

(No Model.)

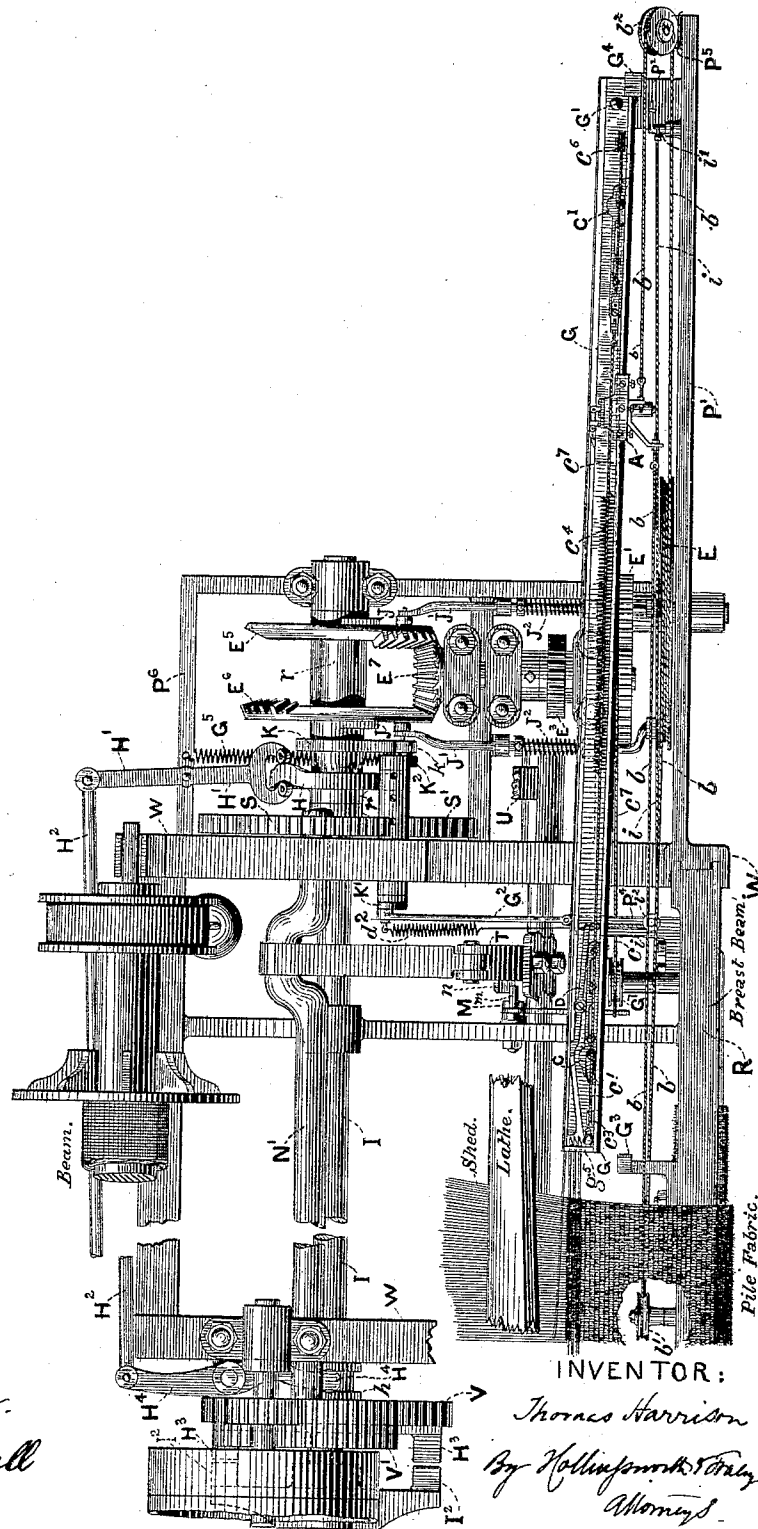
6 Sheets—Sheet 1.

T. HARRISON.
LOOM FOR WEAVING PILE FABRICS.

No. 440,592.

Patented Nov. 11, 1890.

FIG. 1.



WITNESSES:

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(No Model.)

6 Sheets—Sheet 2.

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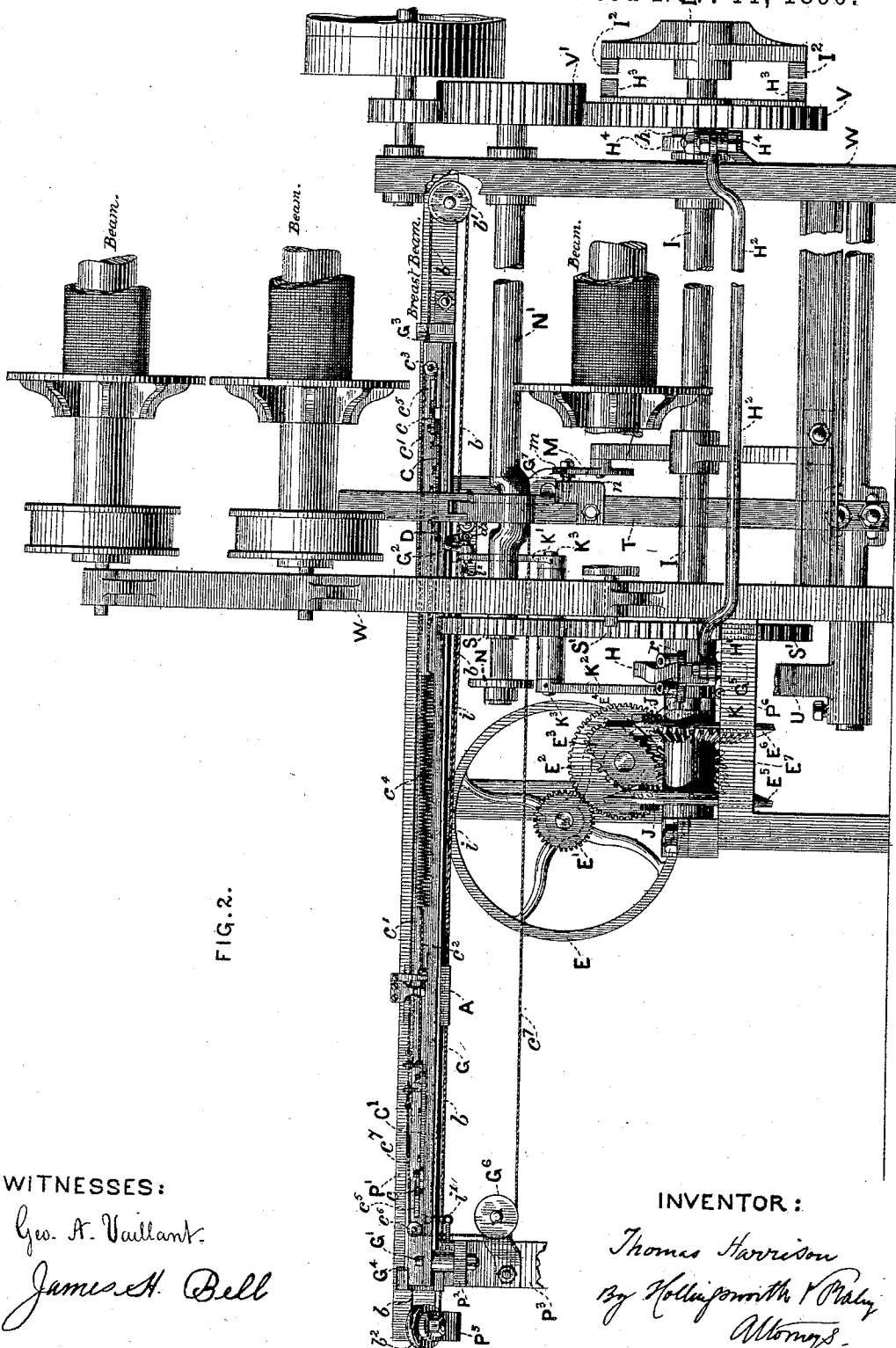


