

Determining Proper Picker and Best Loom Adjustment
for
Maximum Results With Off-Set Type Pickers

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Introduction

This report is based upon field studies made at Crompton and Knowles of Worcester, Massachusetts, who manufacture looms using the off-set type of picker and in many mills where looms of this type are being operated. The conclusions reached are drawn from all of the evidence gathered and the experiences encountered. They reflect a broad cross section of the experiences of many different people operating looms under widely varying conditions. The reader should not, therefore, look upon the conclusions reached and the recommendations made as necessarily reflecting the views held by any one of those who contributed to the study.

Without the wholehearted cooperation of the Crompton and Knowles engineers and of the Mill Superintendents, Overseers of Weaving, and Loom Fixers contacted, a study of this kind would not have been possible. The author wishes to express his gratitude to those who helped and to thank them for the time and effort that they so unselfishly gave.

The interest shown, both at Crompton and Knowles and in the mills, in obtaining the maximum in loom operation, and the honest attempt on the part of all people contacted to be guided by facts rather than opinions speaks well for the future of our Textile Industry.

Purpose of This Report

The studies on which this report is based were undertaken to determine if possible the answers to the following questions:

1. Is there any best type of picker? If so, is that determination based upon the type of loom, the material being woven, or other conditions of operation?
2. What part does loom adjustment -- and particularly adjustments relating to the picking motion -- play in attaining maximum loom performance? And how can the adjustments required for such maximum performance be attained?

Basic Considerations

To answer the questions above, we first had to arrive at a clear understanding of what mills are seeking in the way of loom performance. We found that to

Mill Operators maximum loom performance is made up of four basic elements:

1. The finest quality of cloth obtainable from the materials being woven at the operating speeds required.
2. The maximum output from each loom compatible with the quality defined above.
3. The minimum of maintenance on the loom to achieve 1 and 2 above.
4. As a result of achieving 1, 2, and 3 above, the maximum service life from the loom itself.

Before proceeding to a discussion of types of pickers or loom adjustment, I might point out one thing that is a vital factor in the attainment of maximum loom production as defined above which stood out above all other factors in the studies made. I refer to the amount of power applied to the picking motion.

Clearly, sufficient power must be applied to throw the shuttle across the loom before the shed has started to close -- and to lodge it properly in the shuttle box. But any power applied in excess of this amount works to the detriment of all of the elements of maximum loom performance as defined above:

1. Since all of the materials from which a loom is made yield under pressure, the application of excess power to the picking motion means excess distortion of loom parts which makes impossible the uniformity of weave required for highest quality fabric.
2. The application of excess power means unnecessary strain on all the parts of the loom -- and particularly on the parts of the picking motion -- which shortens the life of these parts, increases the frequency of shutdowns for replacement and, therefore, decreases loom production.
3. The effect of Number 2 above is, of course, to increase loom maintenance.
4. Since all of the power put into the shuttle over and above the minimum required must be absorbed and dissipated by the loom parts, avoiding excess power means maximum loom life.

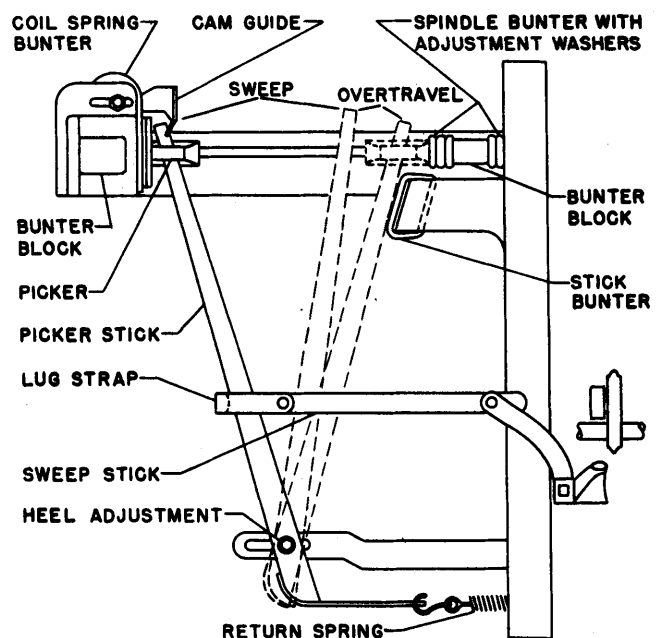


Figure 1

In addition to the above, there is, of course, the waste of power that results from over-powering the picking motion.

