March 21, 1950 A. H. LA FRENIERE 2,501,394

SHUTTLE BOX FOR LOOMS

Filed July 7, 1948 4 Sheets-Sheet 1

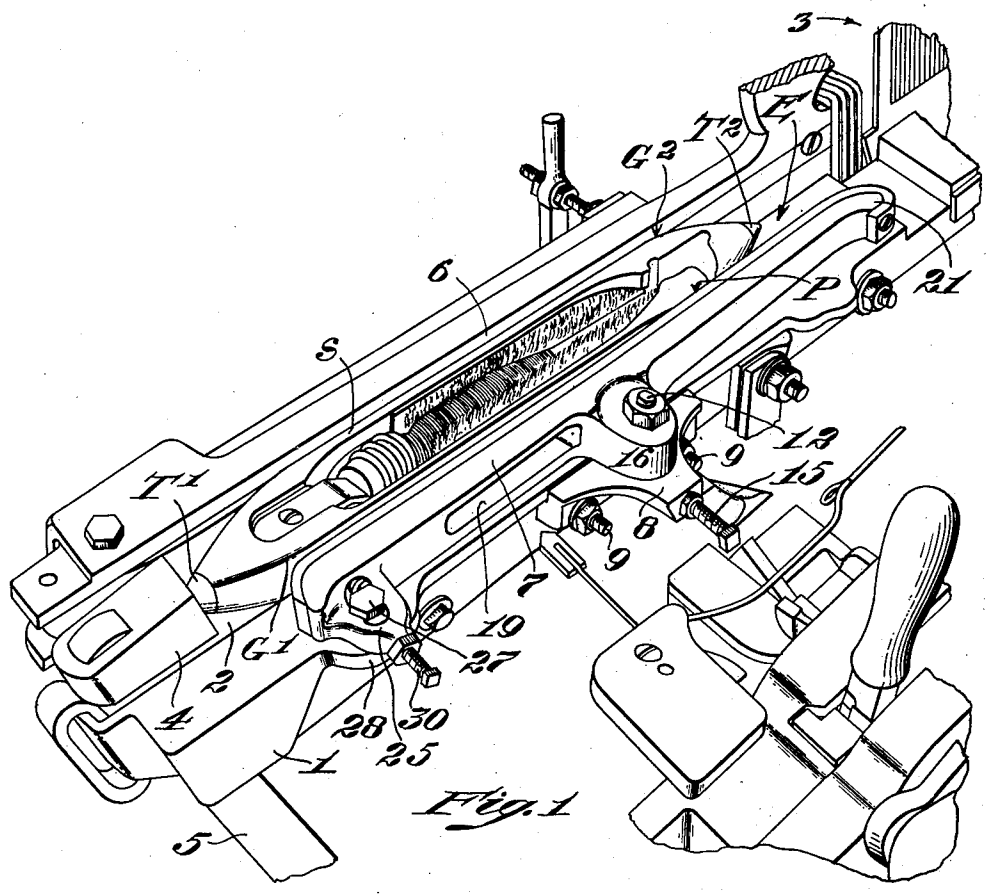


Fig. 1

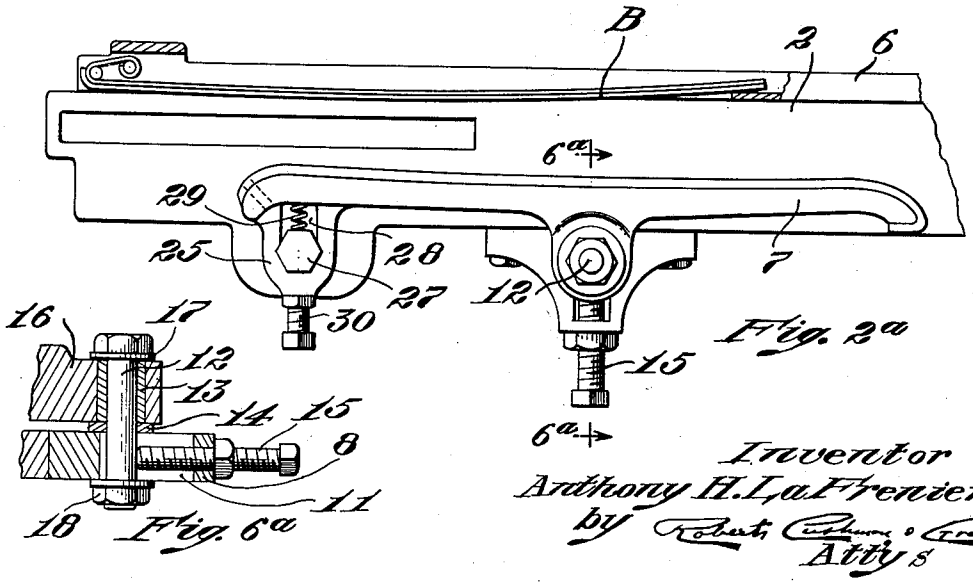


Fig. 6a

Fig. 2a

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March 21, 1950 A. H. LA FRENIERE 2,501,394

