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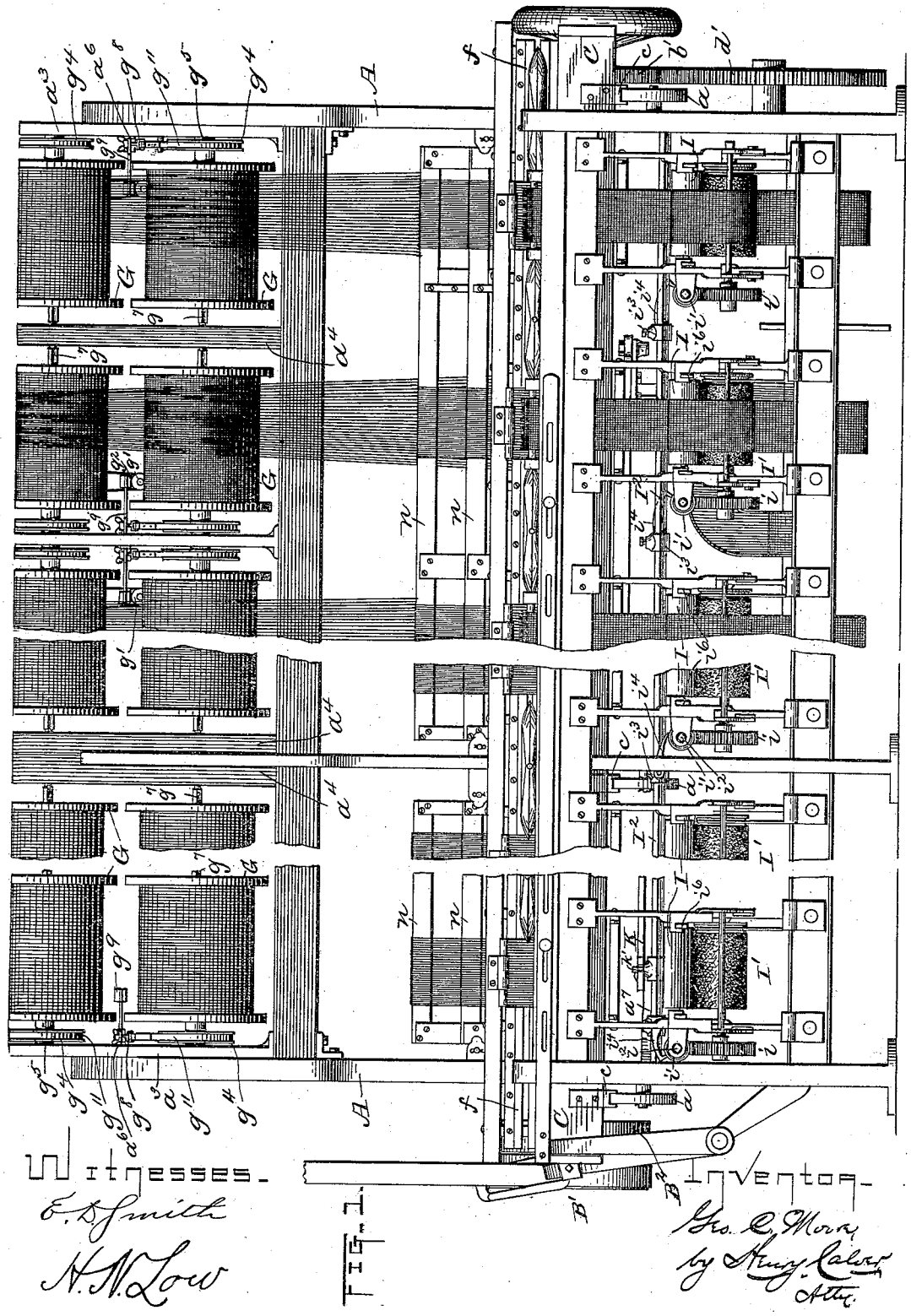
7 Sheets—Sheet 1.

G. C. MOORE.

NARROW WARE LOOM.

No. 407,872. Patented July 30, 1889.



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N. W. Low

Inventor—
Geo. C. Moore
by Henry Calver
Atty.