The desirability of operating looms on a minimum power basis may seem elementary.

Yet there was no point encountered in the studies made at which there was more variation than in this matter of the amount of power being applied to the picking motion. And there is probably no better over-all explanation for the wide disparity in the results being achieved on identical looms handling similar materials than can be found in the wide difference in the amount of power applied to the shuttle -- and the far-reaching effects that this has in loom adjustment and operation.

It is the author's firm conviction from the work he has done that great gains will accrue to the Textile Industry if the advantages of a softer picking action are clearly recognized and the principle of using minimum power on the picking motion is applied.

Factors Found to Affect Loom Operation and Picker Life

Before getting into the selection of the best picker to use and its proper application to the loom, there are some general factors that were found to have a vital bearing on loom operation and picker life that should be discussed.

1. Speed of Looms

From our studies, it is clear that the life that can be expected from the picker and the other working parts of the picking motion varies widely with the number of picks per minute at which the loom is operated. The higher the number of picks, the lower the life that can be expected from these working parts.

However, our studies also brought out the fact that as the speed of the loom increases, the attainment of maximum performance becomes more and more dependent upon a correct choice of picker, proper application of that picker, and the proper adjustment and operation of the loom. These are the three ends that this report is written to help you attain.

2. Use of Bunters

Because of the important part that bunters were found to play in loom adjustment and operation, a special study of them was made. The types studied were:

- A. Spindle (picker) bunters -- rolled fabric, looped leather, rubber blocks, leather washers and rubber washers. The rolled fabric, looped leather or rubber block is the principal cushion. The rubber or leather washers are added or removed to make an adjustment.
- B. Coil spring and leather strap check bunter with rubber or leather block. This is the outer bunter on the box end of the loom. The adjustment of this bunter is described in a later section of this report.
- C. Waste packing. Waste material is used by some loom fixers by stuffing it in back of the coil spring leather strap. It is an easy adjustment to keep the head of the picker in alignment with the cam guide. Also easier to use waste instead of installing a new rubber block.

Note: Crompton and Knowles recommend adjustment of the coil spring and strap for this alignment and cushion.

- D. Stick bunters. Rubber block, leather covered rubber block, leather

covered rolled cloth or looped leather bunters are generally used for stick bunters. Mills using rubber stick bunters show increased wear at the front and rear of the picker stick and stick hole. Mills using leather covered rolled cloth bunters show less wear and longer life to the stick and picker.

Because the narrower cotton and silk looms use a lighter weight shuttle, less power is required to throw the shuttle across the loom. Leather or rubber type spindle bunters, when properly adjusted, have ample cushioning capacity to absorb the shock impact of the picker and stick. Hence our studies showed that a picker stick bunter is not necessary on such looms -- particularly where a reversible type picker is used.

Our studies also indicated that a picker stick bunter is not necessary on W type looms. The only requirement is a rubber or leather spindle bunter with sufficient cushion capacity to absorb the impact of picker and stick.

Records of mills using the reversible type picker without picker stick bunters show:

- A. The elimination of a critical bunter adjustment at spindle and picker stick. (Does not require repeated adjustment of spindle bunter.)
- B. The wear on stick and picker stick hole is concentrated on front section of web and stick. This leaves the rear of the web intact and the picker can be reversed for double service life.
- C. Less total wear on picker and stick.
- D. Decreased maintenance cost in time, labor and materials.
- E. Less work for Loom Fixer.
- F. Increased production for Weaver and mill.
- G. Eliminates chattering of picker on stick, one of the principal causes of rapid wear on the front and rear of the stick and stick hole.

If the picker stick bunter is eliminated, the spindle inner bunter must be properly adjusted. If too many washers wear and drop off the spindle, it may cause the picker stick to bind in the stick hole -- and may break the stick.

3. Camming of Shuttle

The shuttle must cam out of the shuttle hole in the picker head easily and positively. If the shuttle hole is worn too deep, it may cause the shuttle to bind in the box and cause the box to hang up. Binders which are adjusted too tightly do not let the shuttles cam easily. The head of the picker has to do the job -- with a result of increased wear on the picker. To avoid this, the shuttle adjustment should be checked and the picker reversed or replaced if it is worn too deep.

Note: Some Loom Fixers grind the shuttle point round to insure camming action.