SHUTTLE BOX FOR LOOMS

Filed July 7, 1948 4 Sheets-Sheet 2

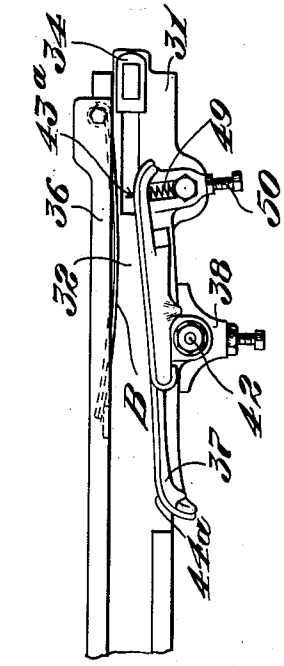


Fig. 2

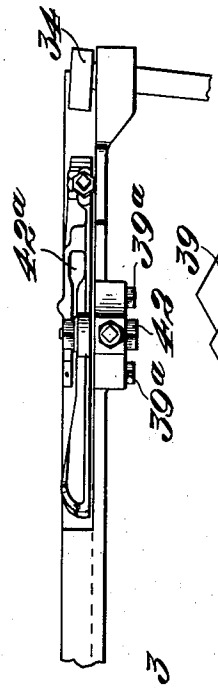


Fig. 3

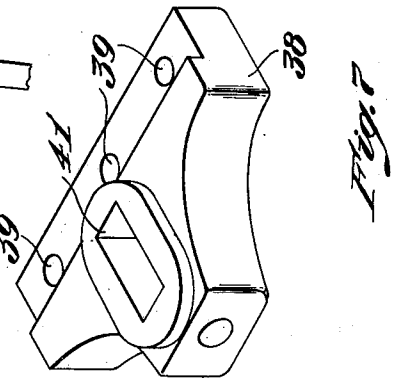


Fig. 7

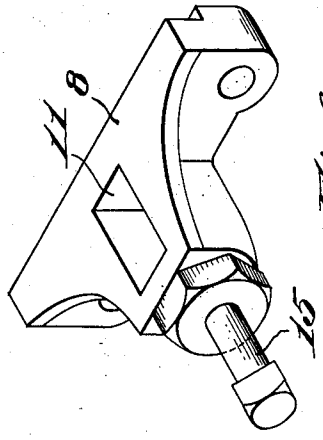
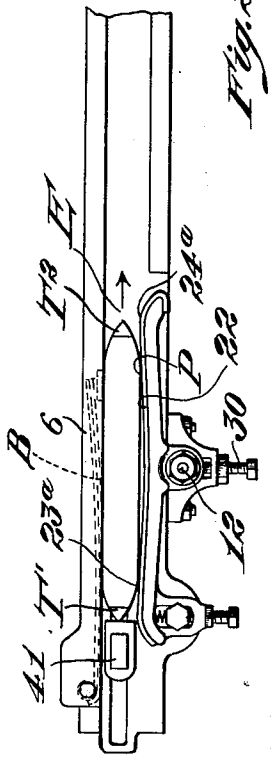
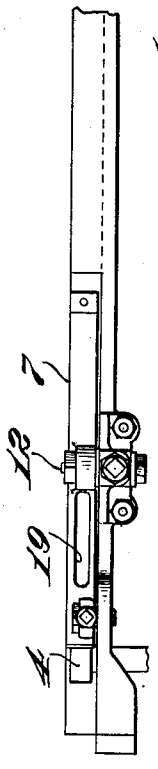


Fig. 6





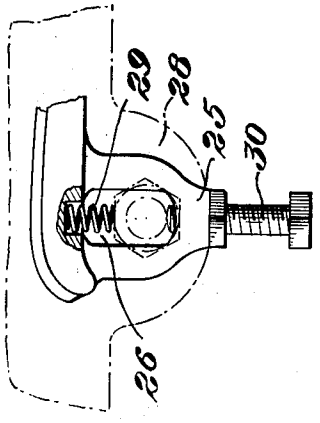


Fig. 8

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March 21, 1950 A. H. LA FRENIERE 2,501,394

