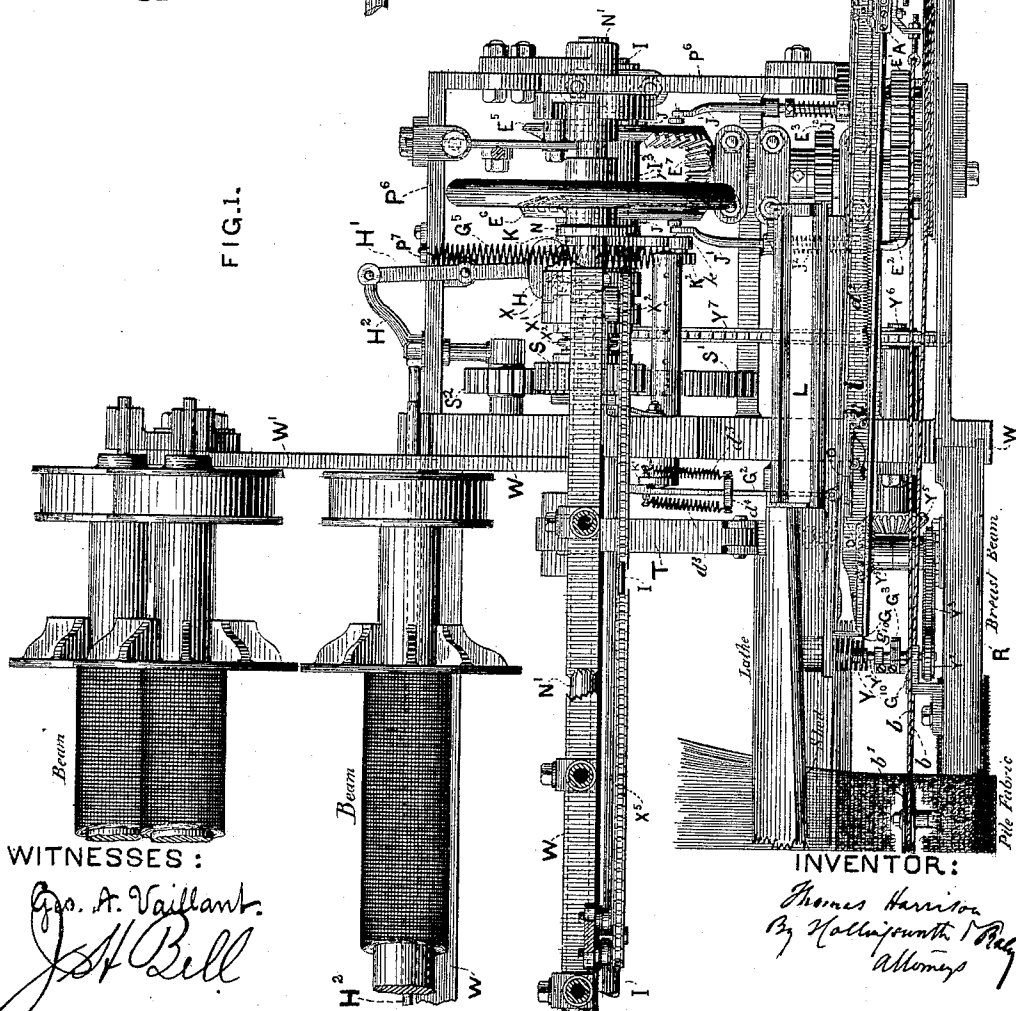
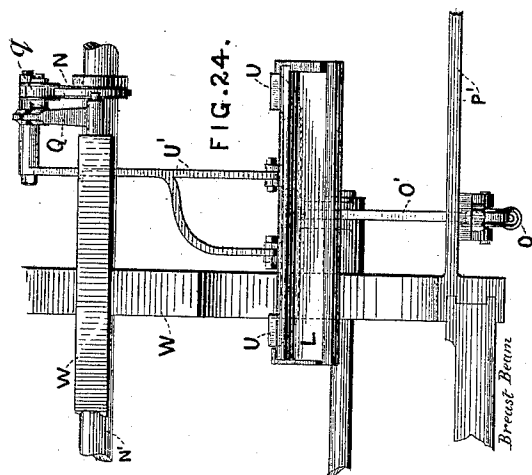


7 Sheets—Sheet 1.

No. 440,593.

Patented Nov. 11, 1890.



THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

7 Sheets—Sheet 2.

T. HARRISON.
LOOM FOR WEAVING PILE FABRICS.

No. 440,593.

Patented Nov. 11, 1890.