4. Shuttle Breakage

In some cases, shuttle failures were preventing the attainment of maximum loom performance. In general, these failures were of two types:

- A. Loosening of shuttle point. This may be caused by improper alignment of the shuttle point and shuttle hole. Some Loom Fixers drill a starting hole in the picker head off center. This was found to stress the shuttle point and frequently to cause breakage at the shank or loosening of the point itself.
- B. Cracking of Shuttle in wood section. This failure resulted from stressed shuttle points cracking the thin wood section along the filling thread groove.

The use of a starting hole -- placed and shaped in accordance with the instructions given later in this report -- was found to result in a more even distribution of the stresses over the shuttle point and in some cases eliminated this problem.

Another factor that was found to be vital in this matter of shuttle point loosening and shuttle breakage was the strength and construction of the shuttle used -- and particularly how tightly the point was fastened into the shuttle. The wide variation found in strength at this point is indicated by the results of tests made to determine the pounds of pull required to pull the shuttle point out of the shuttle. These test results were as follows:

Shuttles from Manufacturer No. 1 -- 250 to 300 pounds
 Shuttles from Manufacturer No. 2 -- 850 to 900 pounds
 Shuttles from Manufacturer No. 3 -- Over 1000 pounds

5. Binder Adjustment

In adjusting shuttle binders, we should bear in mind that a tight box requires a strong pick. A strong pick requires a tighter box on the other end of the loom to stop or box the shuttle. All of this means more power on the stick -- and increases the wear on the picker stick, the stick hole, the bearing in the barrel, and the shuttle hole in the head of the picker. The spring on the binder should, therefore, be adjusted to a tension just sufficient to box the shuttle without bouncing.

The floating type binder, used on current production model looms, has a coil spring adjustment. Pivot binders have a leaf spring adjustment. It is important to remember that all binders on the box end should be adjusted to the same pressure to produce the same even pick on the loom.

6. Power Adjustment

The life service and operation of the picker, picker stick, bunters, shuttle, etc., are dependent in a large measure on the power required by the picking motion of a loom. For smooth loom operation and maximum service, the power required should be adjusted to a minimum.

The following steps in adjustment are recommended:

- A. Loosen the binders on both ends of the loom.

- B. Operate the loom without a warp or filling.
- C. Adjust the power by raising or lowering the lug strap sufficiently to send the shuttle across the loom. This adjustment should provide a minimum amount of power to get the shuttle across just before the warp shed begins to close.
- D. Adjust the binders with a minimum tension sufficient to box the shuttle without bouncing.
- E. Check the sweep of the picker stick. There should be a minimum of 2" overtravel.

7. Worn Picker Sticks

We found that a change in shoe or heel adjustment of the picker stick could have an important effect on the picker in those cases where a hickory picker stick was being used into which a notch had been worn by the picker. When such an adjustment was made, the worn notch in the picker stick would sometimes raise the picker and cause it to bind in the shuttle guide on the forward stroke of the picker stick.

To avoid this difficulty, it is suggested that, after an adjustment, the picker be moved by hand through the full length of the sweep to check for clearance of the picker web in the guide slot. It may be necessary to trim the notch in the stick slightly to insure free movement of the picker.

Sticks of plied up construction usually wear a smooth notch on the picker stick and do not cause this difficulty.

Choosing the Best Type of Picker for a Given Loom Operation

In the work that was done, pickers of the reversible and the non-reversible type were both widely studied. These studies revealed certain inherent weaknesses of the non-reversible type -- particularly for operation on the drop box end of high speed looms:

1. The picker strap grows from repeated tension and does not return the picker completely. The stretched strap may allow the web of the picker to extend partly into the shuttle box and cause a box hang-up when the boxes change.
2. The picker may run across a dry spot on the spindle and not return completely. This may stop the shuttle too soon and cause a box hang-up.
3. The stretched strap causes a varying check on the shuttle and results in an uneven sweep and pick.
4. When the picker is not returned completely, the shuttle bangs into it without the support of the bunter in back of the picker to absorb the shock. This shortens the service life of the picker.

On the other hand, our studies revealed basic advantages which have led both the loom manufacturer and many of the manufacturers who are working to develop

superior loom accessories to concentrate their energies largely behind the reversible type of picker. These advantages appear not to be widely understood or appreciated. All too frequently, the user has viewed this picker as a design worked out to give greater picker life because of the reversibility. Actually, the preference for this type comes from an appreciation of three basic advantages:

1. The greater control of picker position on the return stroke makes possible a more uniform pick -- hence more uniform cloth.
2. The longer bearing on the spindle (and the correspondingly small amount of wear there) insures not only greater picker life but a more uniform picking action as well.
3. The greater cross section of the picker makes it possible to build into it even more of the quality of resilience which is so essential in smoothing out the picking action and obtaining the objectives listed under maximum loom performance above.