FIG. 2.

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(No Model.)

6 Sheets—Sheet 3.

T. HARRISON.
LOOM FOR WEAVING PILE FABRICS.

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FIG. 4.

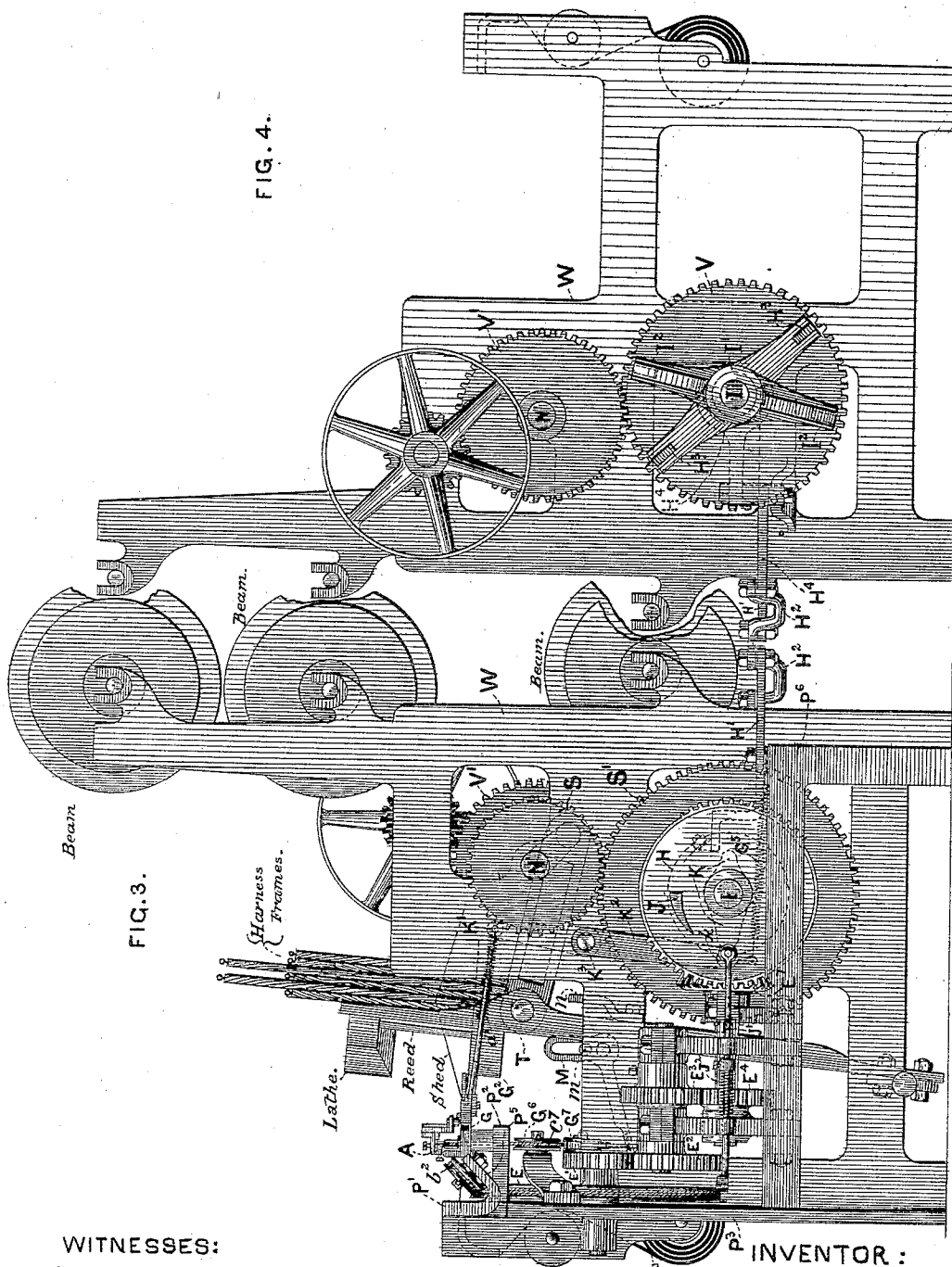


FIG. 3.

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(No Model.)

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FIG. 5.