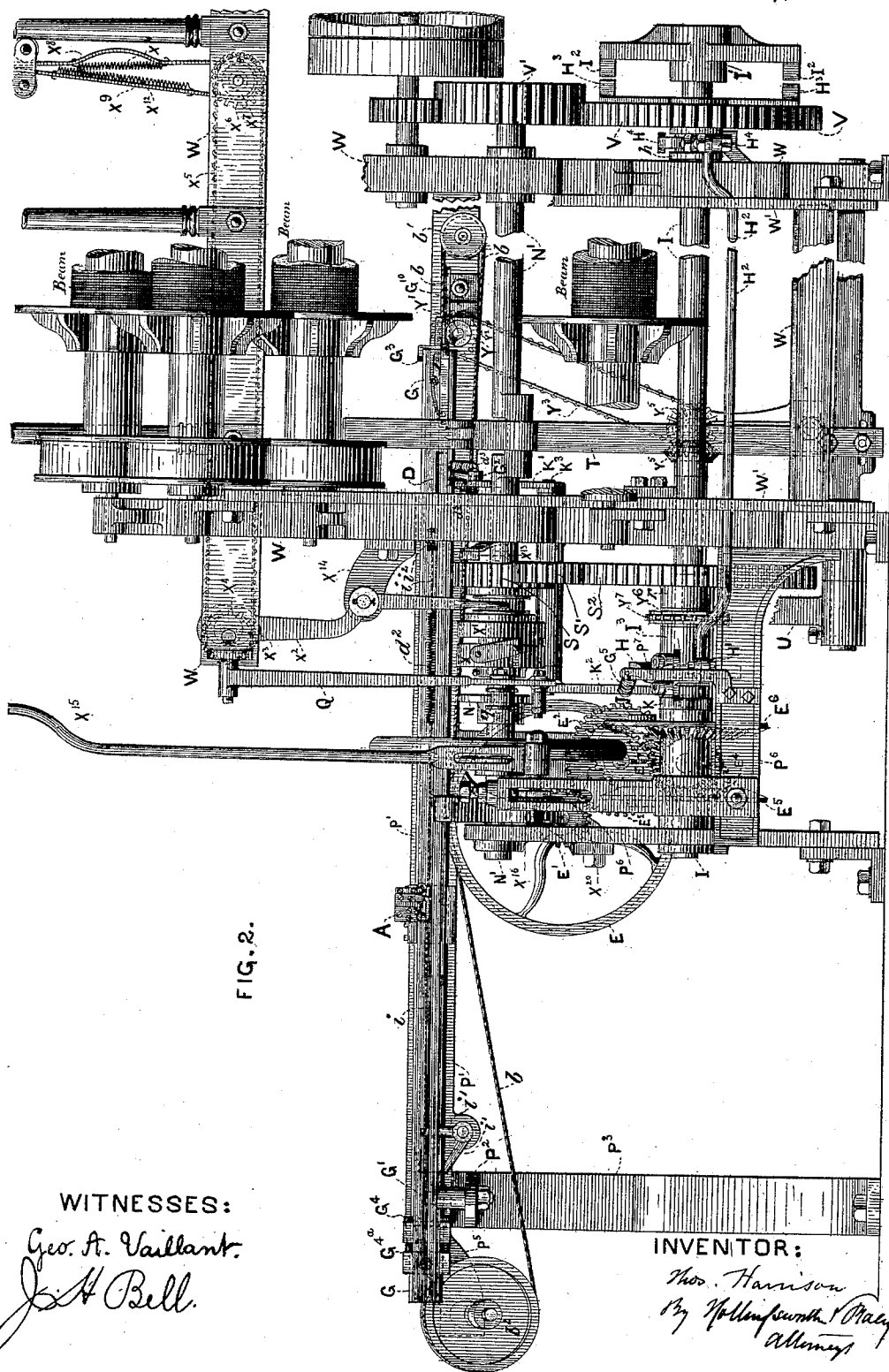


FIG. 2.

WITNESSES:

Geo. A. Vaillant.

J. H. Bell.

INVENTOR:

Thos. Harrison

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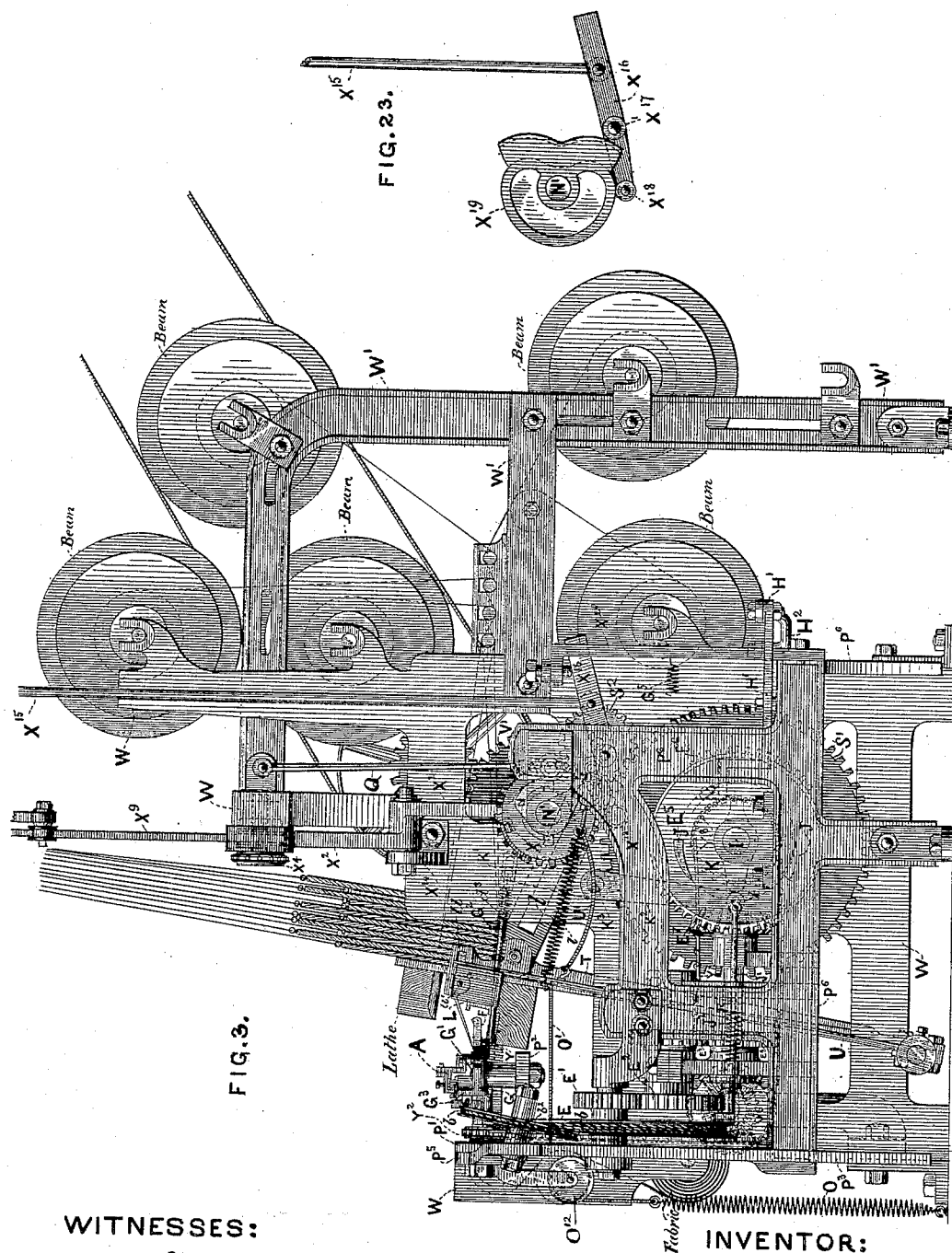
(No Model.)

7 Sheets—Sheet 3.

T. HARRISON.
LOOM FOR WEAVING PILE FABRICS.

No. 440,593.

Patented Nov. 11, 1890.



WITNESSES:

Geo. A. Vaillant.
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Attorneys.

(No Model.)

7 Sheets—Sheet 4.

T. HARRISON.
LOOM FOR WEAVING PILE FABRICS.

No. 440,593.

Patented Nov. 11, 1890.