The points listed above were found to apply not only on looms of current production but on the older models as well. Such unfavorable experiences as were encountered where changeovers had been made from non-reversible to Reversible Pickers on these older looms were found upon analysis to be the result not of the change in design of picker but of misapplication of the picker or improper loom adjustment and operation after the change was made. The data gathered confirmed the judgment of those who have cast their lot with the Reversible Type Picker. ~~In the studies made, it demonstrated itself as the undoubted~~ superior of the two designs for all applications where an off-set type of picker is required.

Almost the same language could be used to describe our findings with respect to rawhide and synthetic pickers. Again, the great bulk of the work being done in the development of pickers for the future was found to be in the field of the synthetic picker. This was found to reflect not only the qualities available in such pickers today, but the promise that the developmental work being done holds for providing us with even better pickers in the near future. The basic advantages found to be inherent in these pickers were three:

1. Far greater picker life -- with a corresponding gain in the advantages listed under maximum loom performance above.
2. A uniformity in quality not possible through the use of natural materials.
3. An equivalent or superior life for the loom and its working parts when such pickers were properly applied and operated.

Again, the unfavorable experiences that were encountered in the use of synthetic pickers when resolved down to their elements were found to reflect not an inherent weakness in this type of construction, but a lack of basic knowledge and fundamental understanding of the proper application, loom adjustment and operation for such pickers.

It is hoped that this report will provide this basic knowledge and fundamental understanding.

Because of the above considerations, the sections of the report which follow have been prepared with the reversible type of picker in mind -- usually of synthetic construction. This has been done not only because our studies show the superiority of this type of picker today, but because of the promise held out by the developmental work being done for a constant and continuing improvement in pickers of this type.

How to Install a Reversible Picker on Crompton and Knowles Looms

1. Measure the center distance from the spindle to the shuttle point in the shuttle box (distance CC in Figure 2).

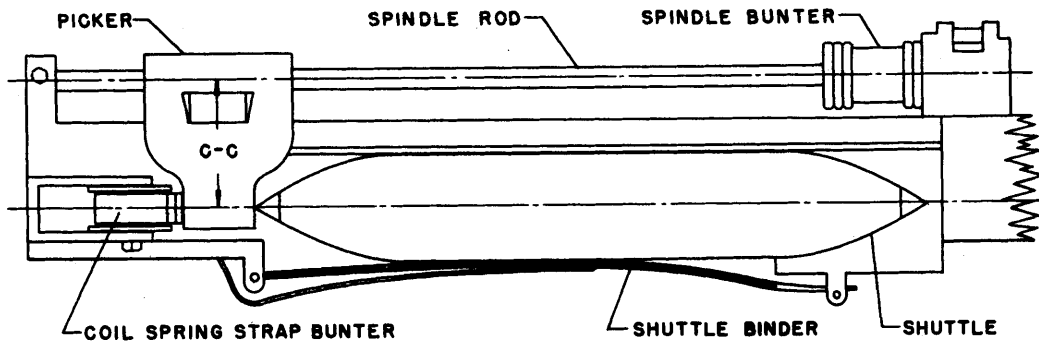
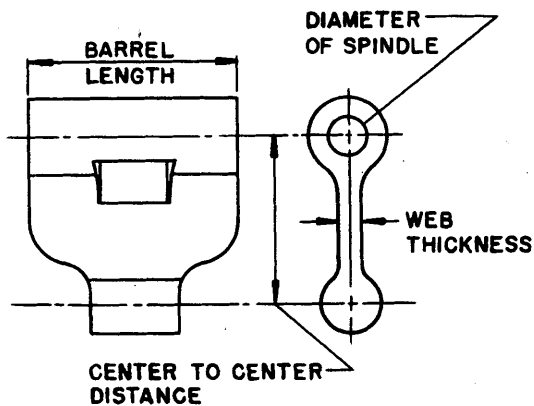


Figure 2

2. Measure the diameter of the spindle rod.
3. Select a picker with the correct size spindle rod bearing and center distance and fit it to the picker stick. Use the longest length barrel which will fit on the guide rod and against the outer bunter to give the adjustment described under Steps 9 to 11. (See Figure 3.)

Note: It may be necessary to trim the front and back of the stick to fit the stick hole in the picker.