SHUTTLE BOX FOR LOOMS

Filed July 7, 1948 4 Sheets-Sheet 3

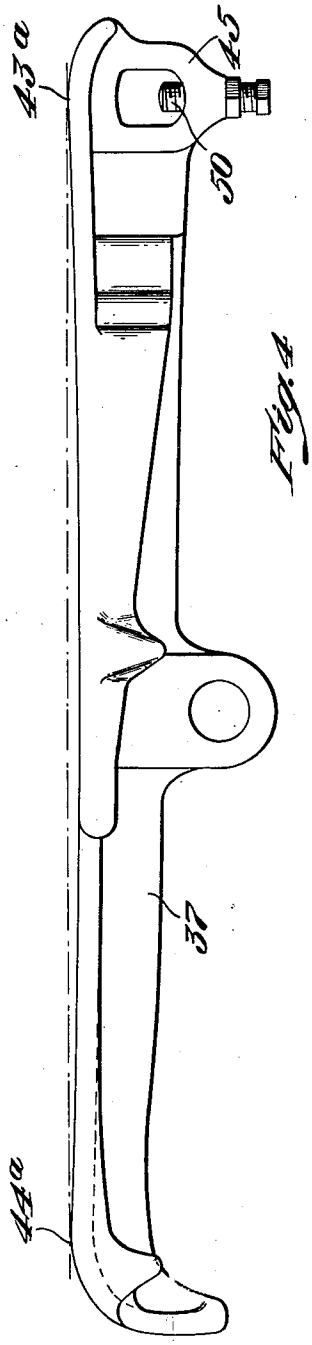


Fig. 4

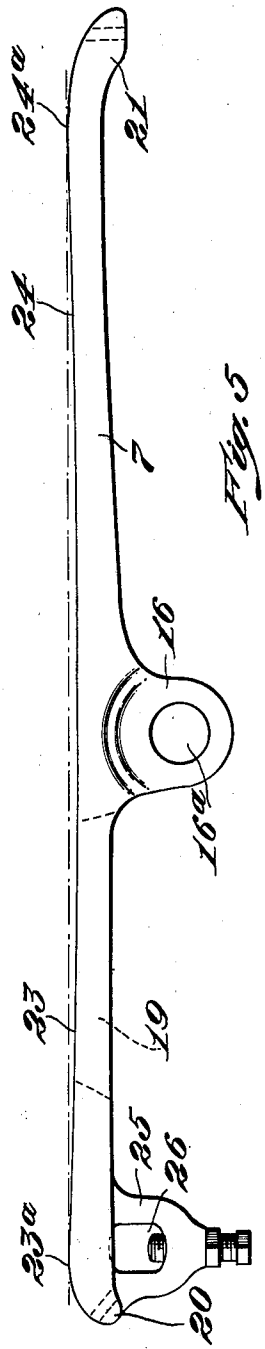


Fig. 5

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SHUTTLE BOX FOR LOOMS

Filed July 7, 1948 4 Sheets-Sheet 4

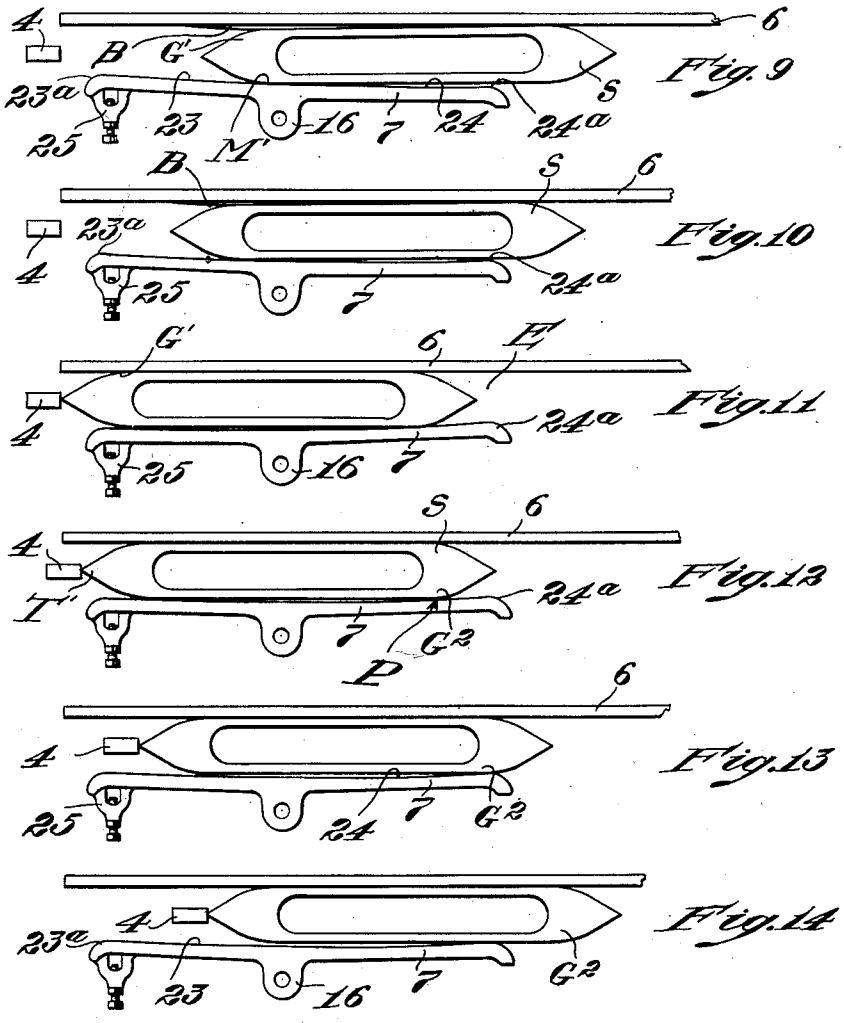


Fig. 9

Fig. 10

Fig. 11

Fig. 12

Fig. 13

Fig. 14

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UNITED STATES PATENT OFFICE

2,501,394

SHUTTLE BOX FOR LOOMS

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Application July 7, 1948, Serial No. 37,325

22 Claims. (Cl. 139—186)

1

This invention pertains to textile looms and more particularly to an improved shuttle box for such a loom and to a novel method of boxing the shuttle—the present application being a continuation-in-part of my application Serial No. 748,191, filed May 15, 1947, now abandoned. The invention relates to weaving looms which in other respects may be of conventional type and wherein a shuttle is impelled back and forth across the shed by the blows of pickers, one of which is associated with each shuttle box. The shuttle also may be of conventional type wherein an elongate body of substantially uniform transverse width terminates at each end at a shoulder beyond which the shuttle tapers to a conical tip.

In the operation of a loom, the shuttle is propelled or "thrown" through the shed from one side to the other alternately by the blows of the pickers. In order to insure travel of the shuttle completely through the shed, regardless of variations in the shed from time to time, the blow delivered to the shuttle by the picker must be heavy enough to give the shuttle a very high initial velocity. A portion of the energy thus imparted remains unexpended when the shuttle reaches the opposite side of the loom and thus unless prevented, the shuttle will rebound when it strikes the picker so that it is improperly located to receive the next picker blow. A shuttle box is provided at each side of the loom into which the shuttle enters and wherein it comes to rest before starting its return journey, and to absorb the residual energy of the shuttle it is customary to provide a resilient binder or friction device on one wall of the box, said binder engaging one face of the shuttle as the latter nears the end of its journey and jamming the shuttle against the opposite box wall so as frictionally to absorb the energy of the shuttle before it strikes the picker. This means for stopping the shuttle by frictional dissipation of energy is obviously just as effective in absorbing energy when the shuttle starts its return journey, and thus a substantial portion of the power supplied to the loom is expended in overcoming shuttle friction as it enters and leaves the box.

In low speed looms, prior devices for stopping the shuttle and for positioning it to receive the blow of the picker have been reasonably satisfactory but in recent high speed looms, for example, those running at 200 or more picks per minute, the force used in driving the shuttle must be very great in order to insure the necessary starting velocity; the picker strikes the end of

2

the shuttle with terrific force; the beat of the lay is at the same high rate as that of the shuttle picking—and the result is to set up heavy vibrations in the entire loom structure which tend to interfere with the proper rectilinear travel of the shuttle from box to box along the lay; the loom parts are subject to undue and rapid wear by reason of this vibration; and damage to the cloth being woven often results, and an excess amount of power is required.

A large part of the power consumed in driving the shuttle through the shed is absorbed in overcoming the frictional resistance of the warps forming the shed, and this resistance varies from pick to pick, the variations being accentuated by loom vibration and by changes in the closeness with which the shuttle hugs the reed. If the shuttle is not properly boxed, when struck by the picker, it may be so spaced from the reed that in entering the shed it encounters great opposition to its movement; such abnormal contact with the selvage damages the selvage warps, and if the opposition so encountered is great enough, the shuttle may fail to reach the other box, causing the loom to slam off with resulting damage and loss of production.

Not only does the entry of the shuttle into the shed, while spaced from the reed, cause yarn breakage and reduction of speed of the shuttle but the shuttle no longer travels in a rectilinear path, and is caused to flutter, bounce and roll as it moves towards the other box. Such fluttering and rolling movements of the shuttle result in great and uneven wear of the shuttle; they produce high vibration in the reed and often cause the dents in the reed to break off for a distance of approximately ten inches at each side of the center of the reed, especially in very high speed looms, and more important, they cause the trailing end of the shuttle to lift as the shuttle enters the shuttle box. Such lifting of the trailing end of the shuttle often causes fraying or cutting of the filling, in particular when the filling is rayon, nylon or silk. Moreover, when the trailing end of the shuttle lifts as it enters the box, so that the shuttle comes to rest in this position, this lifted end (becoming the leading end on the next pick) causes the shuttle to enter the shed improperly, damaging the selvage as it enters; making the shuttle bounce in the middle of the race and damage the other selvage as it leaves the shed, and to strike the box top as it enters the latter with a glancing blow. This causes it to move down and glance off of the middle of the lay end plate so that its leading

end now strikes high into the picker. While the latter directs the leading end downwardly again, the result is that when the shuttle comes to rest the trailing end is again up so that on the return pick, the same sequence of undesirable action takes place frequently resulting in bad doffs.

