only loom in existence for the time being.

There are times when a loom belt needs some good belt dressing; its surface is often spoiled for the want of it.

It is sometimes hard to get the shuttle binders just right for a heavy rigid shuttle, particularly on high speeded looms. A light pliable shuttle will adapt itself to almost any shape of a binder.

Get good tools, keep them in good condition and it will be a pleasure to work with them.

Do not put on a hole of power because the loom bangs off; do this only as a last resort, when it needs it. Too much picking power and a weak drive soon makes an old jigger out of a loom.

It is the sticking of a friction band that causes a warp to let off unevenly. One band is better than two on light work and particularly so on samples. This I know from twenty years experience.

Do not ease up on a shuttle binder with the shuttle clear in the box; draw it out about half way so that the solid part will receive the pressure of the binder while you are hammering on it.

Bending a shuttle binder too near the heel causes the shuttle to stick in the picker.

Learn all you can about your business, cultivate a strong mind, keep a level head and if you have more than an average amount of intelligence you will succeed as a loomfixer. Add to these, a good mind and a cheerful disposition and you will be a JEWEL.

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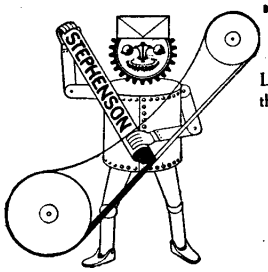

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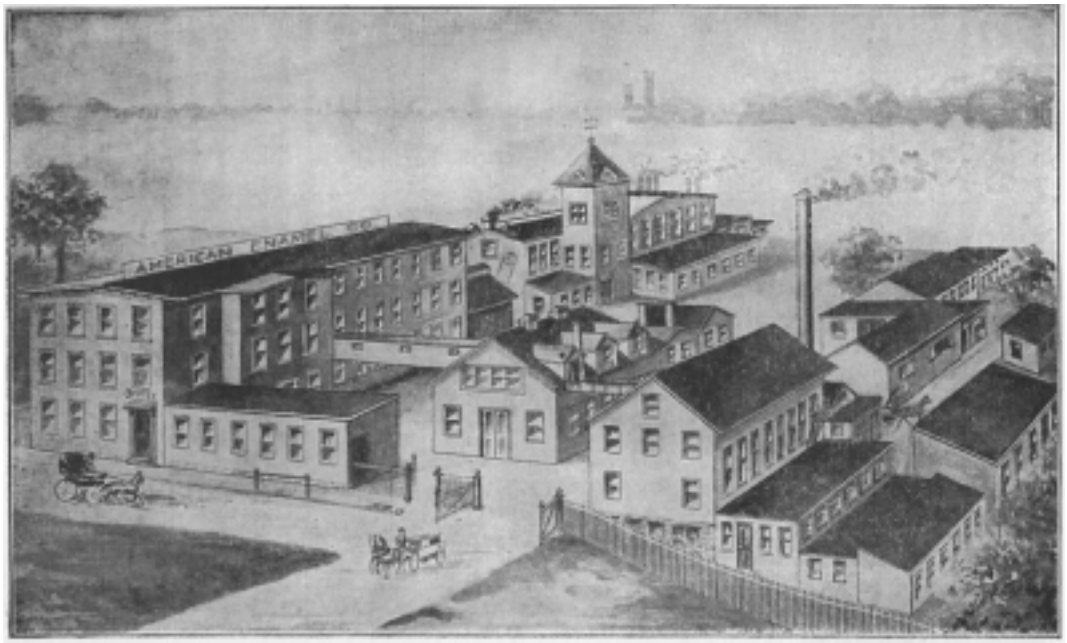
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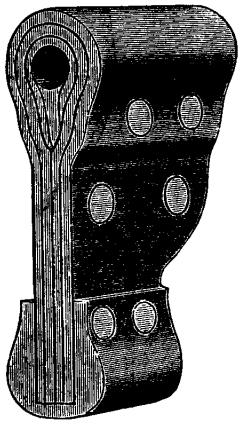

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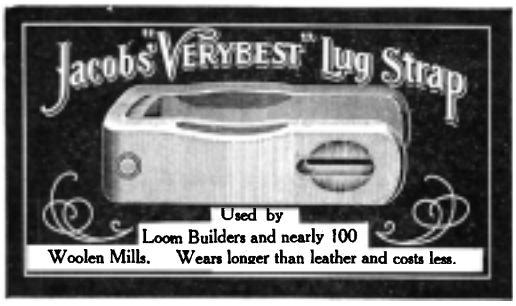

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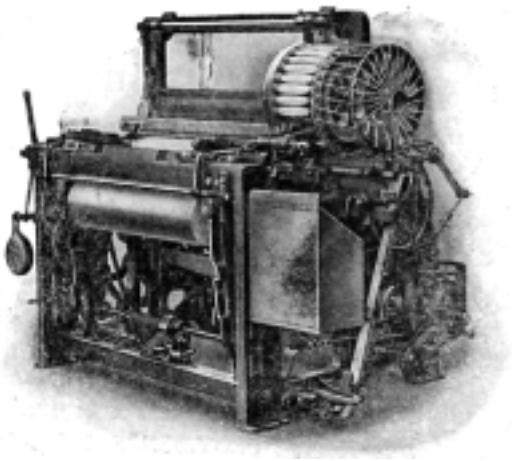

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