Reversible Picker
Figure 3

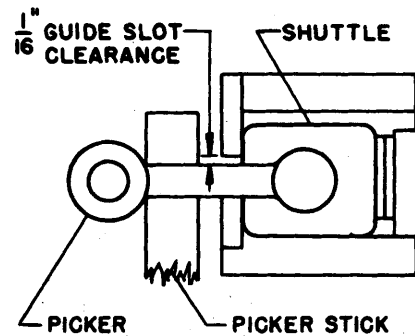


Figure 4

4. Slide the barrel of the picker on the spindle rod and, with the stick in the stick hole, slide the picker head through the slotted opening in the lay end at the rear of the shuttle box.

5. Move the stick forward and check the web clearance in the guide slot in the picker race of the shuttle box. There should be $1/16$ " top clearance above the web in the slot. (See Figure 4.)
6. With the stick at its backward throw, and the web of the picker flat on the lower edge of the guide slot, bring the shuttle back hard against the picker to mark it. The mark should be in the exact center of the picker head. If the mark is too high or too low, the spindle rod should be adjusted vertically until the shuttle point is in the center of the picker head.

Note: Spindle rods on current production C and K looms are $1/16$ " closer in to the centerline of the lay at the front than at the back. The purpose of this angle is to move the rear of the shuttle out and direct the front of the shuttle in toward the reed as it travels across the loom.

A vertical adjustment on the outer end of the rod is used to center the picker head with the shuttle point in the box.

The S6 loom has a vertical adjustment on the inner and outer end and also a lateral adjustment.

7. Remove the picker and drill a $1/8$ " hole approximately $1/4$ " deep. Countersink this hole to a diameter of approximately $1/4$ ". This is the starting point hole for the shuttle point. (See Figure 5.)

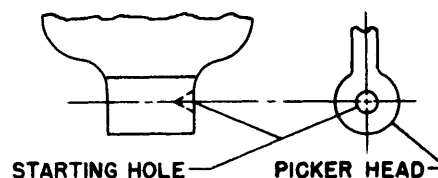


Figure 5

8. Reinstall the picker on the spindle, and on the stick and in the guide slot.

Note: A starting hole is not necessary on looms which are properly adjusted and are not having difficulty with shuttle point loosening or shuttle breakage. Steps 7 and 8 may be omitted when a Reversible picker is installed on these looms.

9. Bunder adjustment on drop box end.
 - A. Adjust the coil spring housing by means of the capscrew through the slot so that the picker is flush or projects not more than $1/4$ " beyond the face of the shuttle box cam guide. (See Figure 6.)

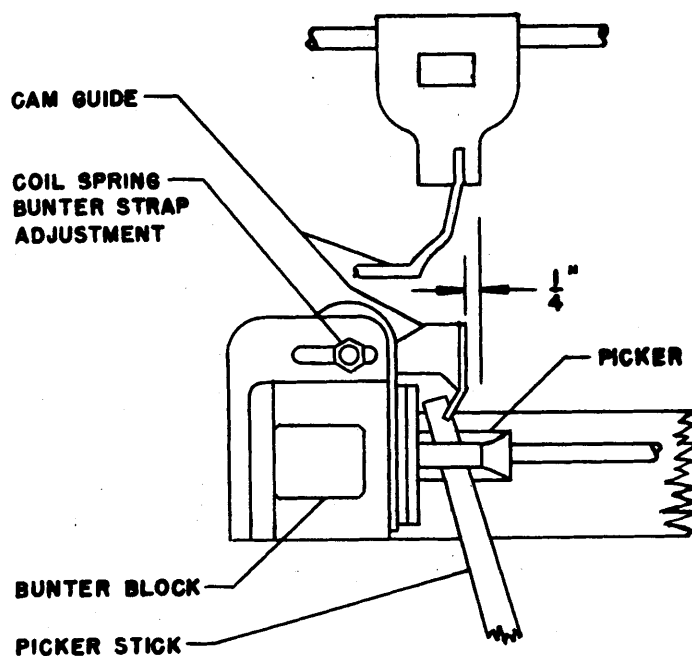


Figure 6

- B. W type looms have only a tension adjustment. Leather packing must be riveted to the

front side of the strap to adjust the picker head flush with the cam guide.

- C. Loosen the capscrew slightly and turn the lug on the back of the housing until there is enough spring tension to hold the strap taut.