I am aware that pivoted binders have heretofore been proposed, but such binders, like the more common spring type, act to check the shuttle by compressing it between opposed surfaces. Furthermore, they only contact the advancing end portion of the shuttle, that is to say, for example, less than one-half the length of the shuttle. These prior pivoted binders, like the usual spring type, have a tendency to throw the shuttle axis out of parallel with the lay and reed as the shuttle is entering the box and since they are so short that they do not engage the forward end of the shuttle at the commencement of the pick and completely lose contact with the shuttle long before it leaves the box, they cannot exert any substantial guiding action such as to insure that the axis of the shuttle as it leaves the box will be parallel to the lay and reed.

It is obvious that the failure of the shuttle to move in a truly rectilinear path on its way from one box to another results in waste of power and that such waste of power, consumed in causing abnormal motion of the shuttle in directions transverse to its proper rectilinear path, can only result in injury of one sort or another either to the shuttle itself, to the lay and reed, or to the yarns being woven. Herein, for convenience in description, that end of the shuttle box at which the picker is located is termed the "outer" end and the opposite ends is termed the "inner" end.

The present invention has for its principal object the provision of an improved shuttle box so designed as to prevent rebound of the shuttle as it enters the box in a novel way and by means which substantially avoids loss of power absorbed in friction at the beginning of the shuttle travel, while at the same time so positioning the shuttle as it comes to rest that its entire length (except for its tapering ends) will be properly in contact with the lay and substantially free from restraining pressure and in the optimum position to receive the picker blow and so that the resultant motion of the shuttle, when picked across the loom, will be in a truly rectilinear path and without substantial components of transverse motion; thus, avoiding damage to the shuttle or loom parts, preventing damage to the cloth, reducing vibration and conserving power and substantially eliminating bad doffs. A further object is to provide a shuttle box having a pivotal side wall, in addition to the usual binder, operative to contact both ends of the shuttle as the shuttle enters the box and to bring the shuttle to rest in the most desirable position for the return pick, that is to say, flat on the lay end plate.

A further object is to provide a shuttle box, one entire side wall of which is pivotally mounted and so devised as substantially to eliminate bouncing, rolling or fluttering of the shuttle as it travels from one box to the other and which is operative substantially to eliminate injurious frictional contact of the shuttle with the cloth selvage in entering and leaving the shed.

A further object is to provide a shuttle box, one entire side wall of which is pivotally mounted and so arranged that the receiving end of said side wall is operative to guide the shuttle

in its outward trip and to hold it parallel with the opposite side of the box so as to compel the shuttle to enter the shed in the most favorable position, that is to say, hugging the reed.

A further object is to provide a shuttle box so devised as to insure free entrance of the shuttle but having means which automatically restricts the width of the box entrance, as the shuttle nears the end of its travel, thereby to prevent rebound.

A further object is to provide a shuttle box having retainer means operable by the shuttle itself, as the latter nears the end of its travel, to constrict the entrance to the box to such an extent that the shuttle cannot rebound.

A further object is to provide a shuttle box having a movable wall so devised that, as the shuttle approaches the picker, it contacts said box wall near one end and thereby moves the opposite end of the wall to a position such as to reduce the width of the box entrance to less than the width of the shuttle.

A further object is to provide a shuttle box having a movable wall so shaped that as the shuttle begins its travel it gradually widens the delivery end of the box and by its reaction in so doing is brought into close contact with the opposite wall of the box.

A further object is to provide a shuttle box having a cam surface so designed, by engagement with the shuttle as the latter nears the end of its travel, as to force the shuttle to contact the opposite wall in such a way that the axis of the shuttle is placed accurately parallel to the face of the reed.

A further object is to provide means operative, as the shuttle is entering the box, to impart a series of blows of progressively diminishing intensity against the side of the shuttle, said blows being applied to opposite ends of the shuttle alternatively, thereby to move the shuttle toward the rear wall of the box so as to align it axially with the direction of picker force.

A further object is to provide an improved shuttle box, one entire side wall of which is so shaped (at its inner shuttle-engaging surface) that when the shuttle is boxed, said wall only contacts the shuttle at widely spaced points adjacent respectively to the opposite ends of the latter. A further object is to provide an improved shuttle box, one entire side wall of which is pivotally supported and whose inner shuttle-engaging surface is concave from end to end, the concavity being deepest at a point adjacent to the pivotal axis of the wall and intermediate the ends of the latter.

A further object is to provide a novel method of absorbing the energy of the shuttle and then bringing it to rest.

Other and further objects and advantages of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings, wherein:

Fig. 1 is a fragmentary perspective view illustrating the improved shuttle box of the present invention embodied in a loom of the Draper type;

Fig. 2 is a diagrammatic plan view, to smaller scale, of the lay of the loom with its central part broken away and with shuttle boxes embodying the present invention at its opposite ends;

Fig. 2ª is a fragmentary horizontal section to larger scale through the rear or fixed wall of the left-hand shuttle box, illustrating a binder of a usual type;

Fig. 3 is a front elevation of the parts shown in Fig. 2;

Fig. 4 is a plan view, to much larger scale, of the pivoted side wall of the right-hand shuttle box according to the present invention;

Fig. 5 is a similar view of the pivoted wall of the left-hand shuttle box;

Fig. 6 is a perspective view of a bracket employed in supporting the pivoted wall of the left-hand shuttle box;

Fig. 6[a] is a fragmentary vertical section through the supporting bracket and the pivot means for the movable box wall;

Fig. 7 is a perspective view of a bracket employed in supporting the pivoted wall of the right-hand shuttle box;

Fig. 8 is a fragmentary plan view, partly in horizontal section and with parts broken away, showing the left-hand end portion of the pivoted wall of the left-hand box and illustrating the spring means which urges the pivoted wall toward normal position;

Fig. 9 is a diagrammatic plan view, to small scale, of the left-hand shuttle box showing the parts in the position which they occupy as the shuttle, in entering the box, first contacts the pivoted wall;

Fig. 10 is a view similar to Fig. 9 but showing the shuttle further advanced into the box;

Fig. 11 is a similar view showing the shuttle at rest in the fully boxed position;

Fig. 12 is a diagrammatic plan view of the left-hand shuttle box showing the picker engaging the end of the shuttle and starting the shuttle on its pick toward the right;

Fig. 13 shows the shuttle at a further stage in the ejection of the shuttle from the box; and

Fig. 14 shows the shuttle substantially at the end of the picker stroke and contacting the pivoted wall of the box only at the right-hand end of the latter.