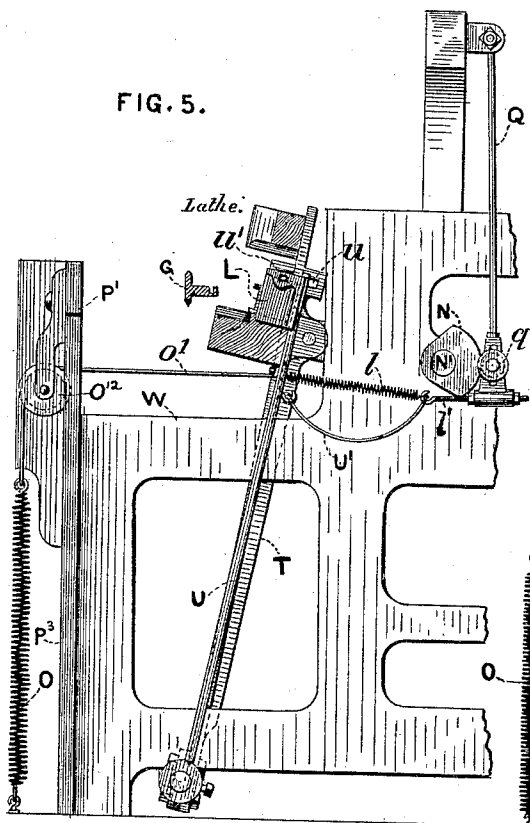


FIG. 6.

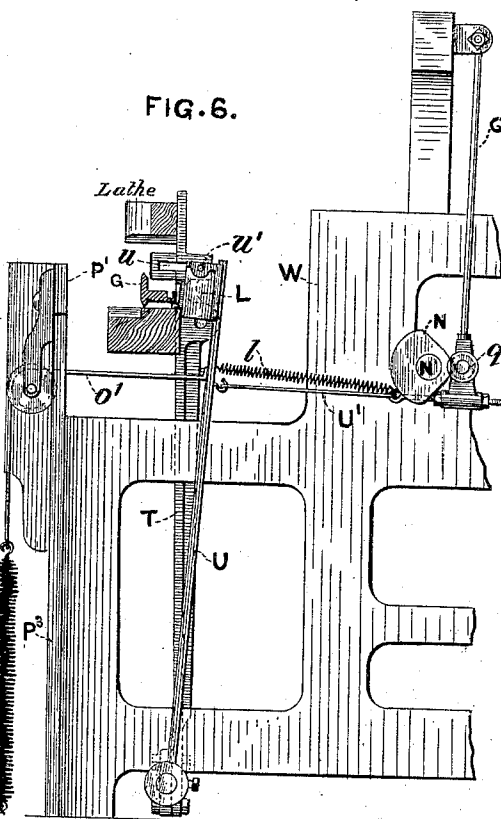
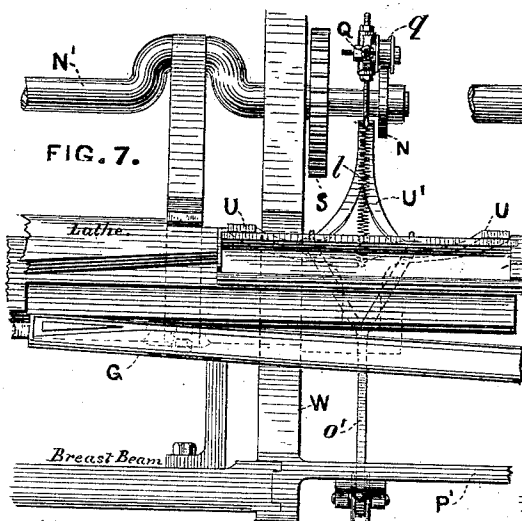


FIG. 7.

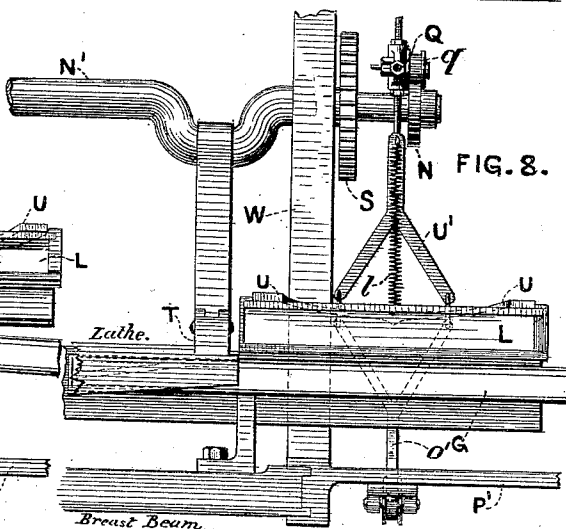


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FIG. 8.



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(No Model.)

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Patented Nov. 11, 1890.

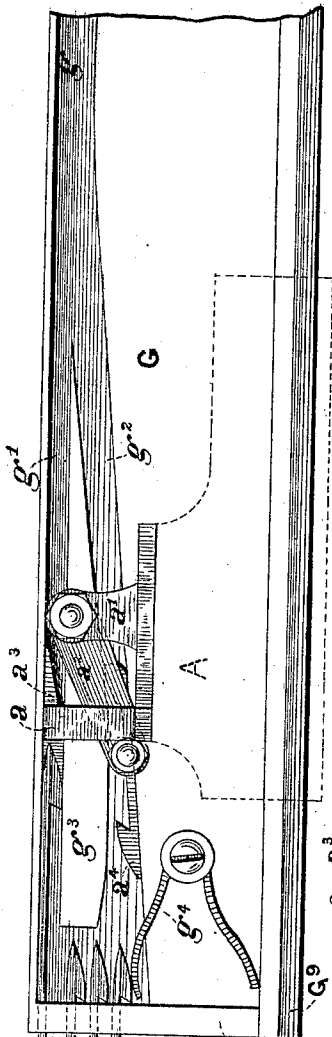


FIG. 9.

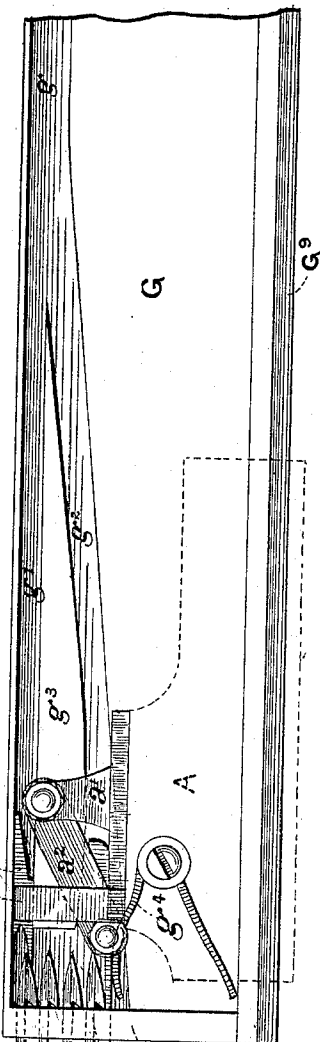


FIG. 10.