FIG. 1.

N. PETERS. Photo-Lithographer, Washington, D. C.

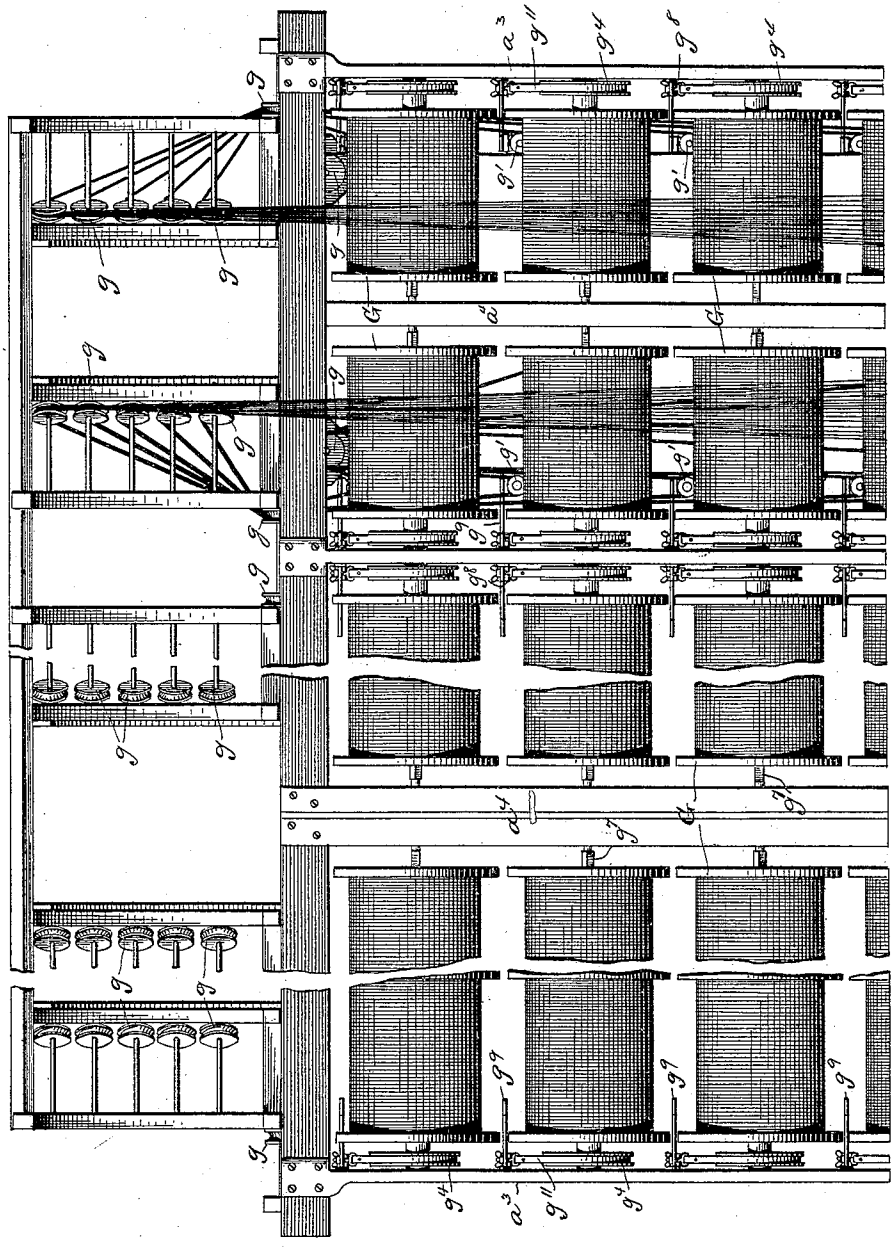
(No Model.) 7 Sheets—Sheet 2.

G. C. MOORE.

NARROW WARE LOOM.

No. 407,872. Patented July 30, 1889.

FIG. 2.



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(No Model.) 7 Sheets—Sheet 3.

G. C. MOORE.

NARROW WARE LOOM.

No. 407,872. Patented July 30, 1889.