Referring to the drawings, and in particular to Fig. 1, which shows parts of a conventional loom of the Draper type, except that it is equipped with a shuttle box according to the present invention, the numeral 1 designates the left-hand end portion of the lay. The lay end plate is shown at 2, the reed at 3, the left-hand picker at 4 and the picker stick at 5. In this type of loom, the fixed rear wall 6 of the shuttle box is provided with a horizontal slot which receives the resilient binder B (Fig. 2[a]). It has heretofore been customary to provide the shuttle box with a fixed front wall (usually with provision for adjustment) and as the shuttle S enters the box it contacts the binder which resiliently urges the shuttle against the front wall so that the energy of the shuttle is frictionally dissipated.

In accordance with the present invention, and with particular reference to the left-hand shuttle box (to avoid complication in description), the entire front wall 7 (Figs. 1, 2, 3 and 5) of the shuttle box is mounted to swing about a substantially vertical axis, intermediate its ends and preferably approximately midway of its length.

To provide pivotal support for the front wall 7, a bracket 8 (Fig. 6) is attached by bolts 9 to the front edge 10 of the lay. This bracket has an elongate slot 11 substantially perpendicular to the front edge of the lay which receives the shank of a bolt 12 (Fig. 6[a]) which extends up through the slot 11 and through a bearing sleeve 13 having a flange 14 which rests upon the upper face of the bracket. An adjustable stop screw 15 limits

the forward movement of the bolt 12 in the slot.

The front wall 7 (Fig. 5) of the shuttle box has an outwardly directed ear 16 provided with a vertical bore 16[a] which fits over the bearing sleeve 13. A washer 17 rests upon the top end of the bearing sleeve and a nut 18 engages the screw-threaded lower end of the bolt to hold the front wall in operative position. By removal of the bolt 12, a front wall of different dimensions (appropriate to the shuttle being used) may be substituted. As an example of proper dimension, the over-all length of the wall 7 may be sixteen inches; the distance, between the points 23[a] and 24[a], fourteen inches; and the overall length of the corresponding shuttle from tip to tip, fifteen and one-fourth inches; and the length of the shuttle from shoulder to shoulder, ten inches. A corresponding length for the right-hand box wall would be fifteen inches. The weight of the wall 7 (usually of cast iron) may be of the order of three pounds, so that it offers a substantial inertia opposition to rapid change in direction of movement. The maximum depth of the concavity of the inner cam face of the wall, as hereafter described, may vary from approximately one-sixteenth to one-eighth of an inch.

The front wall of the left-hand shuttle box is shown in more detail in Fig. 5. This wall may have the general configuration of the normally fixed front wall of the particular type of loom with which it is used, being of a height approximating the height of the shuttle body and including the elongate horizontal slot 19 (Fig. 3) in its left-hand end portion, the outwardly curved tips 20 and 21 and provision for the attachment of a leather or similar lining 22 (Fig. 2) for contact with the shuttle. However, in accordance with the present invention, the leather lining is found to be unnecessary and may be dispensed with, and is not shown in Figs. 4 and 5, the inner surface of the wall itself being smoothly finished for contact with the shuttle.

Usually the shuttle-contacting face of the fixed front wall of the box is substantially rectilinear except at its extreme ends where it merges with the outwardly curved tips, so that the boxed shuttle (from shoulder to shoulder) contacts the inner face of the box wall. On the contrary, in accordance with the present invention, the inner face of the box wall (whether this inner face be defined by a leather lining or not) is shaped to provide cam surfaces 23 and 24. These cam surfaces are so shaped that when the shuttle is boxed, it contacts the inner surface of the front wall only at points located adjacent to the opposite ends respectively of this wall. As illustrated, the points 23[a] and 24[a] are the spaced crests of a sinuous curve, concave toward the opposite wall 6 of the box between said crests and throughout the major part of the length of the wall 7 and which is deepest at a point adjacent to the pivotal axis of the wall 7, the curve reversing at the points 23[a] and 24[a]. This curve need not be exactly symmetrical with reference to the pivotal axis, for instance, it may be somewhat more abrupt to the left of the axis. This concave inner face of the front wall smoothly merges with the convex surfaces at the opposite ends respectively of the wall. The pivotal axis of the front wall 7 is so adjusted (with reference to the shuttle to be used) that when the shuttle is fully boxed, it contacts the inner face of the wall at spaced points (Fig. 12) of the curved inner face but is out of contact with the box wall intermediate these points.

The wall 7 is provided, near its left-hand end,

with a second outwardly directed ear 25 (Figs. 5 and 8) having an elongate slot 26 which receives the shank of a bolt whose head 27 (Fig. 1) is disposed above the ear 25 and whose threaded lower end is received in a threaded hole in a lug 28 projecting from the lay. A coiled spring 29 (Fig. 8) is interposed between this bolt and the rear wall of the slot 26 and tends to swing the left-hand end portion of the wall 7 rearwardly (that is toward the opposite wall 6 of the box). An adjustable stop screw 30 limits such rearward swinging movement of the wall 7. The shuttle box at the right-hand side of the loom (Figs. 2, 3 and 4) is in all substantial particulars like the left-hand box just described, differing only to accommodate loom parts customarily located at the right-hand side only of the loom. Thus, the numeral 31 (Fig. 2) designates the right-hand end of the lay; 32 the right-hand lay end plate; 34 the right-hand picker; and 36 the fixed rear wall of the right-hand shuttle box, said rear wall having the usual binder, corresponding to the binder B above described.

The front wall 37 (Figs. 2, 3 and 4) of the right-hand shuttle box is pivotally supported intermediate its ends (approximately midway its length) by a bracket 38 (Fig. 7) having holes 39 for the reception of bolts 39a (Fig. 3) by means of which it is fixed to the lay. This bracket has an elongate slot 41 which receives a bolt 42 (Fig. 2) which adjustably supports a bearing sleeve (not shown) on which the front wall 37 is pivotally mounted to swing about a vertical axis. In general, the wall 37 is like the left-hand shuttle box wall 7 above described except, for example, that it may be provided with an elongate open-ended slot 42a (Fig. 3) to accommodate a so-called "Stafford cutter." The inner face of the wall 37 is curved similarly to the inner face of the wall 7 (except that the curve is reversed left for right) having the spaced cam crests 43a and 44a corresponding to the crests 23a and 24a of the wall 7. The front wall 37 of the right-hand box has the outwardly directed ear 45 near its right-hand end provided with an elongate slot which houses a spring 49 (Fig. 2) which tends to swing the right-hand end of the box rearwardly, such movement being limited by the stop screw 50.