- D. Move the picker and stick forward by hand to the extreme limit of its forward throw until the picker stick is up against the stick bunter. Add sufficient leather or rubber washers to the spindle to solidly stop the picker at this position. (See Fig. 7)

- 10. Turn the loom over by hand and check the length of the sweep. There should be a minimum of 2" of overtravel when compressing the picker bunter completely (see Figure 1).

- 11. Bunter adjustment on the end.

- A. With stick at its backward throw, add sufficient leather or rubber washers to the spindle and behind the picker block to cushion it properly.
- B. Adjust the forward throw the same as adjustment "D" under drop box end.

- 12. Turn the loom over by hand and check the length of the sweep. There should be a minimum of 2" of overtravel.

The sweep of the stick must be smooth and accelerated to provide sufficient power to speed the shuttle across the loom. There must also be sufficient overtravel to insure completion of the power stroke without a bind of the picker stick in the stick hole. Overtravel should not be less than 2" on any model loom.

Replacing Non-Reversible Pickers With the Reversible Type

All looms not current production, but using an off-set non-reversible picker, can be converted to use the Reversible Picker. On these looms, it will be necessary to establish the center distance and bearing diameter to select the proper size Reversible Picker. Picker sticks and bunter adjustments will need to be modified as explained previously.

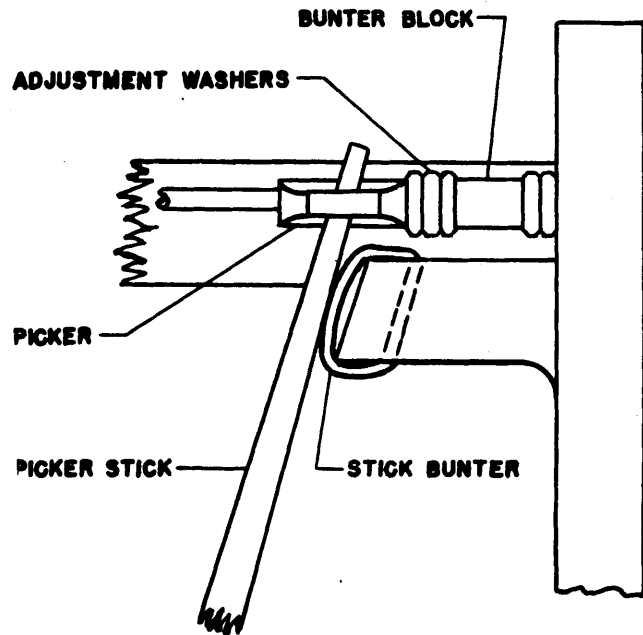


Figure 7

When to Reverse a Reversible Picker

Normal wear in the picker bearing does not affect shuttle control. As the bearing wears and changes its alignment with the shuttle, the shuttle point hole in the picker head wears a corresponding amount and compensates for this change in alignment of picker to shuttle. The bearing in the picker may have worn to where it has a wobbly feel on the spindle. This is not objectionable as the picker will always be in alignment with the shuttle on the power stroke of the picker stick.

A Reversible Picker should be reversed when:

- A. Picker head. When the power, binders and sweep are adjusted correctly, the greatest point of normal wear will occur in the head of the picker. The shuttle point will wear a smooth hole in the center of the head. Loom Fixers can tell by inspection when this hole is worn to a depth slightly less than the point of the shuttle. The picker should then be reversed to use the other side of the picker head. In this way, the life of the picker is actually doubled.
- B. Web section. Looms operating with a heavy power load or with the picker stick and spindle bunters unevenly adjusted, will show the greatest point of wear in web section in the front and back of the picker stick hole. The picker should be reversed when the web section is worn $1/2$ the width of the web.
- C. Barrel. Looms operating with a heavy power load may show the greatest wear in the bearing of the barrel. The picker should be reversed when the ends of the barrel show the spindle rod has increased its clearance in the barrel to approximately $1/8$ ".

Conclusions

In preparing this report, it has been my aim to courageously and honestly summarize into usable conclusions the great mass of facts gathered. If in doing this, I have done an injustice to any manufacturer's product or to any mill's practices, then I hope that those done the injustice will realize that it resulted from the difficulties of making such a summary in a report brief enough to be usable.

I wish that all who will read this report could have experienced with me the rapid advances that are being made in loom operation through application of the new techniques and products that are being developed. It was a heartening experience indeed.

As I have analyzed those advances, I have found them to be due largely to the application of the fundamental principles I have tried to bring out in this report. I hope you can put some of them to use to more closely approach Maximum Performance on your looms.

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