

Feb. 6, 1951

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2,540,673

PICKER STICK LINKAGE AND HYDRAULIC CHECK

Filed Oct. 27, 1947

2 Sheets-Sheet 1

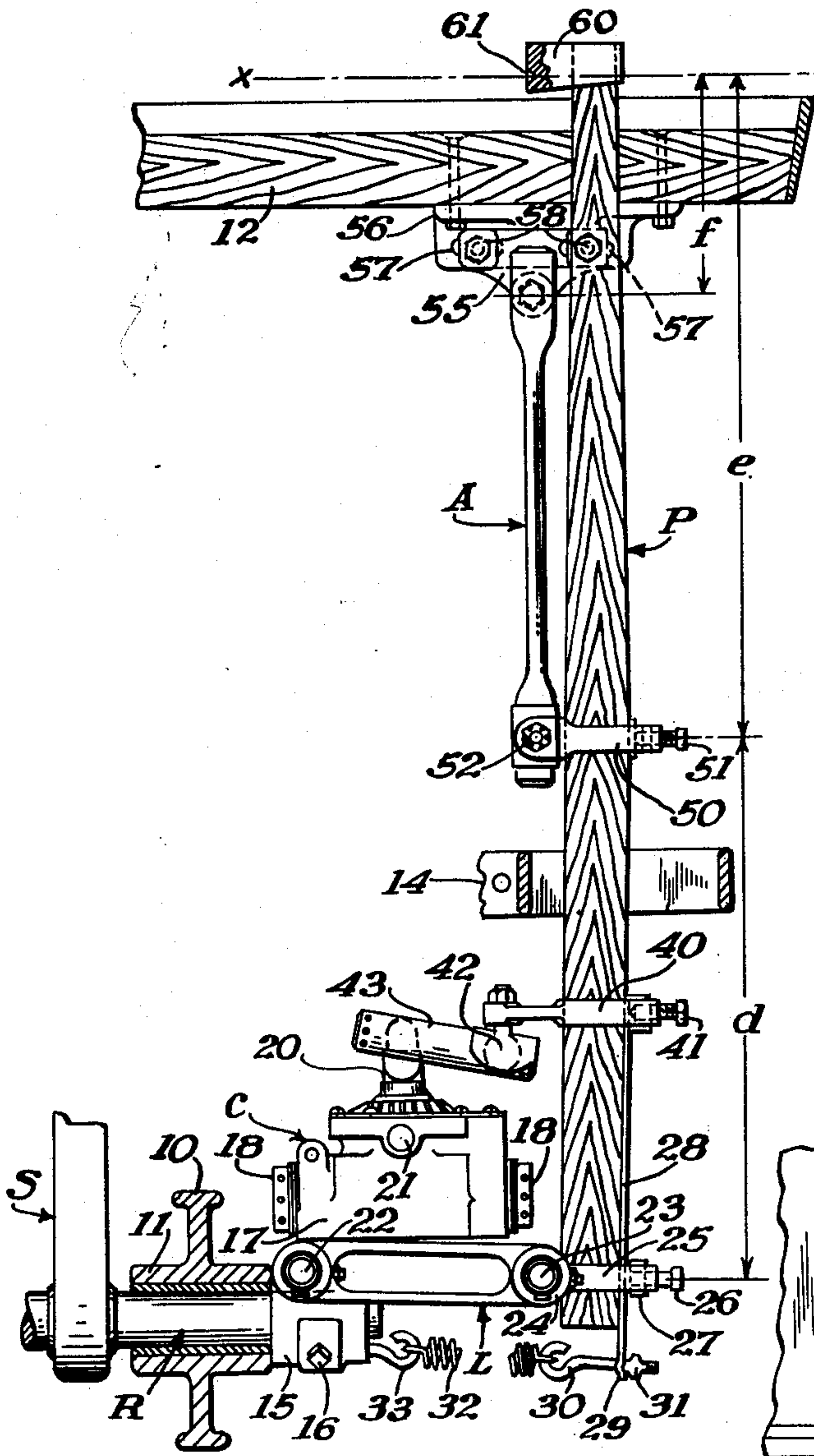


Fig. 1

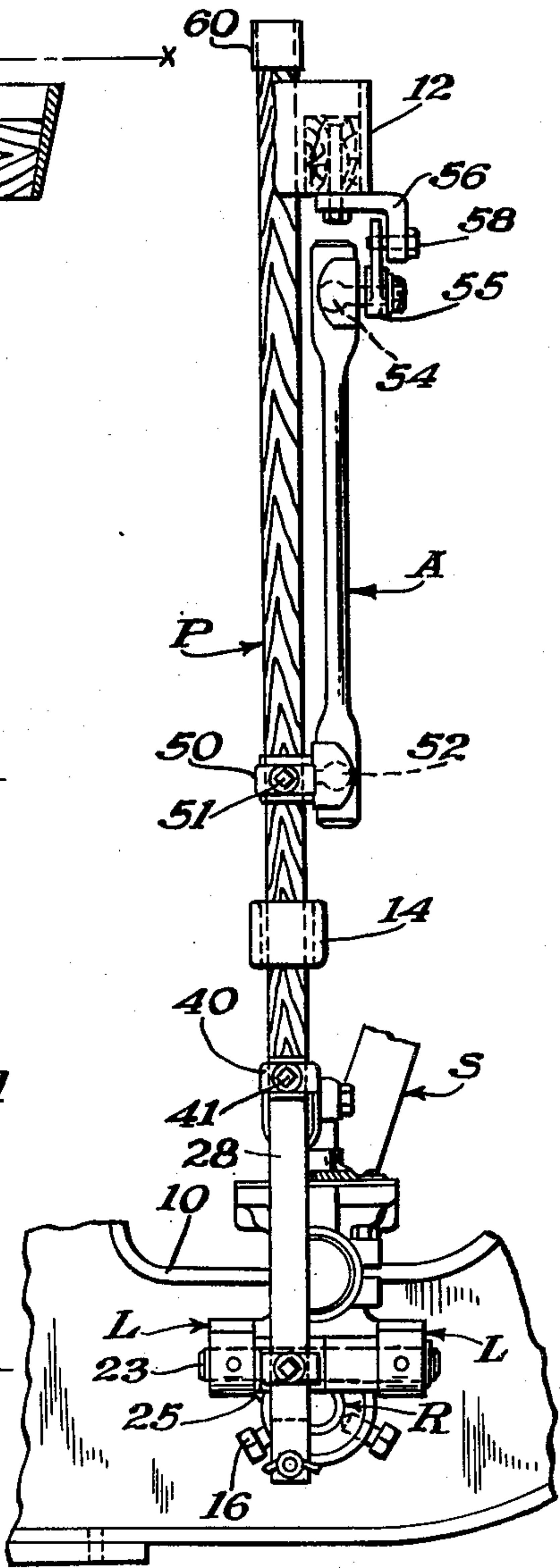


Fig. 2

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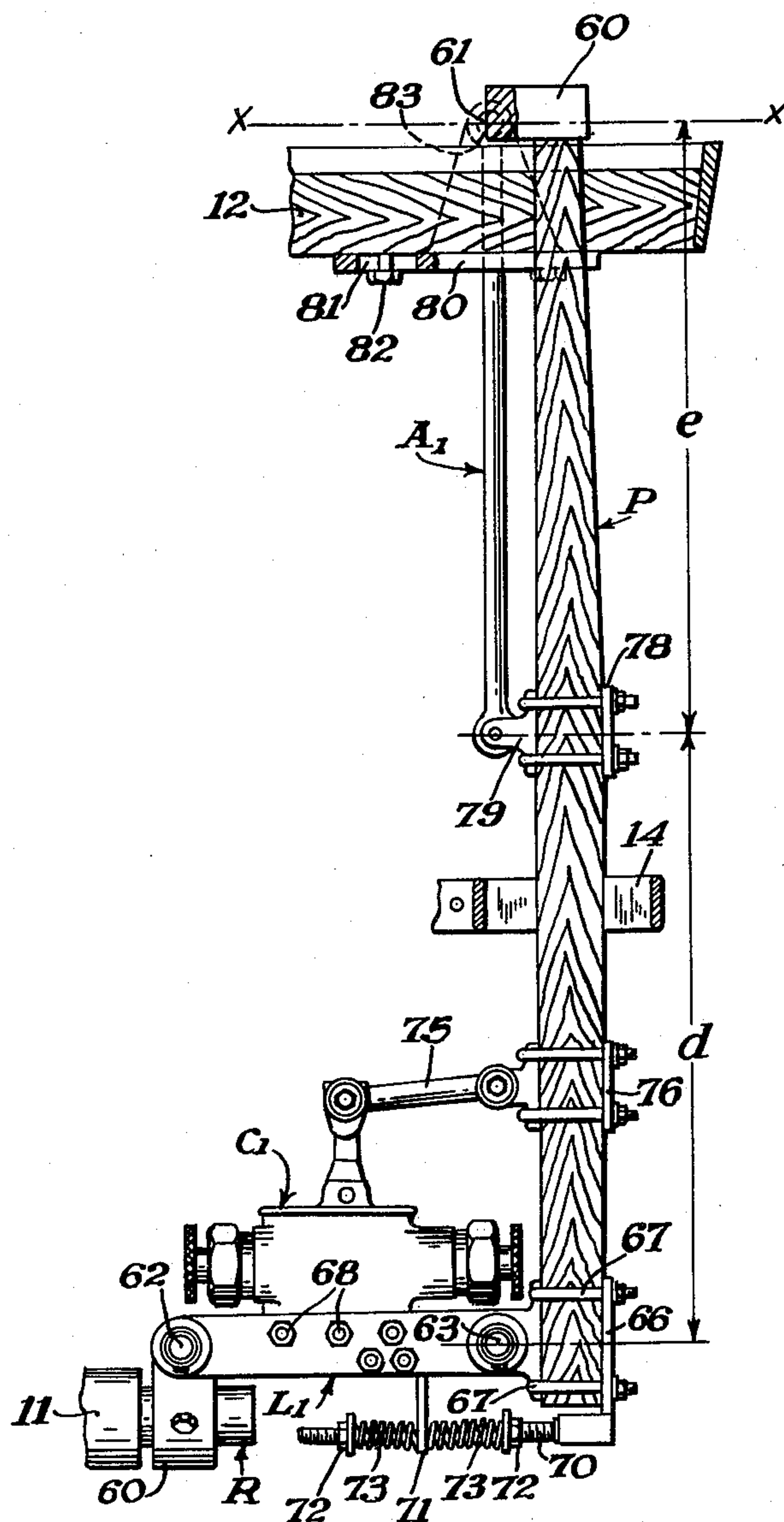