As seen in Figs. 1 and 2, the length of the movable front wall 7 of the shuttle box and the location of its pivot is such that when the shuttle is fully boxed, with its advanced or left-hand tip T′ in contact with the picker 4, the right-hand or trailing tip T^2 of the shuttle is well to the left of the right-hand or inner end 21 of the wall 7. The crest 24a of the curve of the inner surface of the wall 7 is now located (Fig. 2) to the right of the right-hand shoulder of the shuttle and at a distance from the opposite or fixed rear wall 6 less than the width of the shuttle body. In other words, the right-hand or inner end of the wall is so positioned as to act as a gate or retainer element, constricting the entrance E to the box—and the shuttle contacts the box wall at the point P, Fig. 2 (where the curved face of the wall is inclined inwardly toward the shuttle path). On the other hand, the opposite or left-hand crest 23a of the curved inner surface of the wall is in contact with the side of the shuttle so that said latter end of the wall 7 cannot swing rearwardly, and the shuttle is housed in on all sides.

As illustrated in Fig. 2a, that part of the binder B which is first effectively contacted by the shuttle, as the latter enters the box, is spaced to the left from the pivotal axis of the front wall 7, so that the first contact (Fig. 9) of the shuttle with the binder is after the shoulder G^1 of the shuttle has passed the pivotal axis of the front wall.

Normally (that is, meaning during the flight of the shuttle from box to box) the spring 29 holds the left-hand end of the box wall as far to the rear as is permitted by the stop 30, thus swinging the right-hand end of the box wall outwardly or away from the fixed wall 6. When thus positioned, the crest 24a of the cam face 24 of the wall 7 is spaced (Fig. 9) from the rear wall 6 a distance greater than the width of the shuttle, for example, one-eighth of an inch greater than the width of the shuttle body. This provides a wide entrance E (convergent toward the left) into which the advancing end of the shuttle enters freely. Not until the shoulder G^1 of the advancing end of the shuttle engages the binder B (at a point beyond the pivotal axis of wall 7) is the position of the wall 7 changed, because the concavity of the inner or cam face of the wall between the crest points 23a and 24a provides sufficient clearance to prevent premature contact. This early stage in the boxing of the shuttle is diagrammatically indicated in Fig. 9. Immediately the advancing shoulder of the shuttle engages the binder B, said end is caused to contact the cam surface 23 of the wall 7 substantially at the point M^1.

This sudden sharp impact momentarily swings the left-hand end of the wall 7 outwardly, causing its right-hand end at the point 24a (Fig. 10) to strike the face of the shuttle with a sudden blow which drives it back against the rear wall 6. This throws the left-hand end of the wall 7 away from the shuttle, but immediately the action of the spring 29 coupled with the rebound from contact at the point 24a causes the left-hand end of the wall 7 again to contact the side of the shuttle at a point somewhere to the right of the point 23a. It is believed that the wall 7 undergoes a series of such swinging movements in extremely rapid succession, the motion being too rapid for visual observation, the energy of the shuttle being absorbed in thus vibrating the movable wall 7 which is of considerable mass. The intensity of the blows depends upon the energy of the shuttle as it enters the box and progressively diminishes in force. Eventually the shuttle comes to rest, as shown in Figs. 1 and 11, with its longitudinal axis accurately aligned with the line of direction of picker force and with the wall so positioned as to constrict the entrance E thereby to prevent shuttle rebound.

When, for the next pick, the picker 4 applies a blow to the tip T′ of the boxed shuttle (Fig. 12) the inertia of the wall 7 is such (the spring 29 being relatively light) that the right-hand end of the box wall moves outwardly by the cam action of the right-hand shoulder G^2 of the shuttle against the cam surface 24 merely enough to permit the shuttle to escape from the box. Thus, during the entire action of the picker and until the trailing end of the shuttle has completely left the box, (an extremely short period of time, of the order of a small fraction of a second) the shuttle is accurately guided due to the position of the right-hand end of the box wall (Figs. 13 and 14) relatively to the front face of the moving shuttle, so that the force applied by the picker is wholly expended in putting the shuttle into flight without any substantial component acting transversely of the shuttle. Thus, the shuttle enters the shed perfectly positioned with its rear side in contact with the reed and resting flat against the

shuttle race of the lay so that the shuttle exhibits no tendency to bounce or roll during flight or to exert undue pressure against the warps of the selvedge. Since it is thus free from tendency to roll, it wears evenly on its bottom and that side which engages the reed so that the life of the shuttle is substantially prolonged. At the same time, as above pointed out, the power required is substantially reduced, as compared with prior practice, because it is unnecessary to impart so heavy a blow to the shuttle as is required when a substantial part of the energy so delivered to the shuttle is wastefully expended in producing transverse or up and down movements of the shuttle and in overcoming frictional resistance of the shuttle with the warp threads.

While the movement of the shuttle, in entering and leaving the left-hand box has thus been described, it is of course obvious that the operations at the right-hand side of the box are the same and have similar consequences.

While as herein described the right-hand end portion of the front wall of the box (referring to the left-hand box) has been suggested as the means for constricting the entrance to the box as the shuttle nears the end of its travel, it is obvious that entrance constricting gate means, independent of the front wall, but similarly actuated by the advancing end of the shuttle may be employed to the same effect, whether carried by the moving wall itself or otherwise supported, and it is to be understood that the invention is broadly inclusive of any such device.

Furthermore, while the invention has herein been illustrated for specific example as adapted for a loom of that type in which a binder is mounted in a fixed rear wall of the shuttle box, it is to be understood that the invention is equally applicable to looms in which the binder is mounted in a fixed front wall, in which case the pivoted movable wall of the box herein described would form the rear box wall instead of the front wall, the operation in controlling the shuttle being the same in either case.

It is further to be noted that in accordance with the present invention it is the entire box wall which is pivotally mounted and that this wall is longer than the length of the shuttle to be used and that when the shuttle is boxed the pivotal point of this movable wall is nearer to the trailing end of the shuttle than to that end of the shuttle which comes to rest in contact with the picker. Thus, this improved box wall is to be distinguished from prior pivoted binders which only contact the shuttle at its advancing end portion and usually within the first held of its length.

While a desirable embodiment of the invention has herein been shown and described by way of example, it is to be understood that the invention shall be broadly inclusive of any and all modifications falling within the scope of the appended claims.