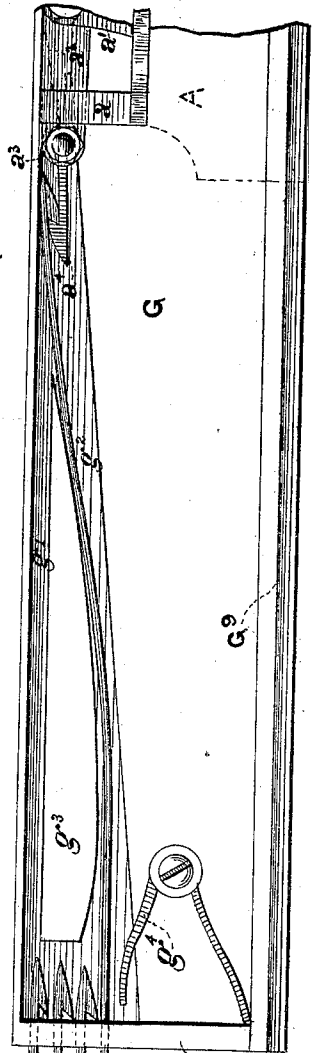


FIG. 11.

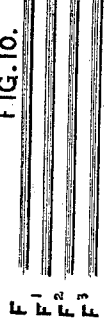


FIG. 12.

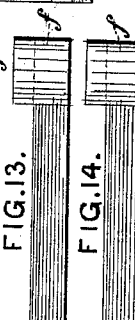


FIG. 13.

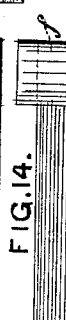


FIG. 14.

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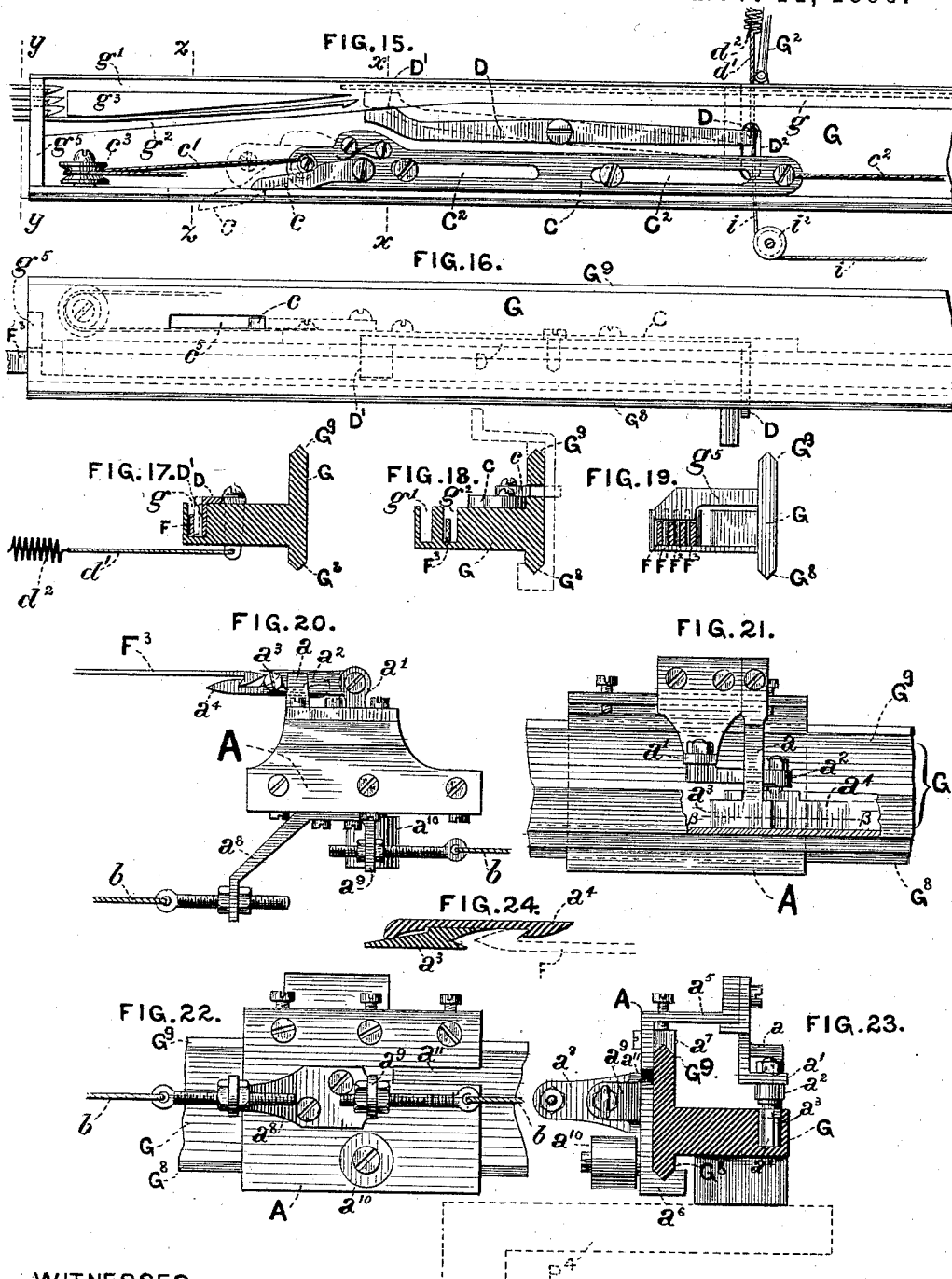
(No Model.)

6 Sheets—Sheet 6.

T. HARRISON.
LOOM FOR WEAVING PILE FABRICS.

No. 440,592.

Patented Nov. 11, 1890.



WITNESSES:

Geo. A. Vaillant.
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UNITED STATES PATENT OFFICE.

THOMAS HARRISON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
SCHEPPERS BROTHERS, OF SAME PLACE.

LOOM FOR WEAVING PILE FABRICS.

SPECIFICATION forming part of Letters Patent No. 440,592, dated November 11, 1890.

Application filed July 16, 1887. Serial No. 244,457. (No model.)