Fig. 3

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UNITED STATES PATENT OFFICE

2,540,673

PICKER STICK LINKAGE AND HYDRAULIC CHECK

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Application October 27, 1947, Serial No. 782,341

25 Claims. (Cl. 139-149)

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This invention relates to looms and more specifically to a novel mounting means for the picker stick that casts a shuttle to and fro across the shed.

The loom of the type to which this invention relates employs a pair of opposed picker sticks which rock back and forth with the lay assembly and alternately cast and receive the shuttle. Formerly, such looms operated at a comparatively slow rate of speed, the arrangement being that the shuttle box checked and absorbed the shuttle energy and a leather strap or similar device was employed to stop and check the picker stick. Recently, workers have striven for increased speed of operation, but this has presented several problems wherein prior equipment has proven unsatisfactory and erratic in its operation. It was found that the old strap checking device is deficient because with an increased shuttle speed the shuttle box can no longer absorb all of the energy of the flying shuttle, whereupon the shuttle strikes the picker stick and forces it against the check strap, causing rebound. Difficulties of this nature can be largely overcome by the provision of novel hydraulic checking devices such as those described in co-pending applications assigned to the assignee of this application, namely Serial No. 670,252, filed May 16, 1946, now Patent No. 2,483,517; Serial No. 702,953, filed October 12, 1946, now Patent No. 2,506,697, and Serial No. 782,342, filed October 27, 1947.

Although said novel hydraulic checking devices greatly improve the action of the loom, several problems remain unsolved. For example, it was customary in a large and representative class of looms to mount the picker stick on a curved shoe, urged against a flat plate by a strap and coil spring assembly. This was arranged to produce a straight line motion to the picker head, but it proved to be an impractical construction when speeds were increased. It was found that the shoe tends to leave the plate under action of the propelling strap as well as when the shuttle strikes the picker head. This produces erratic casting of the shuttle and makes a uniform checking action difficult to obtain. Furthermore, there was no positive control of the path traversed by the picker head and adjustment of the path was impossible.

It is an object of the present invention to cause the picker head to positively and accurately traverse a desired path by mounting the picker head upon a set of links so that no forces normally encountered during operation of the loom

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can cause deviations in the path of travel of the picker.

It is inherent that since the shuttle initially rests in a track there is no danger of its being deflected downwardly before it traverses the shed, but if the picker action is improper the shuttle may be deflected upwardly whereupon the nose or perhaps the entire shuttle might leave the track and not enter the shed properly. It is another object of the present invention to insure that the shuttle is cast without tendency to jumping or nosing up, which object is attained by the aforesaid linkage. The said linkage provides a slightly rising picker motion during the final portion of the power stroke whereby the nose of the shuttle is urged downwardly against its track and so has no tendency to jump clear off the track.

It is a further object to guide the picker head in a substantially straight line from its neutral position (where it receives the shuttle impact) to its rearmost or checked position, making it possible to accurately adjust the hydraulic checking device so that the shuttle and picker are brought to a dead stop without rebound.

As mentioned in the aforesaid pending applications, where the picker stick must absorb energy of the shuttle and bring the shuttle to a stop without rebound, it is important that the picker stick always return to approximately the same position (referred to as the "neutral position" hereafter) when it receives the impact of the flying shuttle. According to the principles outlined in said applications, when in the neutral position the arrangement is such that hydraulic checking action begins and continues throughout the balance of the return stroke. Accordingly, it is desirable that means be provided to bring the picker stick to said neutral position, and it is further desirable that such means offer little resistance to motion of the picker stick and shuttle as they move from the neutral position to the end of their return or check stroke.

Therefore, it is a further object of the present invention to so bias the picker stick that it is strongly urged to move from the end of the power stroke to the neutral position, but is urged by a much smaller force to move from the end of the check stroke to the neutral position. With this arrangement, a comparatively small resilient resistance is offered to the final checking of the shuttle and picker, whereby rebound is eliminated. According to this invention, the assembly of the picker stick and the links which guide it act so that the weight of the parts tends to bring the picker to its neutral position whether

the picker be at the end of the power stroke or at the end of the return stroke. Then, by providing a spring that biases the picker stick so that it tends to move from the end of the power stroke to the end of the return stroke, the force of the spring opposes the force of gravity between the neutral position and the end of the return stroke. In other words, the linkage is so arranged that gravity tends to move the picker toward neutral position from either extreme position whereas the spring tends to move the picker away from the neutral position on the checking part of the return stroke, providing a substantially neutral zone. The same spring force is added to that of gravity in the unchecked part of the stroke, that is, from the end of the power stroke to the neutral position. This facilitates quick return of the picker stick to its shuttle-receiving position after the power stroke.