I claim:

1. In combination in a loom, a shuttle box having front and rear walls, the front wall being pivoted substantially midway between its ends to turn about a vertical pivot, one end of said wall being shaped to constitute a shuttle retainer which constricts the shuttle path after the trailing end of the shuttle has passed said retainer in entering the box, thereby to prevent rebound of the shuttle, the opposite end of said wall being normally disposed in the path of the shuttle and being engaged by the shuttle and forced forwardly by the latter before the shuttle contacts the picker, and a spring normally urging said latter end of the wall toward the opposite wall of the box.

2. A shuttle box for looms comprising front and rear walls, a binder mounted on one of said walls, the entire opposite wall being pivoted to turn about a vertical axis substantially midway between its ends, said latter wall being of a height approximating that of the shuttle and being concave toward the other wall, the pivoted wall being operative, by inertia effect, to absorb the energy of the shuttle as the latter enters the box.

3. A shuttle box for use in a loom in which the shuttle is impelled across the shed by pickers, said box having front and rear walls, a binder mounted on one of said walls, the opposite wall being movable and arranged to turn about a substantially vertical axis intermediate its ends, and spring means tending to urge the end which is nearest to the picker, which is associated with said box, toward the opposite wall of the box.

4. A shuttle box for looms comprising front and rear walls, a binder mounted on one of said walls, the opposite wall being movable, a pivot supporting the latter wall, said pivot being adjustable toward and from the opposite wall, and spring means tending to swing said movable wall about its pivot.

5. A shuttle box for looms comprising front and rear walls, a binder mounted on one wall, the opposite wall being pivotally supported to turn about an axis intermediate its ends, the inner surface of said movable wall being so shaped as to contact a boxed shuttle only at points adjacent to its opposite ends respectively.

6. In combination in a loom having a lay, a reed and a picker, a shuttle box having front and rear walls, one of said walls being fixed, a binder mounted on said fixed wall, the other of said walls being pivotally mounted intermediate its ends to turn about a vertical axis, the inner surface of said pivoted wall being concave so that only its spaced-apart tip portions can contact a boxed shuttle adjacent to the opposite ends respectively of the latter, said shuttle-engaging tip portions being so arranged that when in contact with the shuttle they hold the latter with its axis accurately parallel to the reed.

7. In combination in a weaving loom having a lay, a reed, a shuttle box at each end of the lay, and pickers whereby the shuttle is propelled along the lay in opposite directions, each shuttle box having front and rear walls, each substantially as long as the shuttle to be used and a binder mounted on the rear wall, characterized in that the front wall of each shuttle box is pivoted substantially midway its ends to turn about a vertical axis, each front wall having at one end a part of a height approximating that of the shuttle body and which constricts the entrance to the box as the entering shuttle nears the picker, thereby to prevent rebound of the shuttle, and a spring engaging the movable wall and urging its opposite end toward the rear wall and into the path of the shuttle as the latter enters the box so that it is engaged by the shuttle and before the shuttle contacts the picker.

8. In combination in a weaving loom having a lay, a reed, a shuttle box at each end of the lay, and pickers whereby a shuttle of conventional type, having an elongate body portion terminating at each end at a shoulder beyond which the shuttle tapers toward a conical tip, is propelled along the lay in opposite directions, each shuttle box having front and rear walls, each longer

than the distance between the shoulders of the shuttle to be used, characterized in that the entrance end of the shuttle box is normally of a width greater than the width of the shuttle body, and in that one wall of the box consists of an elongate unitary lever, one end of which is of a vertical height approximating that of the shuttle body and which is operative to constrict said entrance end of the box to a width less than that of the shuttle body as the advancing end of the shuttle nears the picker, the opposite end of said lever being directly engageable by the advancing end of the shuttle, before the latter contacts the picker, thereby to swing the lever to dispose its first-named end across the entrance to the shuttle box.

9. In combination in a weaving loom having a lay, a reed, a shuttle box at each end of the lay, and pickers whereby the shuttle is propelled along the lay in opposite directions, each shuttle box having front and rear walls, one, at least, of said walls terminating at a point inwardly of the at-rest position of the picker, whereby, when the shuttle is fully boxed, said wall extends beyond the inner end of the shuttle, characterized in that said latter wall is movable about a substantially vertical pivot and in having a spring normally holding the inner end of the pivoted wall away from the opposite wall to provide an entrance to the box of greater width than the body of the shuttle, the outer end portion of said pivoted wall being engageable by the shuttle as the latter nears the picker, thereby swinging the inner end of said wall so as to constrict the box entrance to a width less than that of the shuttle body.

10. In combination in a weaving loom having a lay, a reed, a shuttle box at each end of the lay, and pickers whereby the shuttle is propelled along the lay in opposite directions, each shuttle box having front and rear walls, characterized in that the entrance end of the shuttle box is at a distance from the at-rest position of the picker greater than the length of the shuttle, and that said entrance end is normally of a width greater than the width of the shuttle body, one of the walls of the shuttle box being a unitary rigid lever pivoted to swing about a vertical axis substantially midway between its ends, one end of the lever being directly engageable by the advancing end of the shuttle as the latter approaches, but before it contacts the picker, whereby said wall is swung by the shuttle so that the opposite end of the wall is moved inwardly to constrict the entrance end of the box to a width less than that of the shuttle, and spring means urging the first-named end of the lever toward the opposite wall of the box.

11. In combination in a weaving loom having a lay, a reed, a shuttle box at each end of the lay, and pickers whereby a shuttle of conventional type is propelled along the lay in opposite directions, each shuttle box having front and rear walls with a binder mounted on the rear wall of each box, characterized in that the entering end of the shuttle box is at a distance from the at-rest position of the picker greater than the length of the shuttle employed and that said end of the box is normally of a width greater than that of the width of the shuttle body, the front wall of each box consisting of a unitary lever of substantial mass, pivotally supported substantially midway between its ends to turn about a vertical axis, one end of said front wall being engageable by the entering shuttle, as the advancing end of the latter nears the picker, to swing the lever so as to position the opposite end of the lever to constrict the box entrance to a width less than that of the shuttle body, and a spring urging the first-named end of said lever toward the rear wall of the box.

12. In combination in a weaving loom having a lay, a reed, a shuttle box at each end of a lay, and pickers whereby the shuttle of conventional type is propelled along the lay in opposite directions, each shuttle box having front and rear walls, and wherein the entrance end of the shuttle box is at a distance from the at-rest position of the picker greater than the length of the body portion of the shuttle, and wherein the width of said entrance end is normally greater than the width of the shuttle body, a binder mounted on one wall of the box, characterized in that the opposite wall of the box is pivoted to turn about a vertical axis, a spring tending to swing that end of said wall, which is nearest to the picker associated with the respective box, toward the opposite wall of the box, said latter end of the pivoted box-wall being engageable by the advancing end of the shuttle as the trailing end of the latter passes the box entrance, thereby to swing the wall and cause its opposite end to constrict said entrance to a width less than that of the shuttle body.