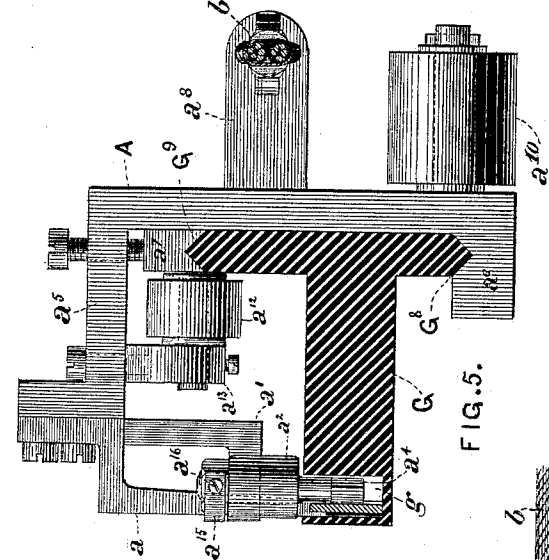


FIG. 5.

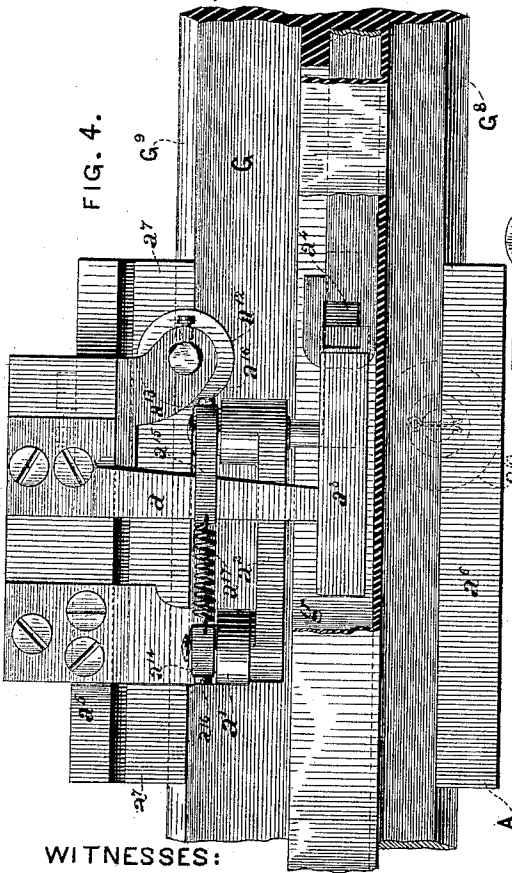


FIG. 4.

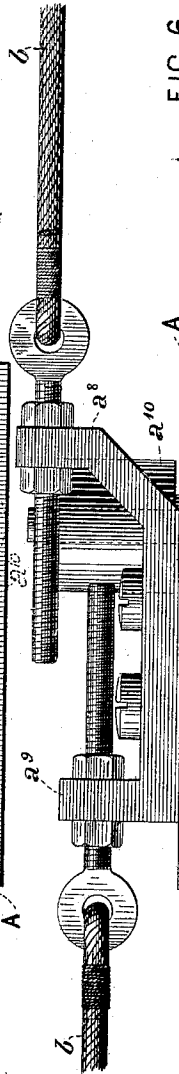
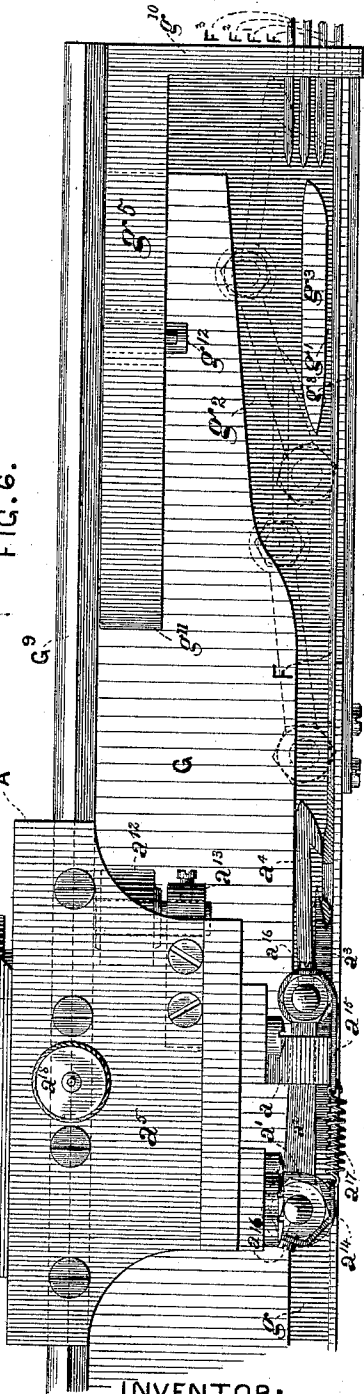


FIG. 6.



WITNESSES:

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(No Model.)

7 Sheets—Sheet 5.

T. HARRISON.
LOOM FOR WEAVING PILE FABRICS.

No. 440,593.

Patented Nov. 11, 1890.