A further object of my invention resides in providing a compact picker stick and check assembly which may be readily mounted on the extreme end of the rock shaft without interference with the loom parts, this being an accessible position that facilitates adjustment of the checking device.

Still another object resides in provision of a link mounting which permits a certain amount of adjustment to insure that the proper path of the picker is maintained even though variations in the loom construction may require variations in location of one or more of the pivots for the link system.

Further objects reside in providing a link mounting for the picker which is adjustable so that slope or inclination of the picker may be controlled to a certain degree.

A further object of one embodiment of my invention resides in simplification of the parts by causing the checking device to serve the dual purpose of a check device and of a link forming part of the picker stick mounting.

These and other objects will be apparent to one skilled in the art as the following detailed description of the preferred embodiment of my invention proceeds.

In the drawings:

Fig. 1 represents a side elevation of the preferred embodiment of the invention;

Fig. 2 is an end view of the assembly; and

Fig. 3 illustrates the modified form as seen in Figs. 1 and 2.

The loom rock shaft R is mounted for swinging in a loom frame member 10 by means of a bearing 11. The sword S supports the lay portion 12 which provides a track for the shuttle in the conventional manner. It is understood that in looms of this type a pair of supports for a picker are provided, the usual and preferred form being a pair of picker sticks mounted oppositely, only one of such sticks being shown in the figures.

The picker stick P is mounted by a link system to be described in detail presently and is connected to a hydraulic check device C. The exact construction of the check device forms no part of this invention, suitable constructions are disclosed in the co-pending applications referred to. Suffice it to say that the check device checks the end of the power stroke which is initiated by power strap 14, whereafter the picker stick returns to the neutral position illustrated in the drawings to thereupon receive the impact of the shuttle. This carries the picker stick to the end of its return stroke with the check device acting to bring the same to a smooth rebound.

The check device is mounted on the end of the rock shaft by means of bracket 15 and is retained thereon by set screws as at 16. The body 17 of the check device houses the working pistons and members 18 are provided for controlling the action of the device. It is noted that with this mounting the adjustments 18 are readily accessible. Arm 20 is pivoted as at 21 to actuate the pistons in the check device in response to motion of the picker stick. Bracket 40, clamped to the stick by screw 41, carries ball member 42 which, in turn, connects to arm 20 of the check device by means of member 43. Certain features of the mounting of the check device in connection with the linkage form no part of this invention but are claimed in the patent to Beacon, No. 2,513,907, dated July 4, 1950, assigned to The Weatherhead Company.

The body of the check device is formed to mount cross shaft 22, to which is pivoted a pair of links L acting as guide members for the lower portion of the picker stick. The other ends of the links are pivoted as at 23 to a bracket member 25 mounted on the picker stick so that links L act as guide members for the lower portion of the picker stick. Set screws 26 and clamp plate 27 are provided so that the position of bracket 25 on the picker stick is adjustable. With this mounting, the lower end of the picker stick follows a restrained substantially vertically motion within the limits of its operation.

In order to bias the picker stick toward the neutral position after completion of the power stroke, a spring is provided which reacts against plate 28 clamped to the stick. The lower end of the plate is notched as at 29 and a threaded eye bolt 30 carries adjusting nut 31 which rests in the notch. Spring 32 connects with eye bolt 30 in the picker stick and with a fixed eye bolt 33. The action of this spring will be described in more detail presently.

To complete the mounting of the picker stick, an upper link or arm A is provided. The lower end of the arm is pivoted to ball 52 on bracket 50, adjustably clamped to the stick by set screws 51. The construction and operation of ball joints such as those illustrated is known to all those skilled in the art and accordingly is not elaborated upon.

The upper end of arm A is pivoted to a similar ball member 54 on the upper bracket 55. The bracket is adjustably mounted on a lay portion 12 by means of bolts 58 which extend through slots 57 formed in the fixed mounting plate 56. The picker head 60 has a pocket 61 for reception of the shuttle, and is mounted on the picker support means or picker stick P.

The line $x-x$ represents a straight line parallel to the lay, which line is the path traversed by the picker with certain exceptions to be hereinafter noted.