13. In combination in a weaving loom having a lay, a reed, shuttle boxes and pickers, and wherein a shuttle of conventional type, having an elongate body portion terminating at each end at a shoulder beyond which the shuttle tapers toward a conical tip, travels along the lay from box to box, characterized in that each shuttle box has spaced side walls, each of a length greater than the distance between the shoulders of the shuttle, a binder mounted upon one of said walls, the other of said walls being pivoted to swing about a substantially vertical axis intermediate its ends, that end of said pivoted wall which is remote from the picker having a cam face operative by engagement with the shuttle as the latter leaves the box to position the shuttle with its axis accurately parallel to the lay and reed, and a spring urging the other end of said pivoted wall toward the opposite wall of the box.

14. In combination in a weaving loom having a lay, a reed, shuttle boxes and pickers and wherein a shuttle of conventional type, having an elongate body portion terminating at each end at a shoulder beyond which the shuttle tapers toward a conical tip, travels along the lay from box to box, characterized in that each shuttle box has spaced side walls, each of a length greater than the distance between the shoulders of the shuttle, a binder mounted on one of said walls, the other of said walls being pivoted to swing about a substantially vertical axis substantially midway between its ends, the inner surface of said pivoted wall being concave substantially from end to end, the concavity being deepest at a point closely adjacent to the pivotal axis of said wall so that said wall contacts a boxed shuttle only at points adjacent to the opposite ends of the latter, and a spring urging that end of said wall which is nearest to the picker, pertaining to that respective box, toward the opposite wall of the box.

15. In combination in a weaving loom having a lay, a reed, shuttle boxes and pickers and wherein a shuttle travels along the lay from box to box, characterized in that each shuttle box has spaced side walls, one of said walls being pivoted to swing about a substantially vertical axis substantially midway between its ends, said pivoted wall having cam surfaces at its shuttle-contact-

ing face engageable with the shuttle as it enters and leaves the box, respectively, said cam surfaces being so arranged that when the shuttle is boxed they contact the shuttle only adjacent to the opposite ends respectively of the latter.

16. In combination in a weaving loom having a lay, a reed, shuttle boxes and pickers and wherein a shuttle of conventional type, having an elongate body portion terminating at each end at a shoulder beyond which the shuttle tapers toward a conical tip, travels along the lay from box to box, characterized in that each shuttle box has spaced side walls, each of a length greater than the distance between the shoulders of the shuttle, a binder mounted on one of said walls, the other wall being pivoted to swing about a substantially vertically axis substantially midway between its ends, said pivoted wall being of substantially rigid material and having an inner shuttle-engaging surface which is smoothly concave substantially from end to end of said wall, and spring means tending to swing that end of said pivoted wall which is nearest to the picker, pertaining to the respective box, toward the opposite wall of the box.

17. In combination in a weaving loom having a lay, a reed, shuttle boxes and pickers and wherein a shuttle travels along the lay from box to box, characterized in that each shuttle box has spaced side walls, a binder mounted on one of said walls, the other wall being pivoted to swing about a substantially vertical axis, said pivoted wall being of rigid material and of substantial weight, the inner surface of said wall, in horizontal section, being smoothly concave, the concavity being deepest at a point adjacent to the pivotal axis, and a spring tending to swing that end of the wall which is nearest to the picker, pertaining to the respective box, toward the opposite wall.

18. In combination in a weaving loom having a lay, a reed, shuttle boxes and pickers and wherein a shuttle travels along the lay from box to box, characterized in that each shuttle box has spaced side walls, one of said walls being pivoted to swing about a substantially vertical axis, means for adjusting the pivotal axis bodily toward and from the opposite wall, the inner, shuttle-engaging surface of the pivoted wall being so shaped that when the shuttle is fully boxed its end portions only contact said wall, and spring means tending to move that end of the pivoted wall which is nearest to the picker toward the opposite wall.

19. A wall structure for one side wall of use in substitution for the shuttle box wall of a weaving loom having a lay on which the shuttle box is mounted and in which a shuttle of conventional type, having an elongate body portion terminating at each end at a shoulder beyond which the shuttle tapers toward a conical tip, is employed, said wall structure comprising a supporting bracket and means for attaching it to the lay, a pivot member carried by said bracket, an elongate box-wall mounted to swing on said pivot member, said box wall being of a length greater than the distance between the shoulders of the shuttle to be used, the inner surface of said wall being longitudinally concave, and a spring for urging that end of the movable wall which is nearest to the end of the lay toward the opposite side of the shuttle box.

20. A wall structure for use in substitution for one side wall of the shuttle box of a weaving loom having a lay on which the shuttle box is mounted, said wall structure comprising a supporting bracket and means for attaching it to the lay, a pivot member carried by said bracket, means for adjusting the pivot member bodily from front to rear, an elongate box-wall of substantially rigid material mounted to swing on said pivot member, said pivoted wall being of a length to reach beyond the inner end of the shuttle when the latter is fully boxed, the inside surface of said pivoted wall being longitudinally concave, a spring urging that end of the movable wall which is nearest to the picker end of the lay toward the opposite wall of the box, and means for adjusting the tension of the spring.

21. In combination in a loom, a shuttle box having a fixed wall, a binder mounted on said fixed wall, and shuttle controlling means including a movable retainer element, of approximately the full height of the shuttle box, which is normally out of the path of the shuttle but which is operative to constrict the entrance of the box when the shuttle is fully boxed, said controlling means including a part which is directly contacted by the shuttle itself as the latter enters the box and before it strikes the picker thereby moving said retainer element to constrict the entrance to the box.

22. In combination in a loom having pickers for impelling a shuttle across the shed, a shuttle box whose entrance end is normally freely open for admission of the shuttle, shuttle-controlling means, including a pivoted wall, of substantially the full height of the shuttle box, one end of the wall being operative at times to constrict said entrance end of the box, another part of the wall being constructed and arranged for engagement by the advancing end of the shuttle, as the latter approaches but before it contacts that picker which is associated with said box thereby to swing the wall so as to dispose said first-named end in entrance-constricting position.

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Certificate of Correction

Patent No. 2,501,394 March 21, 1950

ANTHONY H. LA FRENIERE

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 13, line 55, strike out the words "one side wall of" and insert the same after "for" and before "the" in line 56, same column;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of June, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.