To all whom it may concern:

Be it known that I, THOMAS HARRISON, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Looms for Weaving Pile Fabrics, whereof the following is a specification, reference being had to the accompanying drawings.

My invention is adapted to the production of a looped fabric whose loops may be subsequently cut to form a pile or left intact, as may be preferred, and the improvements belong to that class of looms which form such a fabric by the insertion of wires or "needles" beneath the warp-threads at proper intervals during the weaving operation.

The object of my improvements is to insert and withdraw the needles automatically with great precision and without affecting to any great extent the rapidity of the weaving.

In the accompanying drawings, Figure 1 represents a partial top or plan view of a loom to which my improvements have been applied; but in this figure, as well as in the other general views, many of the common well-known parts of the loom are not represented, since their construction, as well as their position, is familiar to all skilled in the art. Fig. 2 is a partial rear view of the loom. Fig. 3 is an end view taken from that side on which the raceway is situated. Fig. 4 is an opposite end view showing only the driving-wheels. Fig. 5 is an end view, partly in section, showing the position of the lathe and shuttle-box at one extreme of their movement, all other parts being omitted. Fig. 6 is a similar view showing the lathe and shuttle at the other extreme position. Fig. 7 is a top or plan view of these parts in the position of Fig. 5. Fig. 8 is a top or plan view of said parts in the position shown in Fig. 6. Figs. 9, 10, and 11 are top or plan views on a much enlarged scale of the free end of the oscillating raceway, showing several positions of the needles and traveling carriage. Fig. 12 is an edge view of the needle, and Fig. 13 is a side view thereof. Fig. 14 is a side view of a modified form of needle adapted not only to make the loops, but to cut them for producing the pile. Fig. 15 is a top or plan view of the free end of the raceway, showing certain

working parts which are omitted in the other enlarged views thereof. Fig. 16 is a side view of the same. Figs. 17, 18, and 19 are sectional views of the same on the lines xx zz yy respectively. Fig. 20 is a top view of the traveling carriage. Fig. 21 is a view thereof from the rear of the loom, showing part of the race therefor; Fig. 22, a view thereof from the front of the loom; Fig. 23, an end view thereof; and Fig. 24 is a partial sectional view showing the devices which grasp the needle end for effecting its insertion and withdrawal.

To avoid prolixity of description the names of certain parts of the loom are inscribed upon the drawings to indicate the positions thereof.

Referring now to the general views of Figs. 1, 2, and 3, it will be seen that upon the right-hand end of the frame W is a horizontal extension P^1 , from the outer end of which the horizontal bracket P^2 projects laterally. A vertical leg P^3 , extends down to the floor and supports the outer extremity of the extension P^1 .

Upon the bracket P^2 is a vertical pivot G^1 , by means of which the raceway G is attached so as to be capable of a limited swinging movement in a horizontal plane, being supported and sliding upon a piece P^4 , which projects laterally from the breast-beam P^5 . The raceway G consists of a metallic strip or bar somewhat longer than the needle and having a deep groove g , which extends the entire length along one side. Near the free end of the raceway the groove widens (see Fig. 9) and is divided through a portion of the wide part by a raised piece or switch g^3 , so as to form two passages, one of which g^1 is the straight continuation of the main groove g , the other g^2 being a lateral switch, which leads therefrom to the end of the raceway, where the two again communicate, as shown, so as to accommodate several needle-heads side by side. A guard-strip g^5 extends across the top of the wide opening thus formed.

Extending along the side of the raceway opposite to the groove g are guide-rails G^8 G^9 , (see Figs. 17 to 23,) which project both above and below the surface of the raceway and have beveled edges to fit the guides upon the traveling needle-carriage A . The details of

this carriage and its actuating mechanism will be described farther on, it being sufficient for present purposes to state that the carriage rides upon the raceway from end to end thereof, and is provided with devices traveling in the grooves of the raceway adapted to thrust out a needle and release it and subsequently to grasp and draw in another one. The groove g' is the exit-passage and the groove g^2 the entrance through which these movements are effected.

The raceway G extends inward upon a level with the lower part of the reed to some distance beyond the inner end of the shuttle-box, which latter, as will hereinafter be described, is mounted upon a separate frame of its own, and is not directly connected with the lathe, as is usually the case.

The needles $F F' F^2 F^3$ (see Figs. 12 and 13) are thin strips of steel somewhat longer than the width of the fabric to be woven. The front end of the needle is rounded and (except when the loops are to be cut) the edges are blunt. The rear end of the needle is provided with a barbed projection f , somewhat wider than the needle itself and adapted to be grasped by the devices upon the traveling carriage A. These needles are to be inserted one at a time into the "shed," the insertion being made, as indicated in Fig. 1, when the reed is in its rearmost position. On the forward movement of the reed the needle is to be brought up closely against the edge of the already-woven fabric, and as many picks as may be desired between the rows of loops are then woven.

I prefer to employ, say, four needles, as indicated in the drawings, in order that they may remain in the fabric until it has been firmly woven for some distance beyond the one which is to be withdrawn. It will thus be seen that the range of oscillation of the raceway must be sufficient for it to present the entering needle where the opening of the shed is sufficiently deep to insure its free passage and (since the rear end of the needle always remains in the raceway) that it shall accompany the reed movement from the point of insertion until the needle has been pressed home against the fell of the fabric. The oscillation of the raceway necessary to meet these requirements is effected in the following manner: A rod G^2 is attached to the raceway near its free end and connected with the upper end of the lever K' . (See Figs. 1 and 2.) This lever is mounted upon one end of a horizontal rock-shaft K^3 , upon whose other end is a lever K^2 , provided with a friction-roller k . This friction-roller bears against the surface of a cam-piece K, mounted upon a sleeve r , which runs upon the picking-shaft I of the loom. A spring G^5 , attached to the end of the lever K^2 and to the frame P^6 , normally holds the friction-roller k up against the cam-piece K. The sleeve r is rotated by means of gears $S S'$, the former of which is mounted upon the driving-shaft N' , the lat-

ter S' being secured to the sleeve. It will be observed (see Fig. 3) that the cam-piece K has two cams—one considerably longer than the other—and at diametrically-opposite points. Therefore a single revolution of the cam-piece will give two forward and two backward movements to the lever K^2 , and consequently to the raceway G, one of said movements being about half the length of the other.