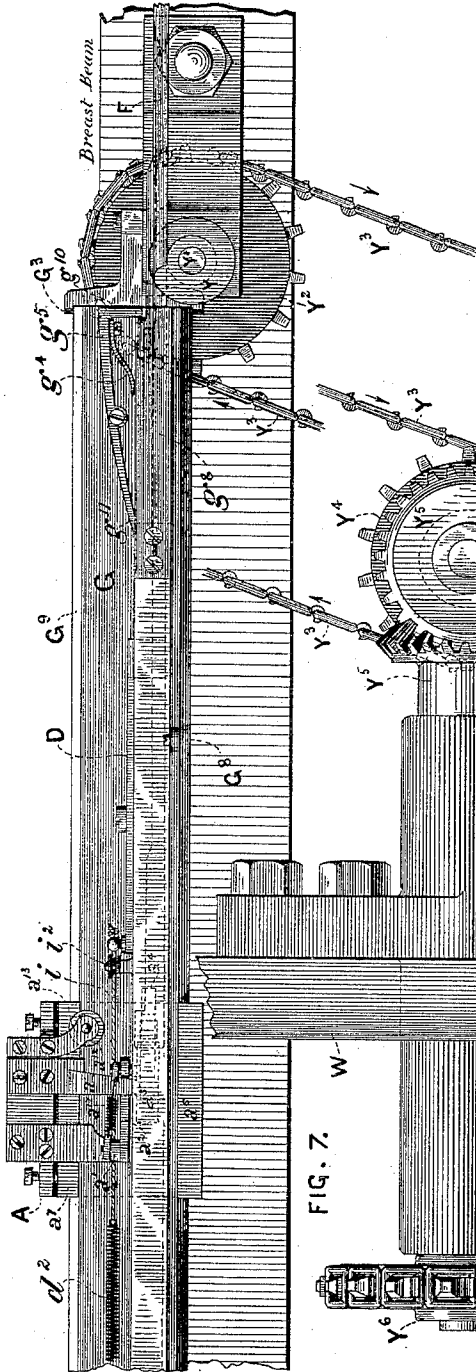
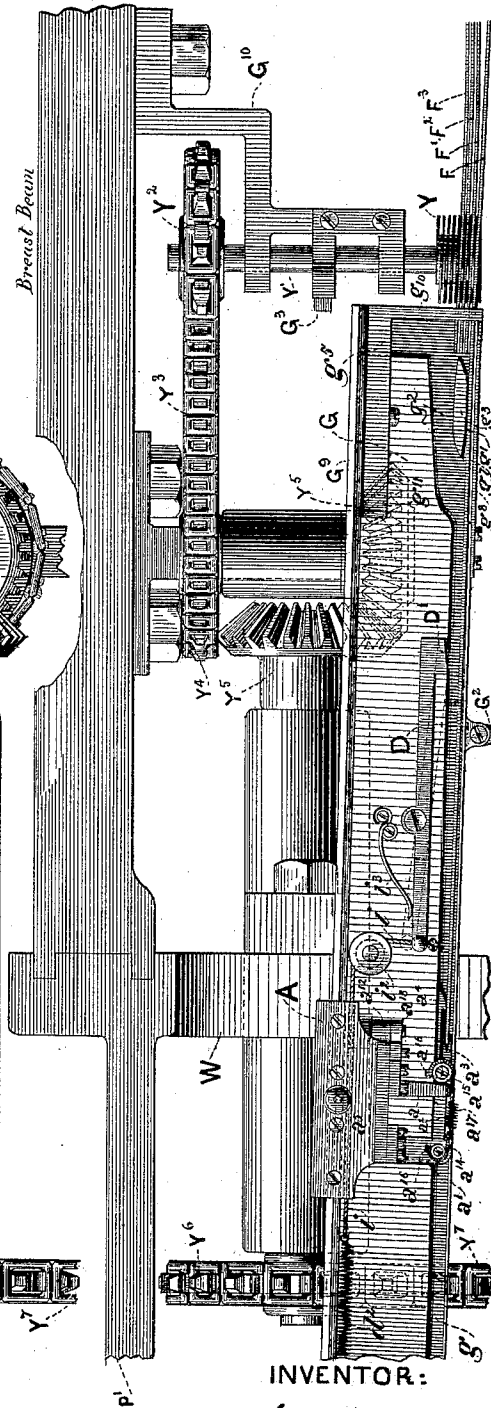


FIG. 7.

FIG. 8.



WITNESSES:

Geo. A. Vaillant.

J. H. Bell

INVENTOR:

Thos. Harrison
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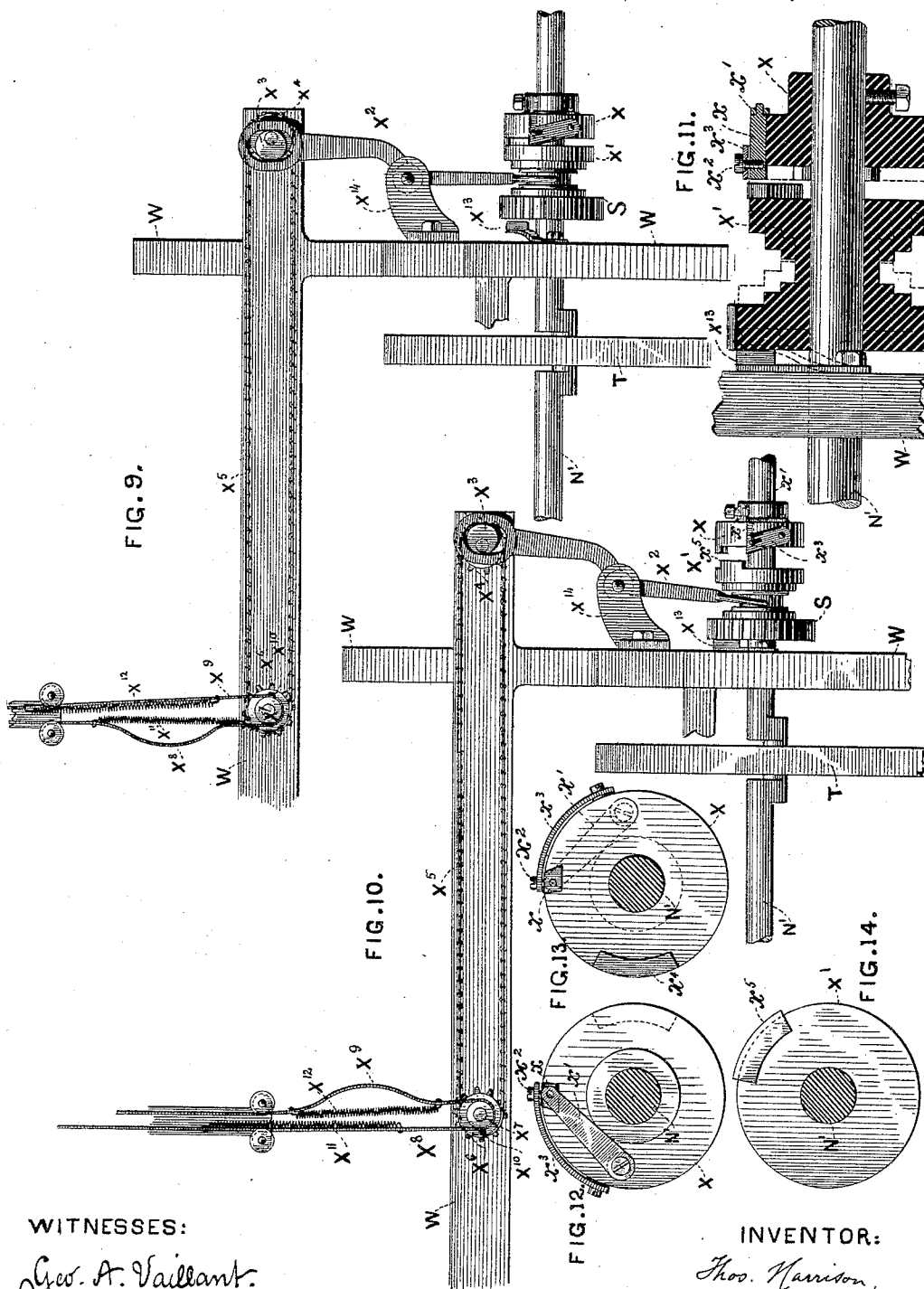
(No Model.)