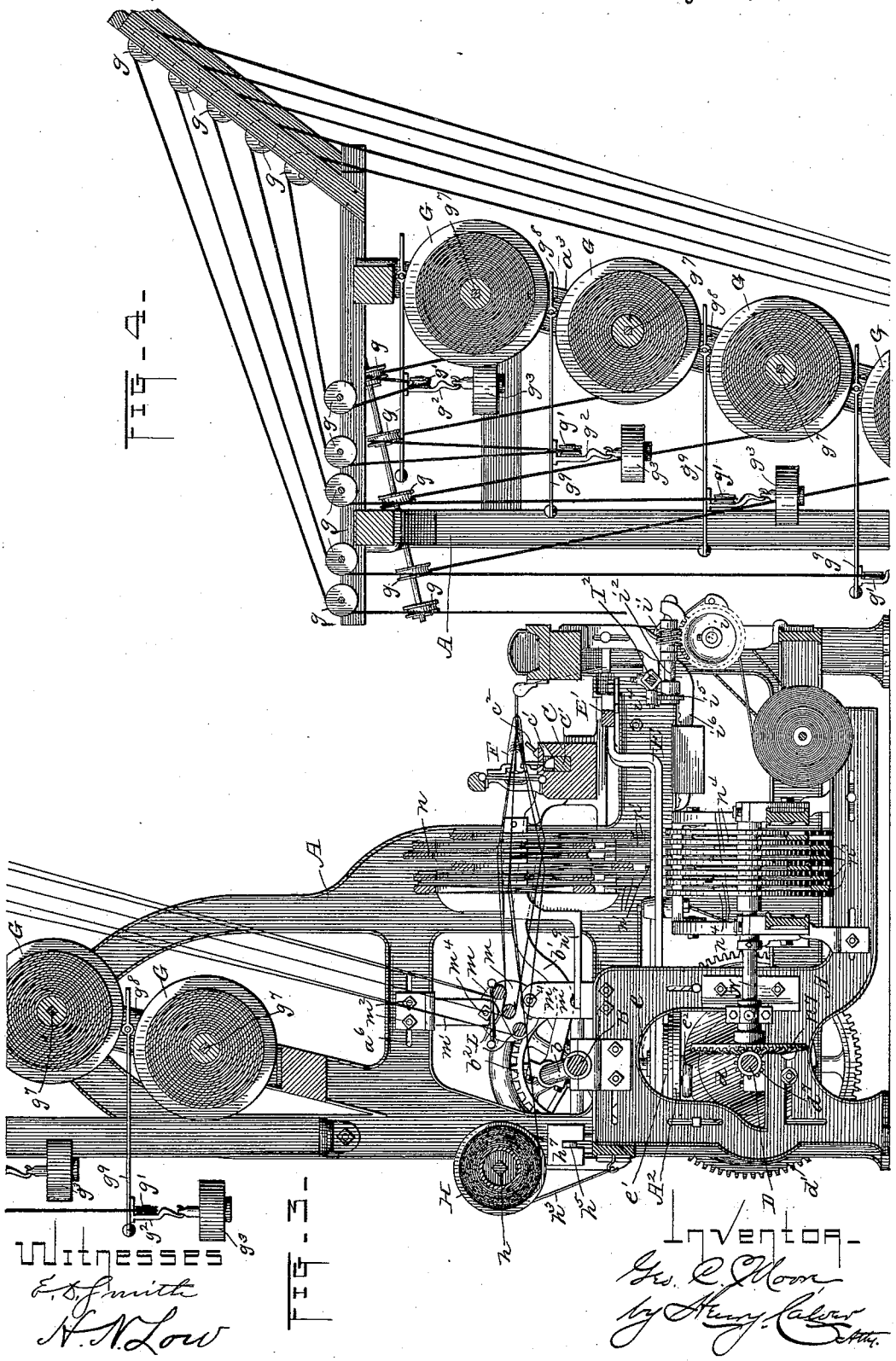

FIG. 4.

FIG. 3.

Witnesses
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N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 7 Sheets—Sheet 4.

G. C. MOORE.

NARROW WARE LOOM.

No. 407,872. Patented July 30, 1889.