Assuming now that the proper device for inserting and withdrawing the needles is mounted upon the raceway, the time of the latter's movements with relation to the movements of such device are as follows: When the shed is wide open and the reed in its rearmost position, the needle is to be inserted. At this moment the portion of greatest eccentricity of the cam K is against the roller k , and the raceway G is thus thrown to the extreme inward position toward the reed. The needle-inserting device is then in operation and the parts are in the positions shown in Figs. 1, 2, and 3. The insertion of the needle having been completed, the revolution of the cam permits the spring G^5 to retract the lever K^2 , and thus throws the raceway G outward, accompanying the forward motion of the reed. When, however, the proper moment has arrived for the withdrawal of the needle, the rotation of the sleeve r brings the shorter of the two cams upon the cam-piece K to bear against the roller k . This produces a slight inward movement of the raceway, sufficient, however, to bring the needle to be withdrawn properly in line with the withdrawing device, and thus avoids too great a lateral strain upon the needle and the fabric, as might be the case were the withdrawal effected while the raceway G was at its extreme outward position. The needle-withdrawing device then acts, the raceway is again actuated by the cam K so as to throw it into the extreme inward position, and the series of movements is repeated.

The traveling carriage A consists of a flat back piece provided upon one side with guide-pieces $a^6 a^7$ at top and bottom, each of which is grooved correspondingly with the bevel of the guide-rails $G^8 G^9$. On the outer side are suitable attachments $a^8 a^9$ for the actuating-cords b , by means of which it is to be moved. The top a^5 of the carriage overhangs the raceway G and carries two downwardly-depending legs $a a'$, the former a of these terminating in a notched carrier-head a^3 . This head consists of a short horizontal piece notched perpendicularly across its front end and somewhat narrower than the groove g . The notch of this carrier-head a^3 receives the end of the needle. The other leg a' carries an arm a^2 , attached thereto by a vertical pivot, so that said arm can swing in a horizontal plane, and to the other end of said arm a^2 is pivoted a barbed hook a^4 , which consists of a thin horizontal piece having a pointed front end and barbed upon the side which is toward the carrier-head. When the arm a^2 is in one position, the needle-hook a^4 fits snugly up against

the carrier-head a^3 , as shown in the sectional view of Fig. 24. When in this position, the combined thicknesses of the carrier-head a^3 and hook a^4 are such that they fit snugly within the groove g ; but by reason of the horizontal swinging arm a^2 the hook a^4 can, when the switch-groove g^2 is reached, separate from the carrier a^3 and travel in an independent path.

Assuming now that the cords b by which the carriage A is driven are actuated at the proper times and in the necessary direction, and supposing that the carriage is at the extreme outer end of the raceway, with the needle lying in the groove g and having its head inserted in the notch of the carrier-head a^3 , the operation is as follows: The carriage is actuated rapidly toward the loom, and the needle-carrier head a^3 pushes the needle along the groove g and out beneath the guard-strip g^5 , thrusting it into the shed. When the carriage reaches the point where the groove g^2 diverges from the main groove g , the point of the barbed hook a^4 strikes against the inclined side of the raised dividing-strip g^3 and is deflected (the arm a^2 swinging laterally to adapt itself to this movement) down the switch-groove g^2 . The carrier-head a^3 , however, remains in the groove g' and continues to push the needle downward. This position of the parts is shown in Fig. 9, where the insertion of the needle is nearly completed.

Assuming now that the preceding needles have been duly inserted in this manner and that the extreme one F^3 is ready to be withdrawn, the action of the withdrawing device is as follows: The shorter elevation of the cam K having operated, as before described, the raceway is thrown slightly inward, so as to bring the needle to be withdrawn nearly in line with the prolongation of the switch-groove g^2 . The barbed hook a^4 has traveled down the switch-groove g^2 and is protruded beyond the end of the raceway, as shown in Fig. 10. A light spring g^4 , mounted near the end of the raceway, presses against the arm a^2 . This throws the barb of the hook a^4 into engagement with the barb f of the needle. The return movement of the carriage then commences, and the barbed hook a^4 withdraws the needle from the fabric and pulls it back along the switch-groove g^2 into the groove g . The length of the groove g is such that at the time the carriage has completed its return movement the point of the needle has cleared the end of the projection g^3 , so as to lie flat within the groove g .

To prevent the needle from diverging down the switch-groove g^2 when the movement of insertion takes place, I mount upon the raceway near the switch (see Fig. 15) a horizontally-swinging lever D, having at that end which is close to the entrance of the switch g^2 a downwardly-depending piece D', extending down into the groove. This piece D' is received within a slight recess in the wall of the groove when the parts are in the posi-

tions shown in the solid lines, so as to lie flush with the surface of the groove; but when thrown outward, as indicated by the dotted lines, the piece D' will press the needle up against the opposite wall of the groove, and thus prevent any tendency on the part of the needle to run down the switch-groove g^2 . At its other extremity the lever D is bent at right angle and projects down through the slot D², which extends partly across the raceway G, and to this downward extension of the lever are attached cords d' , leading to actuating mechanism, which will be described hereinafter.

As it is essential that the carriage A should reach exactly the proper point at each end of the raceway, I prefer not to rely upon the main actuating mechanism only, but provide a supplemental device, by means of which if it fails to reach the proper limit it will be pushed home. One of these devices is placed near each end of the raceway, and as they are similar in construction they will be described by reference to Figs. 15 and 16, which show the one at the end nearest the loom. A slide C, having suitable guide-slots C², is mounted upon the top of the raceway G. This slide carries a spring-actuated pawl c , which normally bears against the inside of the guide-rail G³. An elongated slot c^5 , however, is formed through this guide-rail G³, so that when the slide C is moved to the position shown in the dotted lines of Fig. 15 the pawl will protrude through the slot and can move forward for a limited distance. A cord c' is attached to the front end of the slide and passes around the pulley c^3 and thence back along the raceway to the slide C', to the end of which it is suitably attached. The construction of this second slide C' and its pawl is exactly similar to that of the slide C and its pawl, excepting that they face in opposite directions, the operative movement of each being toward the end of the raceway to which they are adjacent. A cord c^7 is attached to the slide C' and thence passes over the pulley C⁶ and down through the raceway to a pulley G⁶, whence it leads to suitable actuating devices, hereinafter described. Cords c^2 lead from the rear ends of each slide to a spiral spring C⁴, situated near the middle of the raceway G. When the actuating mechanism pulls upon the cord c^7 , both of the slides C will be pulled toward the respective ends of the raceway, and the pawls will be protruded. This movement of separation of the slides produces a tension of the spring c^4 , since each of them is moved away from the other, and thus elongating the spring. When therefore the cord c^7 is relaxed, the two slides will be drawn back toward one another into the non-operative positions. As will presently be explained, the movement of the actuating mechanism of the slides is timed relatively to the movement of the carriage A, so that when the carriage has just passed the point at which the pawl protrudes the slides

will operate, and at whichever end of the raceway the carriage may be when pulled the pawl of the proper slide will engage behind it, push it home to the proper point, and hold it there until the actuating mechanism of the cord c^7 releases it, whereupon the slides move back, the pawls are drawn in, and the carriage is free to move again.