It will be understood, and it can be demonstrated mathematically, that if the pivoted points 54 are located in the line $x-x$ instead of below it by distance f shown in Fig. 1; and if the distances d and e were made equal; and if the lower end of the picker stick were guided perfectly vertically, then the pocket 61 of the picker would traverse a straight line $x-x$. However, in many looms it is not feasible to mount pivot 54 in the line of picker travel, and provision of a vertical guide for the lower end of the link is an awkward and expensive construction. In the preferred form of my invention I substitute the lower guide members L for the vertical guide slot

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of the classical straight line motion. Also, in certain looms it is not feasible to have the pivot point 54 in the line $x-x$ whereas the bracket supporting the upper end of the arm is readily mounted a distance f below the line as shown. With such a mounting, however, the geometry of the system must be modified to produce the straight line motion. Merely by way of example of a satisfactory arrangement, I have found that if the distance d and e added together are 30", 10 if the effective length of arm A is 11", if the distance d is 13½", and if the effective length of link L is 6.1", then the picker traverses a path which is ideally adapted for the purpose at hand. It will be understood that those figures are given merely by way of example and that they do not limit the scope of the invention in any way.

With the construction shown in Fig. 1, the pocket 61 travels in substantially a straight line from the neutral position to the end of the return stroke, that is, to the right in Fig. 1. If this occurs, any slight error produced by departure from the classical straight line linkage caused by existence of the distance f is substantially compensated for by the action of guide members 25 L which do not guide the lower end in a straight line because of their finite length. However, on the portion of the stroke from neutral position to the left in the figure, (that is to the position where the shuttle flies clear of the picker) the picker follows a slightly rising path. The actual amount of rise is very small, but, nevertheless, this action tends to lift the tail of the shuttle which, in turn, urges the nose down against the track, and insures that the shuttle does not fly up or jump and so fail to traverse the desired path through the shed.

With regard to action of the spring 32, it will be noted that even if the spring were omitted, the weight of the picker, arm A, and guide members L, would urge the picker to the neutral position from either extreme position, because the center of gravity of the assembly is lowest in the neutral position. With this in mind, it will be readily appreciated that the force of the spring 32 is added to the force of gravity in returning the picker from the end of the power stroke to the neutral position. This is desirable because it is important that the picker stick be returned to its shuttle-receiving position before the shuttle impact is received. It will be further noted that the force of spring 32 opposes the force of gravity in the zone between the neutral position and the end of the return stroke (that is, to the right in Fig. 1). This also is highly desirable because it affords a substantially neutral zone during which the only effective forces reacting on the picker stick are those due to the energy of the shuttle and the resistance of the check device. Thus, the check device can accurately be set to absorb the shuttle energy and bring it to a stop without rebound.

In installing the device, it will be obvious that the distance f is beyond control, it being determined by the construction of the loom. Likewise, in the interest of economy, it is desired that the arm A be made of a standard length. It is also required that the pocket 61 be in the line $x-x$. The latter condition is readily fulfilled because the distance e may be adjusted until the picker is properly positioned by merely loosening the lower clamp 25. By way of example, if distance f is greater than standard so that distance e must be increased by an equal amount to bring the pocket 61 within the line $x-x$, a compensa-

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tion of this variation can be had by lengthening d by an amount equal to 4 of the variation in lengths e and f . It is noted that the sign of the correction is positive, that is, if e is lengthened then d is lengthened and vice versa.

Another characteristic of the linkage is that if the adjustable bracket 55 is installed so that point 54 falls in line with the pivots 23 and 52, then the path $x-x$ will be substantially parallel to the lay. On the other hand, if it is desired to have a slightly inclined path, the amount and direction of inclination can be controlled by adjusting bracket 55 the proper distance to one side or the other of the neutral line. This feature of the invention provides for selecting the most effective path of the picker without modification of the construction of the device.

The modification shown in Fig. 3 has a somewhat different geometric arrangement but includes many of the features of the preferred embodiment. In this modification, the check device C1 is mounted on the rock shaft by means of bracket 60, but the check device is mechanically integral with guide links L1, pivoted to the bracket 60 at 62 and to the picker stick at 63.

Location of pivot 63 is adjustable as before, the mounting including U-bolts 67 and clamp plate 66. Bolts 68 may be employed to fasten the check device to the lower guide links L1.

Members 75 and 76 operatively connect the check device to the picker stick. Arm A is pivoted to the picker stick by means of bracket 79 and clamp assembly 78. In this form the geometry is like that of the classical straight line motion because the upper pivot point is in the path of picker travel. Bracket 80 is adjustably mounted by means of slots 81 and bolts 82 and has an upper extension 83 that mounts the upper end of arm A. In this form the distances d and e are made equal. There is a slight rise near the end of the power stroke in this form also, this rise being caused by guide links L1 which should theoretically be of infinite length to produce a perfectly straight line.

I may provide a pair of opposite centering springs 73 mounted on threaded bolt 70 attached to the lower bracket and adjusted by means of nuts 72. These springs engage a relatively fixed plate 71 attached to the links L1. The operation of the modified form is like the preferred form except that the check device C1, being mounted on the guide links L1 is inclined during the stroke rather than remaining horizontal.

Of course, it is understood that I may employ the mounting links shown in Fig. 1 with the form of check device shown in Fig. 3, and substitute the spring mounting of Fig. 1 for that shown in Fig. 3 without departing from the spirit of the invention.