7 Sheets—Sheet 6.

T. HARRISON.
LOOM FOR WEAVING PILE FABRICS.

No. 440,593.

Patented Nov. 11, 1890.



WITNESSES:

Geo. A. Vaillant.
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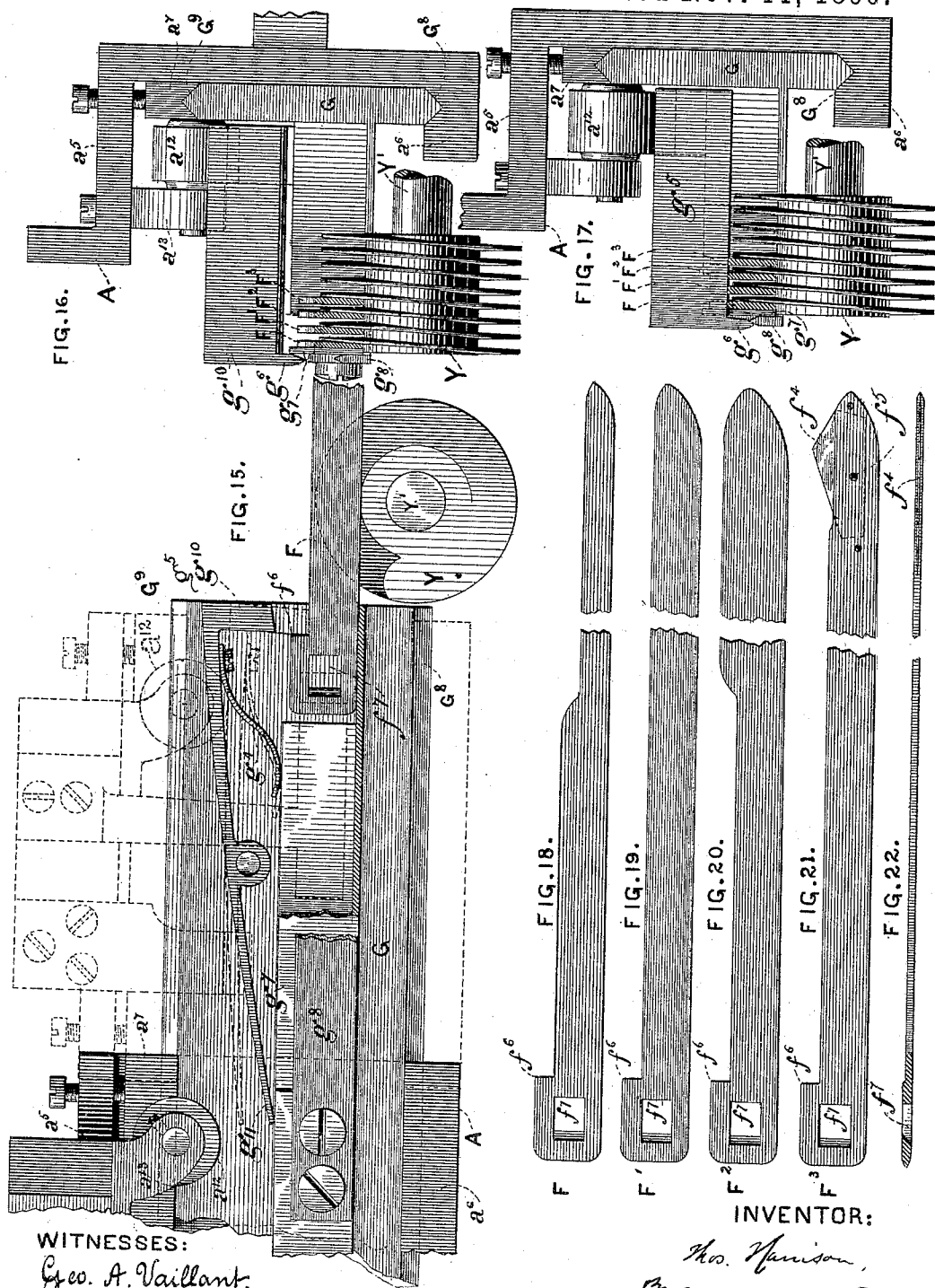
(No Model.)

7 Sheets—Sheet 7.

T. HARRISON.
LOOM FOR WEAVING PILE FABRICS.

No. 440,593.

Patented Nov. 11, 1890.



WITNESSES:

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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. 440,593, dated November 11, 1890.

Application filed July 24, 1888. Serial No. 280,921. (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 construction of looped fabrics whose loops may be cut either during the operation of the machine itself or subsequently, or may be left intact; and the improvements belong to that class of looms which form such fabric by the insertion of "wires" or "needles" beneath the warp-threads at proper intervals during the weaving operation.

In an application heretofore filed by me on July 16, 1887, being Serial No. 244,457, I have described a system of needle-operating devices, in combination with a loom, adapted to weave such fabrics. My present invention is an improvement upon that described in said application, and the features of my improvement consist, mainly, in certain devices for insuring the accurate insertion and withdrawal of the needles, and for obtaining an automatic control of the needle-throwing system by combining the same with the Jacquard system common to many looms of this class.

Further improvements consist in the simplification and strengthening of the various working parts of the machine.

Broadly speaking, the needle-operating mechanism consists of an oscillating raceway adapted to move in conformity with the reed-motion, said raceway containing the group of needles which are to be successively inserted and withdrawn into and from the shed of the fabric, and being provided with a traveling carriage adapted to grasp and throw the needles longitudinally in either direction, as may be required.

In the machine described in my said application only a limited pattern could be produced, because the movements of the needle-operating mechanism did not admit of any great range of variation. Furthermore, as the needles, even when inserted in the fab-

ric, must always have one end resting in the raceway, and as they are necessarily flexible, the danger of accidental displacement, owing to the transverse movements of the raceway and the pull of the fabric itself, was very great. The avoidance of these objections is, as before stated, the chief purpose of my present invention, which I will now proceed to describe.