The limit of motion of the carriage is fixed by stops G^3 and G^4 , mounted upon the frame at each end of the raceway.

The actuating devices of the carriage itself and of the other members whose movements must have a definite relation thereto will now be described. (See Figs. 1, 2, and 3.)

Upon the sleeve r , running on the shaft I, are mounted two mutilated bevel-gears E^5 E^6 , whose toothed portions are adapted to alternately engage with the bevel-pinion E^7 . Upon the shaft of this pinion is mounted an elliptical gear E^4 , which engages with a corresponding elliptical gear E^3 . Upon the end of the shaft of the elliptical gear E^3 is a large gear E^2 , meshing with a pinion E' , which is secured to a shaft of a large grooved pulley E. A cord b , preferably of wire, is passed two or three times around this pulley E. Thence it passes to one side around a pulley b^2 , mounted upon the extreme outer end of the extension P' , and thence to a suitable attachment, as a^9 , upon the carriage A. Upon the other side of the pulley E a cord b passes to a pulley b' , mounted upon the inside of the breast-beam R, whence it returns to a suitable attachment, as a^8 , upon the carriage A. Upon the rotation of the sleeve r one of the mutilated bevel-gears will engage with the pinion E^7 , and through the train of elliptic gears E^3 E^4 , gear E^2 , and pinion E' will rotate the pulley E, while of course the train of elliptic gearing will cause it to move at first with a comparatively slow motion, then with a greatly accelerated speed throughout a large portion of the path, and then slow down again toward the end of the movement. A movement of this character is therefore communicated to the carriage A, which commences to move slowly, then moves very rapidly throughout a large portion of its travel, and then slows down again. This arrangement tends to prevent injury to the parts from the sudden shock which would be required in starting the carriage with the maximum speed necessary.

To further obviate the danger from a too sudden stoppage of the carriage at the end of its path and to overcome the momentum of the pulley E, I provide the latter with a pair of brakes, arranged as follows: Upon the outside of each of the gears E^5 E^6 is a cam J, in shape half a crescent. Two rods J' , sliding horizontally in suitable guides, are each provided with a roller, against which the cam J will bear, and as it advances will of course move the rod longitudinally. The other ends of the rods are provided with rubber pads, which when the rods are actuated by the

cams J press against the rim of the pulley E. The return of the rods J' is effected by means of coiled springs J^2 , which surround them and which are compressed by the forward movement.

Supposing now that the mutilated gear E^5 has just acted on the bevel-pinion E^7 , and its cam J has at the close of its operative movement pushed the brake against the pulley E, the rotation of the sleeve r then continues, the brake is released and springs back to its original position, and the opposite mutilated gear E^6 has reached the operative point. Its teeth then engage with the pinion E^7 and produce through the train of gearing a reverse movement of the pulley E of varying velocity, like that above described, by means of which the carriage A is brought back to its position at the other end of the raceway. Near the close of this movement the cam J of the gear E^6 operates the brake J' upon that side and checks the movement of the pulley at the proper time, so that a single rotation of the sleeve r produces both a forward and backward movement of the carriage A, and, as has been before described, also produces the oscillating movement of the raceway G, which permits the proper insertion and withdrawal of the needle. Just as the carriage reaches the extreme of its path at the outer end of the raceway, it trips a small bell-crank lever i' , to which a cord i is attached, leading from around the pulley i^2 , (see Figs. 1 and 15,) and thence to the downwardly-projecting end of the lever D. Therefore when the carriage in drawing out the needle reaches the end of its outward travel it operates (by means of this lever i' and cord i) the lever D, whose projection D' is brought to bear up against the end of the needle now in the groove g , so as to throw it close up against the side of the groove, and thus insure its delivery by the groove g' , instead of risking a divergence down the switch-groove g^2 . A cord d' leads from the downwardly-projecting end of the lever D to a coiled spring d^2 , which is attached to the outer end of the lever K'. This spring is extended, of course, by the movement of the cord i in actuating the lever D, and therefore as soon as the carriage A commences to return and frees the bell-crank lever i' this spring d^2 throws the lever D back into its normal position, so that the piece D' is brought back flush with the side of the groove.

The movement of the cord c^7 , which is to actuate the slides C C', is derived from the bell-crank lever M, to one of whose arms the cord c^7 , after passing over the pulley G^7 , is attached. A pin m projects laterally from the other arm of the lever M in such a position as to be struck by the piece n , mounted upon the lathe T, when the latter has nearly completed this forward movement. Thus the sequence of movements of the several parts will be as follows: When the reed is in the rearmost position, the shed open, and the