It will be seen that in my invention the picker stick is accurately and positively guided and that it cannot jump clear of its support. Also, it provides a path ideally adapted for casting the shuttle. In the preferred form the interaction of gravity and the return spring provides a zone of substantial neutral equilibrium during the checked portion of the return stroke.

Furthermore, means are provided for compensating for variations in loom construction and for adjusting the inclination of the path of the picker.

The check is mounted outboard the loom where it is readily accessible. All of these cooperate to provide a picker stick mounting that is exceptionally dependable and uniform in its ac-

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tion. Substantial increase in loom speed is possible without spoilage of the fabrics due to erratic casting of the shuttle.

It is contemplated that other straight line motion link assemblies may be employed without departing from the spirit of the invention. The linkage illustrated is one example of a very simple arrangement that accomplishes the desired objects with a minimum number of simple parts. Accordingly, I contemplate that the appended claims and not the illustrated embodiment are determinative of the scope of my invention.

What is claimed is:

1. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker fixed thereto, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line in the path of shuttle travel, said linkage means comprising an upper link extending downward from a point in said assembly below the picker and pivoted to the assembly and to said picker stick, and a lower link extending substantially horizontally outwardly from said assembly and pivoted to a lower portion of the picker stick, the lower pivot of said upper link being adjustable along said stick to bring the picker into the desired line of shuttle travel, the pivot of said lower link with said stick being adjustable along said stick to correct the path of the picker in compensation for the displacement of the upper pivot of the upper link from the line of shuttle travel.

2. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker fixed thereto, linkage means to mount the picker stick on said assembly, said linkage means comprising an upper link extending downward from said assembly and pinned to the assembly and to said picker stick, guide means carried by said assembly and engaging a lower portion of said picker stick to provide for vertical motion thereof while positively locating said portion of the picker stick in a horizontal direction, said link and guide means cooperating to guide the picker in substantially a straight line path, the center of gravity of said picker and link assembly being lowest when said picker is in an intermediate position whereby gravity tends to urge said picker to said intermediate position, spring means connected to said picker stick to urge the stick toward its outermost position, said spring means being substantially overcome by the effect of gravity on the picker stick and linkage with the stick in an intermediate shuttle-receiving position, means to actuate said picker stick at a point between said links, and a hydraulic check device for absorbing shuttle energy as the picker stick completes its return stroke, said device having relatively movable elements, one element being connected to said loom and the other to said picker stick.

3. In a loom, a frame, rock shaft, and lay assembly, a picker, straight line motion linkage means for guiding said picker, said linkage means comprising a first member to which said picker is attached and a plurality of link members pivoted to said assembly and to said first member to provide substantially a straight line motion for the picker, and a double-acting check device mounted on one of said plurality of link members and having a pivotal connection with said first member, said plurality of link members acting to positively constrain said picker in its motion whereby reaction of said check device in either direction cannot affect said picker.

4. In a loom, a frame and rock shaft bear-

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ing, a rock shaft, and lay assembly, a picker, straight line motion linkage means for guiding said picker, said linkage means comprising a first member to which said picker is attached and a plurality of link members pivoted to said assembly and to said first member to provide substantially a straight line motion for the picker, and a double-acting check device having a housing element supported on said rock shaft outboard of said bearing, and having an element movable relatively to the housing and provided with a pivotal connection with said first member, said plurality of link members acting to positively constrain said picker in its motion whereby reaction of said check device in either direction cannot affect said picker.

5. In a loom, a frame, rock shaft, and lay assembly comprising a frame, a picker and picker stick, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a first link pivoted to said assembly in a horizontal plane through the line of said picker travel and to said picker stick at a distance below said picker equal to the length of the link, and a guide member for a lower portion of the picker stick, said guide member permitting pivoting and vertical motion of said lower portion and positively guiding said portion laterally, whereby the checking force of said checking device cannot in any way affect the path taken by the picker.

6. In a loom, a frame, rock shaft, and lay assembly comprising a frame, a picker and picker stick, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, a double-acting check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a first link pivoted to said assembly in a horizontal plane through the line of said picker travel and to said picker stick at a distance below said picker equal to the length of the link, and a guide member for a lower portion of the picker stick, said guide member permitting pivoting and vertical motion of said lower portion and positively guiding said portion laterally, whereby the checking force of said checking device cannot in any way affect the path taken by the picker.

7. In a loom, a frame, rock shaft, and lay assembly, a picker and picker stick, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, and a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a first link pivoted to the assembly in a horizontal plane through the line of said picker travel and to said picker stick at a distance below said picker equal to the length of the link, and a second link member pivoted to the assembly and to the picker stick, the distance between said two pivots on the picker stick also equaling the length of said first link whereby the picker travels in a straight line and the checking force of said checking device cannot in any way affect the path taken by the picker.

8. In a loom, a frame, rock shaft, and lay assembly, a picker and picker stick, linkage means

to mount the picker stick on said assembly so that the picker moves substantially in a straight line, and a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a link pivoted to said assembly in a horizontal plane through the line of said picker travel and to said picker stick at a distance below said picker equal to the length of the link, and a guide member for a lower portion of the picker stick, said guide member permitting pivoting and vertical motion of said lower portion and positively guiding said portion laterally, whereby the checking force of said checking device cannot in any way affect the path taken by the picker, the picker, link pivot points, and the lower end of said picker stick all lying substantially in a straight line vertical to the direction of picker travel when said checking device is in a neutral position.

9. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, and a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a link having a first pivotal connection with said assembly in a horizontal plane through the line of said picker travel and a second pivotal connection with said picker stick at a distance below said picker equal to the length of the link, and a guide member for a lower portion of the picker stick, said guide member permitting pivoting and vertical motion of said lower portion of the picker stick and positively guiding said portion laterally, whereby the checking force of said checking device cannot in any way affect the path taken by the picker, the lower pivot axis of said picker stick being spaced below said second pivotal connection of said link with the picker stick by a distance substantially equal to the length of the link.

10. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, and a double-acting fluid check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a first link having a pivotal connection with said assembly in a horizontal plane through the line of said picker travel and a pivotal connection with said picker stick at a distance below said picker equal to the length of the link, and a second link member having a pivotal connection with said assembly and with a lower portion of the picker stick, said two pivotal connections with the picker stick being spaced by a distance substantially equal to the length of said first link.

11. In a loom, a frame, rock shaft, and lay assembly comprising a frame, a picker stick and a picker, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, and a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a link having a first pivotal connection with said assembly in a horizontal plane through the line of said

picker travel and a second pivotal connection with said picker stick at a distance below said picker equal to the length of the link, and a guide member for a lower portion of the picker stick, said guide member permitting pivoting and vertical motion of said lower portion and positively guiding said portion laterally, whereby the checking force of said checking device cannot in any way affect the path taken by the picker, the lower pivot axis of said picker stick being spaced below said second pivotal connection of the link with the picker stick by a distance substantially equal to the length of the link, said picker and all said pivot points lying substantially in a straight line vertical to the direction of picker travel when said checking device is in a vertical position.

12. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker, linkage means to mount the picker stick on the assembly so that the picker moves substantially in a straight line, said linkage means comprising a first link pivoted to the assembly in a horizontal plane through the line of said picker travel and to said picker stick at a distance below said picker equal to the length of the link, and a second link member pivoted to the assembly and to the picker stick, and a check device mounted on said second link and having an arm permanently connected to said picker stick, the distance between said two pivots on the picker stick also equaling the length of said first link whereby the picker travels in a straight line and the checking force of said checking device cannot in any way affect the path taken by the picker.

13. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker fixed thereto, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a horizontal straight line, a check device having one element permanently connected to said picker stick, said linkage means comprising a link having a first pivotal connection with said assembly and a second pivotal connection with said picker stick, a guide member for a lower portion of the picker stick, said guide member permitting pivoting and vertical motion of said lower portion and positively guiding said lower end portion laterally, whereby the checking force of said checking device cannot in any way affect the path taken by the picker, and means to provide adjustment of the location of said first pivotal connection in a direction substantially parallel to said picker motion whereby the path taken by said picker stick may be inclined.

14. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker fixed thereto, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a horizontal straight line, and a double-acting check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a first link having a pivotal connection to said assembly and to said picker stick and a second link pivoted to a lower portion of the picker stick and to said assembly to provide laterally guided vertical motion of the end portion of said picker stick whereby the checking force of said checking device cannot in any way affect the path taken by the picker, and means to provide for adjustment of the pivotal connection of said first link with said as-

sembly in a direction substantially parallel to the path of the picker motion whereby said path may be inclined.

15. In a loom, a frame, rock shaft, and lay assembly comprising a picker stick and a picker, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, and a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a first link having a first pivotal connection with said assembly adjustably positionable in a horizontal plane through the line of said picker travel and a second pivotal connection with said picker stick at a distance below said picker equal to the length of the link, and a second link member having a pivotal connection with said assembly and with a lower portion of the picker stick, said two pivotal connections with the picker stick being spaced by a distance substantially equal to the length of said first link.

16. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, and a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a link having a first pivotal connection with said assembly in a horizontal plane through the line of said picker travel and a second pivotal connection with said picker stick at a distance below said picker equal to the length of the link, said second connection having adjustment means whereby said picker may be adjustably positioned independently of said link, a guide member for a lower portion of the picker stick, said guide member permitting pivoting and vertical motion of said lower portion of the picker stick and positively guiding said portion laterally, whereby the checking force of said checking device cannot in any way affect the path taken by the picker, the lower pivot axis of said picker stick being spaced below said second pivotal connection of said link with the picker stick by a distance substantially equal to the length of the link.

17. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, a bracket on said lay assembly mounted for motion substantially parallel to the picker motion, a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a link pivoted to said adjustable bracket and to said picker stick and a guide member for a lower portion of the picker stick, said guide member permitting pivoting and vertical motion of said lower portion and positively guiding said lower end portion laterally, whereby the checking force of said checking device cannot in any way affect the path taken by the picker.

18. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker fixed thereto, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, and a double-act-

ing check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a first link pivoted to said assembly and to said picker stick and a second link pivoted to a lower portion of the picker stick and to said assembly to provide laterally guided vertical motion of the end portion of said picker stick whereby the checking force of said checking device cannot in any way affect the path taken by the picker, the pivotal connections of said links to said picker stick having adjustment means whereby the position of the picker may be adjusted independently of said links.

19. In a loom, a frame, rock shaft, and lay assembly, a picker, straight line motion linkage means for guiding said picker, a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said linkage, said linkage means comprising picker support means and a plurality of link members pivoted to said assembly and to said picker support means to provide substantially a straight line motion for the picker, said plurality of link members acting to positively constrain said picker in its motion whereby reaction of said check device in either direction cannot affect said picker motion, adjustment means between one of said plurality of link members and said assembly to provide for changing the direction of picker travel, and adjustment means between one of said plurality of link members and said picker support means to adjust the position of the picker relative to said link members.

20. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a horizontal straight line, and a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a first link pivoted to said assembly in a horizontal plane through the line of said picker travel and to said picker stick at a distance below said picker equal to the length of the link, a second link member pivoted to said assembly and to the picker stick, the distance between said two pivots on the picker stick also equaling the length of said first link, whereby the picker travels in a straight line and the checking force of said checking device cannot in any way affect the path taken by the picker, adjustment means to cause inclination of the picker path, and other adjustment means to cause the picker stick to pivot on said second link independent of said first link whereby the neutral position of the picker may be adjusted.

21. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker fixed thereto, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a horizontal straight line, and a double-acting check device having relatively movable elements; one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a first link having a pivotal connection to said assembly and to said picker stick and a second link pivoted to a lower portion of the picker stick and to said assembly to provide laterally guided vertical motion of the end portion of said picker stick whereby the checking force of said check-

ing device cannot in any way affect the path taken by the picker, means to provide for adjustment of the pivotal connection of said first link with said assembly in a direction substantially parallel to the path of the picker motion whereby said path may be inclined, and adjustment means at the pivotal connection of said first link and picker stick to provide for motion of said picker independent of motion of said link whereby the vertical position of said picker may be adjusted.

22. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker, linkage means to mount the picker stick on said assembly so that the picker moves substantially in a straight line, a check device having relatively movable elements one element being connected with said assembly and the other element permanently connected to said picker stick, said linkage means comprising a link pivoted to said assembly in a horizontal plane through the line of said picker travel and to said picker stick at a distance below said picker equal to the length of the link, and a guide member for a lower portion of the picker stick, said guide member permitting pivoting and vertical motion of said lower portion and positively guiding said portion laterally, whereby the checking force of said checking device cannot in any way affect the path taken by the picker, said picker, link pivot points, and the lower end of said picker stick all lying substantially in a straight line vertical to the direction of picker travel when said checking device is in a vertical position, and spring means to bias said picker stick to said neutral position when displaced therefrom in either direction.

23. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker fixed thereto, linkage means to mount the picker stick on said assembly, said linkage means comprising an upper link extending downward from said assembly and pinned to the assembly and to said picker stick, and a lower link extending substantially horizontally outwardly from said assembly and pinned to said assembly and to a lower portion of the picker stick, said links cooperating to guide the picker in substantially a straight line path, the center of gravity of said picker and link assembly being lowest when said picker is in an intermediate position whereby gravity tends to urge said picker to said intermediate position, spring means connected to said picker stick to urge the stick toward its outermost position, said spring means being substantially overcome by the effect of gravity on the picker stick and linkage with the stick in an intermediate shuttle-receiving position, means to actuate said picker stick at a point between said links, and a hydraulic check device having relatively movable elements, one element being connected to said

assembly and the other to said picker stick below said picker stick actuating means.

24. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker fixed thereto, linkage means to mount the picker stick on said assembly, said linkage means comprising an upper link extending downward from said assembly and pivoted to the assembly and to said picker stick, and a lower link extending substantially horizontally outwardly from said assembly and pivoted to said assembly and to a lower portion of the picker stick, said links cooperating to guide the picker substantially in a straight line path, the center of gravity of said picker and link assembly being lowest when said picker is in an intermediate position whereby gravity tends to urge said picker to said intermediate position, means to actuate said picker stick at a point between said links, and a hydraulic check device having relatively movable elements, one element being connected to said assembly and the other to said picker stick below said picker stick actuating means.

25. In a loom, a frame, rock shaft, and lay assembly, a picker stick and a picker fixed thereto, linkage means to mount the picker stick on said assembly, said linkage means comprising an upper link extending downward from said assembly and pinned to the assembly and to said picker stick, and a lower link extending substantially horizontally outwardly from said assembly and pinned to said assembly and to a lower portion of the picker stick, said links cooperating to guide the picker in a substantially straight line path that rises slightly during a final portion of the power stroke, said links being arranged so that the picker passes through its vertical position on the power stroke, and a hydraulic check device connected between said assembly and picker stick and arranged to check outward motion of said stick as it moves from its vertical position under impact of the shuttle.

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