In the accompanying drawings, Figure 1 represents a partial top or plan view of a loom containing my improvements. Figs. 2 and 3 are respectively partial rear and end views thereof. The scale of the remaining figures, except Figs. 23 and 24, is much enlarged. Figs. 4, 5, and 6 are views of the traveling carriage and the adjacent part of the raceway, Fig. 4 being a side elevation of said carriage, Fig. 5 an end view thereof, showing the raceway in section, and Fig. 6 a top or plan view thereof. Fig. 7 is a partial side elevation of the free end of the raceway and adjacent parts, said figure being partly broken in order to show the actuating mechanism of such parts. Fig. 8 is a top or plan view of the parts shown in Fig. 7. Figs. 9 and 10 are views in elevation of the clutch-coupling mechanism by which the control of the needle-actuating devices is obtained from the Jacquard system. Figs. 11, 12, 13, and 14 are detail views of portions of said clutch mechanism, Fig. 11 being a longitudinal section through the same, and the remaining three figures being end views of the parts taken from different positions. Fig. 15 is a partial side elevation of the free end of the raceway, showing different positions of the parts which guide and stop the needles. Figs. 16 and 17 are end views thereof corresponding, respectively, to the full and dotted line positions indicated in Fig. 15. Figs. 18, 19, 20, 21, and 22 are views showing various forms of needles and certain details of construction thereof. Fig. 23 is a side view of the cam which imparts motion to the lifting-lever of the Jacquard system, and Fig. 24 is a top or plan view of a modification of the mechanism for oscillating the shuttle-box of the loom.

To avoid prolixity of description, the names

of certain well-known parts of the loom are inscribed upon the drawings, and therefore no description of said parts nor of their relation to the features in which my improvements consist is necessary.

Referring now to the general views of the machine, P^1 is a horizontal extension mounted upon the right-hand end of the main frame W and having at its outer end a leg P^3 , which extends down to the floor, and a horizontal rearward projection P^2 . 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 swinging movement in a horizontal plane. This raceway G consists of a metallic bar having a deep groove g , which extends along one side thereof. Near the free end of the raceway said groove widens and is divided by a raised piece g^3 , (see Fig. 8,) so as to form two passages, one of which g^1 is a straight continuation of the main groove g , the other passage g^2 being a lateral switch-groove which leads to the front end of the raceway at the other side thereof from the termination of the passage g^1 .

For a short distance from the front end of the raceway the outside wall of the groove g is cut away, and its place is supplied by a spring-piece g^8 , arranged to yield in an outward direction while still maintaining the continuity of the wall of the groove.

Above the front end of the raceway is a horizontally-pivoted piece g^5 , which I term the "needle-stop," the front end g^{10} thereof extending across the top of the passages g^1 g^2 so as to form when depressed a guard to prevent the complete expulsion of the needle. The rear end of said needle-stop extends backward and downward, as shown at g^{11} , so that it may be properly acted upon by a roller, hereinafter to be described, when the front end g^{10} is to be depressed. A spring g^4 tends to normally keep the front end raised.

Guide-rails G^8 G^9 extend along the top and bottom of one side of the raceway and have beveled edges to fit the guides a^6 a^7 on 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 in the raceway from end to end thereof, and is provided with devices traveling in the grooves of the raceway adapted to insert and withdraw the needles. The groove g^1 is the exit-passage through which a needle is thrown out, and the switch-groove g^2 is the passage through which the needle on being withdrawn from the fabric is drawn into the raceway. The raceway 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 is mounted upon a separate rocking frame of its own and is not directly connected with the lathe, as is ordinarily the case.

Near the commencement of the switch-groove is a guard-piece D , pivoted to oscillate

in a horizontal plane and having a depending lip D^1 , which extends down into the groove g . In one position said lip fits (see solid lines in Fig. 8) into a cavity in the wall of the groove. In the other position it presses against the side of the needle, so as to insure the exit by the passage g^1 . A spring i^3 normally holds the guard-piece out of action, and a cord i , passing around a pulley i^2 , is pulled at the proper moment to throw it into play.

The needles F F^1 F^2 F^3 are thin strips of steel somewhat longer than the width of the fabric to be woven and may have any of the configurations shown in Figs. 18 to 21, inclusive. The front end of the needle may be blunt, as shown in Figs. 18, 19, and 20; or it may be provided, as shown in Fig. 21, with a sharp blade f^4 , inserted in a longitudinal groove in the end of the needle and maintained in position by a removable pin f^5 , the object being to permit the renewal of the blades when worn. The rear ends of the needles are enlarged and have abrupt shoulders f^6 , and in said enlargement is a square opening f^7 , the rear edge of which is beveled, as is shown in Fig. 22, so as to co-operate with the drawing devices in the manner presently to be described.

The traveling carriage A consists of a flat back piece provided upon one side with guides a^6 a^7 , fitting the guide-rails G^8 G^9 , respectively. On the outer side of the carriage are suitable attachments a^8 a^9 for actuating cords b , by means of which the carriage is reciprocated along the raceway. The top a^5 of the carriage overhangs the raceway and carries two downwardly-depending legs a a' , the former of which terminates in a horizontal carrier-head a^3 . This carrier-head is situated in the groove g of the raceway, and has a notch in its front end to receive the correspondingly-shaped rear extremity of the needle. The other leg a' terminates in a lateral extension overhanging the groove g , and in said extension is a vertical pivot, by means of which an arm a^2 is attached so as to be capable of a swinging movement in a horizontal plane. To the front end of said arm a^2 is pivoted a barbed needle-hook a^4 , whose barb is adapted to enter the square opening in the rear end of a needle and engage with the beveled side of such opening for the withdrawal of the needle. The arm a^2 is rigidly attached to the vertical pivot, by which it is suspended from the extension a' , and said pivot and the pivot connecting the arm a^2 with the needle-hook a^4 are provided with hexagonal nuts a^{16} , to which are fastened flexible bands a^{14} a^{15} , respectively, connected by an intermediate spring a^{17} . The normal tension of this spring is such that when the configuration of the needle-groove permits it the needle-hook a^4 will be thrown into the position shown by the dotted lines at the right-hand end of Fig. 6, so as to incline the barb of said hook toward the point of engagement with the butt of the needles. This tendency

on the part of the hook a^4 is of course controlled by the proximate wall of the groove.

The carriage A is provided upon its outer side with a roller a^{10} , adapted when the carriage retreats to trip a bell-crank lever i' , to which the cord i of the guard-piece D is attached. The carriage also has at its front end a downwardly-depending bracket a^{13} , between which and the upper guide-piece a^7 is suspended a roller a^{12} , whose function is to depress the needle-stop g^5 by riding up the incline thereof when the carriage approaches the completion of its forward movement.