raceway swung to the extreme innermost position toward the reed, as shown in Fig. 1, the mutilated gear E⁵ commences to operate, the carriage A runs along the raceway toward the loom and inserts the needle, the forward movement of the reed begins, and the raceway swings in the same direction as that in which the reed is traveling. By the time the carriage has almost reached the extremity of its inward movement and when its rear end is just opposite to the inner slot c⁵ the projection n upon the lathe strikes the pin m, and by means of the lever M pulls the cord c⁷, throwing the slide C forward, so that the pawl c, protrudes through the slot c⁵, engages with the rear end of the carriage A, and pushes the latter home into contact with the stop G³, the oscillation of the raceway G having brought its end over so as to be close to the said stop. The return movement of the reed then takes place, and the pawl c is retracted by the backward movement of the slide C, so that the carriage is now free to return. The shorter elevation of the cam K now becomes operative, and by means of the levers K² K', rock-shaft K³, and rod G² throws the raceway G partly inward to bring the needle about to be withdrawn into proper relation with the widening groove. The return movement of the carriage is effected by means of the gear E⁶. As soon as the rotation of the sleeve r brings it into play, it thereupon causes the backward movement of the carriage, withdrawing the needle and receiving a similar home-thrust from the pawl upon the slide C' upon the outer end of the raceway. On completing this outward movement the carriage trips the lever i', which in turn actuates, by means of the cord i, the lever D. After the desired number of picks have been woven, these movements recur; but as it is necessary that there should be an intermission of the shuttle movement during the carriage movement I accomplish this in the following manner: The sleeve r, which runs upon the picking-shaft I, as before described, carries a ring-cam H, adapted to bear against a bifurcated lever H', mounted upon the frame P⁶ and having a connecting-rod H², which leads to a lever H⁴, pivoted at the opposite end of the main frame. This lever H⁴ is bifurcated to embrace a sliding collar h, mounted upon the picking-shaft I and secured to the inner side of a gear V, which also slides upon said shaft. Said gear V has upon its outer face projecting lugs H³, and upon the extreme outer end of the picking-shaft I is mounted a cross-head I', which has inwardly-projecting lugs I², adapted to engage with the lugs H³ when the latter are thrust outward by the shifting of the gear V upon the shaft I. The gear V is driven by a gear V' of sufficient width of face to permit the necessary shifting movement of the gear V upon the shaft I. The action of the ring-cam H is of course to shift the lever H', and through the connecting-rod H² and lever H⁴ disengage the lugs H³ from the lugs I², so that

the rotation of the picking-shaft I is intermittent during a half-rotation of the gear V, which corresponds to the carriage movement. The shuttle is driven from the picking-shaft I in the ordinary manner, which need not be described.

Upon Sheet 4, Figs. 5, 6, 7, and 8, are shown those modifications of the lathe and shuttle-box which are rendered necessary by the position of the new parts. Instead of being attached to the end of the lathe, the shuttle-box is mounted upon a separate oscillating frame U of its own, the shuttle-box L of course terminating in close proximity to the end of the reed and having a pin u', which moves in a guide-slot u, mounted on the end of the lathe.

Upon the end of the shaft N' from which the lathe is driven I mount a cam N, which bears against a roller q, attached to a swinging rod Q, mounted upon an upper portion of the main frame. To the lower end of this rod is attached a Y-shaped strap U', whose ends are secured to the shuttle-box. A similar strap O' is attached upon the opposite side of the shuttle-box frame U and passes over the roller O¹² to a strong coiled spring O. When the lathe moves forward, the shuttle-box is also brought forward by means of the spring O; but the forward motion is limited by the strap U'. This position of the parts is shown in Fig. 6, where it will be seen that the lathe has moved forward sufficiently for the reed to be almost in contact with the end of the raceway G, while the shuttle-box, which is about upon a level with said raceway, remains in the rear thereof. The configuration of the cam N is such that immediately before the return movement of the latter commences said cam begins to draw back the shuttle-box, so that at the time the lathe overtakes it it is moving with sufficient velocity to avoid any dangerous shock. When, however, it is overtaken, its rearward movement is completed by the lathe movement, the pin u' serving to couple it thereto. The strap U' is now relaxed, as shown in Fig. 5. As soon as the lathe commences its forward movement, the spring O causes the shuttle-box L to follow the lathe movement until the strap U' again checks it.

I provide a spring l, attached at one end to the shuttle-box L and at the other to the hook l' upon the end of the swinging rod Q, in order to keep the roller q always in contact with the cam N.

From the foregoing description it will be seen that by varying the relations of the gears from which the carriage movement is derived any desired variation in the intervals of insertion of the needles can be obtained.

When the loops are to be cut during the weaving operation, I employ the needle F⁴, (shown in Fig. 14,) which has an enlarged end f', made very sharp on its upper edge. As the needle is withdrawn, this enlargement f' distends the loops and cuts them, so as to form the pile.

Having thus described my invention, I claim in a loom for weaving pile fabrics, &c., the following devices and combinations thereof:

1. The combination, with the traveling carriage having needle-inserting and needle-withdrawing devices, substantially as described, of the oscillating raceway having a straight longitudinal groove and a lateral switch-groove communicating with said straight groove at a point beyond which the end of the needle passes when withdrawn, said grooves also communicating by an open space extending across the front end of the raceway, a horizontally-swinging lever provided with a downwardly-depending piece which extends down into said main groove at the entrance of the switch-groove, actuating mechanism for said lever, and a stationary guard-strip extending over said open space at the front end of the raceway, substantially as set forth.
2. The combination, with the raceway G, having grooves g g' , and switch g^2 , of the traveling carriage, the needle-inserting device adapted to run in the groove g and the continuation g' thereof, and the needle-withdrawing device mounted upon a swinging arm and thereby adapted to travel in the groove g and to be deflected down the switch g^2 , substantially in the manner and for the purpose set forth.
3. The combination, with the raceway and the traveling carriage, of a slide mounted upon said raceway and a pawl carried by said slide and adapted to engage with the carriage, said slide being provided with actuating mechanism, substantially as described, whereby its pawl is operated in proper relation to the carriage movements, for the specified purpose.

anism, substantially as described, whereby its pawl is operated in proper relation to the carriage movements, for the specified purpose.

4. The combination, with the traveling carriage A, of a cord b , leading therefrom in both directions, a pulley E, around which said cord passes, a pinion E' , connected with said pulley, a gear E^2 , meshing with said pinion, an elliptical gear E^3 , connected with said last-mentioned gear, a second elliptical gear E^4 , engaging with the gear E^3 , a bevel-pinion connected with the gear E^4 , a pair of mutilated bevel-gears arranged in correlation, substantially as set forth, to engage alternately with said pinion, and actuating mechanism, as specified, for said mutilated gears.

5. The combination, with the oscillating raceway, the carriage traveling thereon, and the picking-shaft, of actuating mechanism for said shaft, a sliding clutch-coupling connecting said shaft with its actuating mechanism, a sleeve or collar r , mounted on said shaft, an actuating device, substantially as set forth, carried by said collar and connected, respectively, with the raceway and its carriage, the cam H, mounted upon said collar, shifting mechanism intermediate between said cam and said coupling, and actuating mechanism for said collar, whereby the motion of the picking-shaft is intermitted during the period of insertion of the needles.

THOMAS HARRISON.

Witnesses:

EDW. E. JOLY,
WM. SIMON.