In the machine described in my said application, Serial No. 244,457, the needles during the period of their insertion in the fabric had their butt-ends free, though lying in the end of the raceway. If, then, a needle become bent, or from other cause was not in proper position laterally for engagement with the withdrawing-hook of the carriage, it was liable to be missed by said hook and either to be broken or to cause defects in the fabric. To obviate this defect and to maintain the parallelism and equidistance of the needles, I provide the following device: Upon a horizontal shaft Y' , which extends across the free end of the raceway, I mount a worm Y, having threads of a depth about equal to the width of the needles and a pitch of about twice the thickness of the needle. A sufficient number of threads is provided to receive and hold all the needles employed. When the needle is thrust out from the groove g of the raceway, it passes along by the end of the worm Y on that side, as shown clearly in the enlarged views Figs. 15 and 16. Obviously the rotation of the worm in the proper direction will draw the shank of the needle into its coil and gradually shift it across the front end of the raceway, and this rotation is effected by the following devices: The shaft Y' is journaled in bearings upon a stand G^{10} , bolted to the inside of the breast-beam, and within these journals it has a limited longitudinal freedom, which enables it to take up a portion of the swing of the raceway. Upon the end of said shaft Y' is a sprocket-wheel Y^2 , driven by an endless chain Y^3 from a sprocket-wheel Y^4 , whose shaft is rotated by means of a pair of bevel-gears Y^5 , which are also driven by means of a chain and sprocket-gearing Y^6 Y^7 from the rotating sleeve r , from which all the movements of the needle-actuating system are derived. The rotation of the worm is so timed that the travel between two successive threads is just equal to the interval that it elapses between the insertion of two successive needles, and of course its movement stops with the stoppage of the remaining parts of the needle-actuating system.

The worm Y is so mounted that the level of the bottom of its threads is the same as the bottom of the raceway-grooves, so that when the needle-stop g^5 descends it seats the ends firmly down in the grooves of the worm-wheel,

as indicated in the views Figs. 15, 16, and 17. Fig. 16 and the solid lines in Fig. 15 show the position of the parts just as the carriage is approaching the free end of the raceway and inserting a needle. As the carriage advances to the position indicated in Fig. 17 and in the dotted lines of Fig. 15, the roller a^{12} runs up the incline g^{11} of the needle-stop g^5 and depresses it, so as to bear directly upon the needle-shanks in front of the shoulders f^6 . At the same time a downwardly-depending finger g^6 at one side of the needle-stop g^5 laps over and closes in the spring side piece g^8 , before referred to, so as to hold the parts firmly in position during the period while the worm Y is taking hold of the needle and drawing it into its coil.

The mechanism for operating the carriage A is substantially similar to that described in my said application of July 16, 1887. The picking-shaft I is provided with a sleeve r , on which are mounted two mutilated beveled gears E^5 E^6 , whose toothed portions are adapted to alternately engage with a beveled pinion E^7 . Upon the shaft of this pinion is mounted an elliptical gear E^4 , which engages with a corresponding gear E^3 . Upon the end of the shaft of the elliptical gear E^3 is a larger gear E^2 , meshing with a pinion E' , which is secured to the shaft of a large grooved pulley-drum E. A cord b , preferably of wire, passes two or three times around this pulley E, and thence leads to one side around a pulley b^2 , mounted on the extreme outer end of the extension P' , and thence to a suitable attachment, as a^3 , upon one end of the carriage A. Upon the other side of the pulley E the cord b passes to a pulley b' , mounted upon the inside of the breast-beam R, whence it returns to a point of attachment, as a^8 , upon the front of the carriage A. Upon the rotation of the shaft I and its sleeve one of the mutilated beveled gears will engage with the pinion E^7 and through the train of gearing will rotate the pulley E, the motion commencing slowly, then rapidly accelerating, and finally subsiding gradually. The other of the mutilated gears will effect a similar motion in a reverse direction, and therefore the carriage A is alternately reciprocated from one end of the raceway to the other and with the peculiar varying motion described. To overcome the momentum of the moving parts, however, I provide the pulley E 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 provided with rollers, against which the cams J will bear, and which as they advance will of course move the rods 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 and act as brakes. The return of the rods J' is effected by means of 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 and that its cam J has at the close of its operative movement pushed its brake against the pulley E, as the rotation of the cam continues the brake is released and springs back to its original position. The opposite mutilated gear E^6 has by this time reached its operative point, and in a similar way produces the reverse movement on the pulley E, and at the completion thereof applies the other brake thereto in a similar manner.

The oscillating movement of the raceway itself is effected as follows: A rod G^2 is attached to the front end of the raceway and is connected with the upper end of a lever-arm K' . This lever-arm is fast upon one end of a horizontal rock-shaft K^3 , upon the other end of which is a lever-arm K^2 , provided with a friction-roller k . This friction-roller bears against the surface of a cam-piece K, mounted upon the same sleeve r to which the mutilated gears E^5 E^6 are secured. A spring G^5 , attached to the end of the lever K^2 and to the frame at P^7 , holds the friction-roller k up against the cam-piece K, and thus both the oscillating movement of the raceway and the reciprocating movement of the needle-carriage thereon are derived from the movement of the sleeve r , which is freely mounted upon the picking-shaft I. The sleeve r is rotated by means of a gear S' , attached to one end thereof, and driven through an intermediate pinion S^2 by a spur-gear S, whose movements are controlled from the Jacquard system of the loom in the following manner: Said gear S is secured to a sliding hub X' , moving freely in a longitudinal direction upon the main driving-shaft N' of the loom. Around the center of this hub is a grooved depression which receives a bifurcated shifting-lever X^2 , pivoted upon a bracket X^{14} , mounted upon the side of the frame W. The upper end of said lever has an oval slot, in which an eccentric X^3 works. This eccentric is mounted upon the same shaft with a chain-gear X^4 , driven by an endless chain X^5 from a corresponding gear X^6 , intermittently reciprocated by means of a pulley X^7 , mounted upon its shaft and provided with a belt, the two ends of which X^8 X^9 , respectively, are connected with the lifters of the ordinary Jacquard system, whose movements are so well understood that it is not deemed necessary to describe them. Coiled springs X^{11} X^{12} , respectively, are mounted by attachment at both ends and under tension upon said belt ends X^8 X^9 , in order to take up the slack which occurs in their alternate operation. Assuming, therefore, that the eccentric X^3 can be oscillated by the Jacquard system at proper intervals, it will of course shift the hub X' longitudinally along the shaft N' , and will, by the coupling device now about to be described, couple or uncouple the spur-gear S to said shaft. Upon the outer end of said

shaft N' is rigidly secured a disk X, having an upward clutch projection x^4 . The proximate end of the sliding hub X' is also provided with a similar clutch x^5 , adapted to engage with the clutch x^4 , and when the two are in engagement the gear S will of course be coupled to the shaft N' . To insure the absoluteness of the coupling, I provide upon the fast disk X a latch constructed as follows: A bolt x slides in a dovetailed groove in the periphery of the disk X and in a direction parallel to the shaft N' . At the rear end of said bolt is a flat spring x' , tending to protrude the bolt upon that side of the disk which is proximate to the hub X' . A pivoted latch-piece x^3 , conforming to the curved periphery of the disk X, is provided with a slot to receive the end of a pin x^2 , mounted in the bolt x . The inclined side of this latch-piece x^3 is presented to the clutch x^5 upon the disk X' when the latter is shifted so as to engage with the fast disk, and as said clutch approaches the latch x^3 it pushes it and the bolt x inward, so as to permit the passage of the clutch. As soon, however, as the latter passes the bolt springs back again and thus locks the clutch mechanism.

To insure the immediate stoppage of the spur-gear S when uncoupled from the driving-shaft, I provide a spring-brake X^{13} , mounted upon a portion of the frame W in such relation to said gear that when the latter is shifted toward the frame in the uncoupling movement said spring X^{13} will bear against one side thereof, and thus stop the rotation.

In Fig. 23 is shown the actuating mechanism by which the lifting-lever of the Jacquard system is worked. Upon the shaft N' is mounted a cam X^{10} , having the peculiar configuration there shown and adapted to bear against a roller X^{18} upon the lever X^{16} , pivoted at X^{17} to an extension P^6 of the frame W. A rod X^{15} leads to the overhanging lever (not shown) by which the lifting motion is ordinarily produced in the Jacquard system.

The operation of the mechanism for coupling and uncoupling the spur-gear S, which actuates the raceway and the needle-crotch, is broadly as follows: According as the strap X^8 or X^9 is pulled by the lifting-lever of the Jacquard system, the chain-wheel X^6 makes a half-rotation in one direction or the other, imparting a similar motion to the chain-wheel X^4 and the eccentric X^3 . The movement of the eccentric X^3 shifts the lever X^2 in one direction or the other, so as to couple or uncouple the spur-gear S. By means of this attachment the entire needle-operating mechanism can be disconnected from and again connected to the loom proper, thus giving complete control of the design in the piled portion of the fabric. Heretofore the loom could only weave three or four picks between each pair of needles, thus greatly limiting the design; but by combining the actuating mechanism of the needle system with the Jacquard

system any pattern which is capable of being punched on the cards can be produced in the piled portion of the fabric.

In the foregoing specification I have not
5 thought it necessary to describe at length the actuating mechanism of the picking-shaft I, since such mechanism forms the subject of claim in the application before referred to; but in Fig. 24 I show in plan view a modifi-
10 cation of the connections for the shuttle-box L, which is not attached directly to the lathe of the loom, as is ordinarily the case, but receives a separate oscillating movement, in order to permit it to adapt itself to the move-
15 ment of the raceway.

The shuttle-box L is mounted upon a rock-
ing frame U U, pivoted at the lower part of the main frame W and provided on the front with a strap O', passing over a pulley O¹² on
20 the front of the frame to a stout spring O, secured at the bottom thereof. Instead of a loose strap (such as is shown in Fig. 3) for throwing the rocking frame backward, I provide a rigid rod U', attached to a lever Q,
25 which carries a roller q, bearing against a cam N, mounted upon the main driving-shaft N'. By the configuration of this cam I obtain the proper movement on the part of the shuttle-box to enable it to accompany a portion of
30 the forward reed-movement, after which it falls behind the reed-movement, and thus clears the raceway, which would interfere with the complete forward movement of the shuttle-box.

I do not claim, broadly, the use of a screw for carrying a needle while inserted in the fabric, as I am aware that such screws have been in use for the purpose of rigidly holding the needle-head from both above and below.
40 As heretofore used, however, such screw did not permit the needles to conform to the reed-movement, nor were they used in combination with such an oscillating raceway as that which characterizes my improvements.

45 Having thus described my invention, I claim—

1. The combination, with the weaving devices and the needle-inserting and needle-withdrawing mechanism, of a rotating member from which said mechanism is actuated,
50 substantially as set forth, a continuously-rotating shaft, a sliding coupling, whereby said rotating member may be coupled to and disconnected from said shaft, a shifting-lever
55 controlling said coupling, and mechanism, substantially as set forth, whereby said shifting-lever is actuated by the movement of the lifting-lever of the Jacquard mechanism, substantially in the manner and for the purposes
60 set forth.

2. The combination, with the shaft I, of the

sleeve r freely mounted thereon, the pivoted raceway, the needle inserting and withdrawing mechanism and raceway-oscillating mechanism, substantially as set forth, the gears S
65 and S', by which said sleeve is driven, the sliding clutch-coupling disk X', connected with said gear S, the fast clutch-coupling disk X, the continuously-rotating shaft N', to which said fast disk is attached, the slotted shifting-
70 lever X², the eccentric X³, and the system of chain-gearing connected therewith for controlling the movement of said lever, the belts operatively connected with a shaft of said chain-gearing system and adapted for opera-
75 tion by the Jacquard mechanism.

3. The combination, with the pivoted raceway, its actuating mechanism, and the needle inserting and withdrawing mechanism, of a worm extending across the front end of said
80 raceway and adapted to receive and carry the needle-shanks, said worm being freely mounted to oscillate longitudinally in conformity with the movements of the raceway, and actuating mechanism, substantially as
85 set forth, whereby said worm is rotated in the described relation to the movement of the fabric and needles.

4. The combination, with the raceway G, having a needle-groove g, of the spring-plate
90 g², forming an elastic termination for the outer wall of the said groove, substantially as set forth.

5. The combination, with the raceway and the needle inserting and withdrawing mechanism, of a hinged needle-stop and means,
95 substantially as set forth, whereby said needle-stop is depressed toward the completion of the forward movement of the needle-inserting device.
100

6. The combination, with the raceway having an enlarged groove near its front end, of the arm a², jointed needle-hook a⁴, and the intermediate spring-connection attached to the pivots of said hook and arm, whereby on
105 entering the enlargement of the groove the needle-hook will be turned into position to engage with the needle, substantially as set forth.

7. The combination, with the oscillating
110 raceway and with the lathe, of the shuttle-box L, the independent rocking frame U on which said shuttle-box is mounted, the spring and belt O O', the rigid connection-rod U', attached to said rocking frame, the lever Q,
115 attached to said connecting-rod, and the cam N, adapted to throw said lever in one direction, substantially as set forth.

THOMAS HARRISON.

Witnesses:

EDWARD FELL LUKENS,
JAMES HENRY BELL.