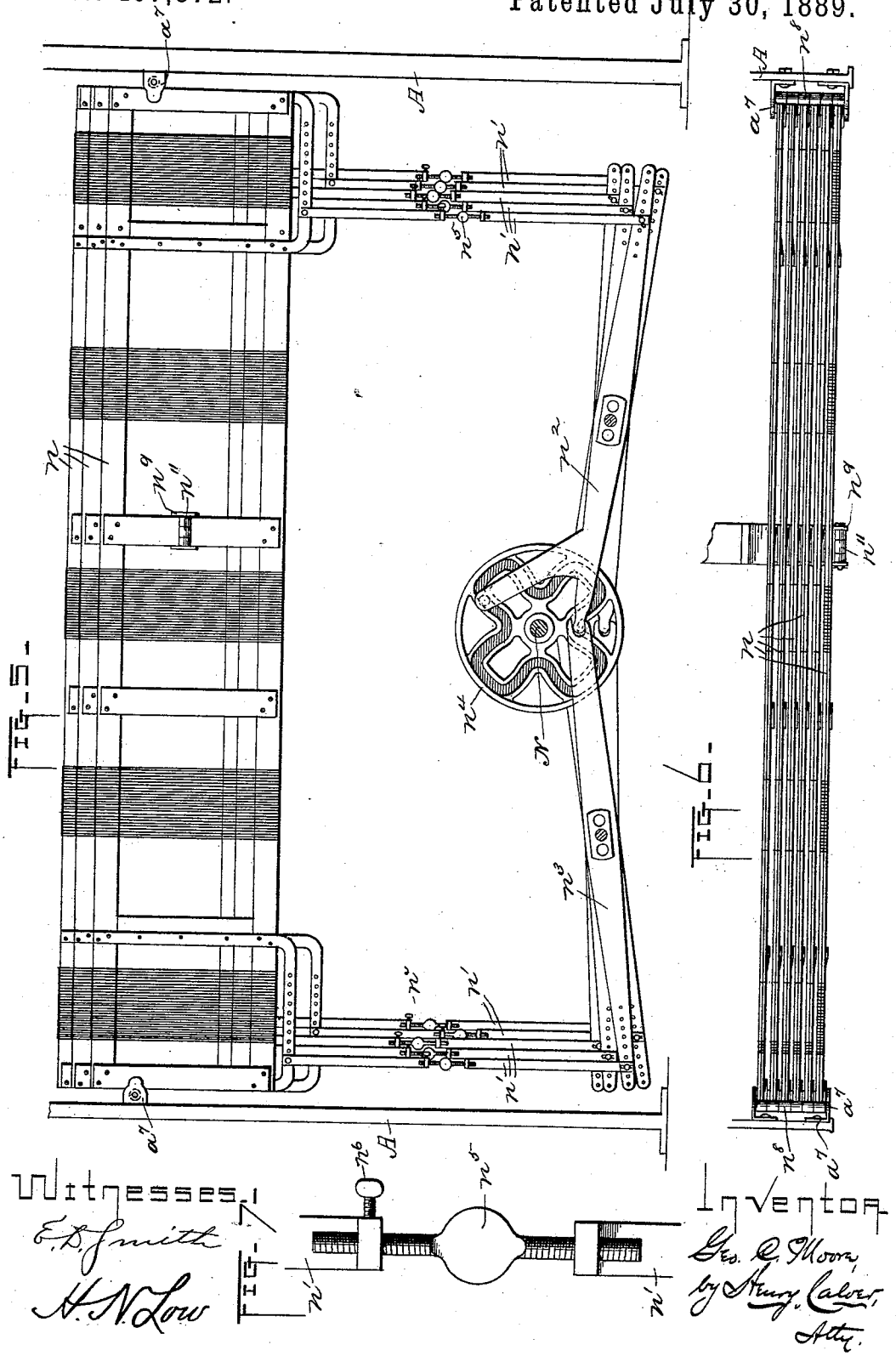

FIG. 5.

FIG. 6.

FIG. 7.

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(No Model.)

7 Sheets—Sheet 5.

G. C. MOORE.

NARROW WARE LOOM.

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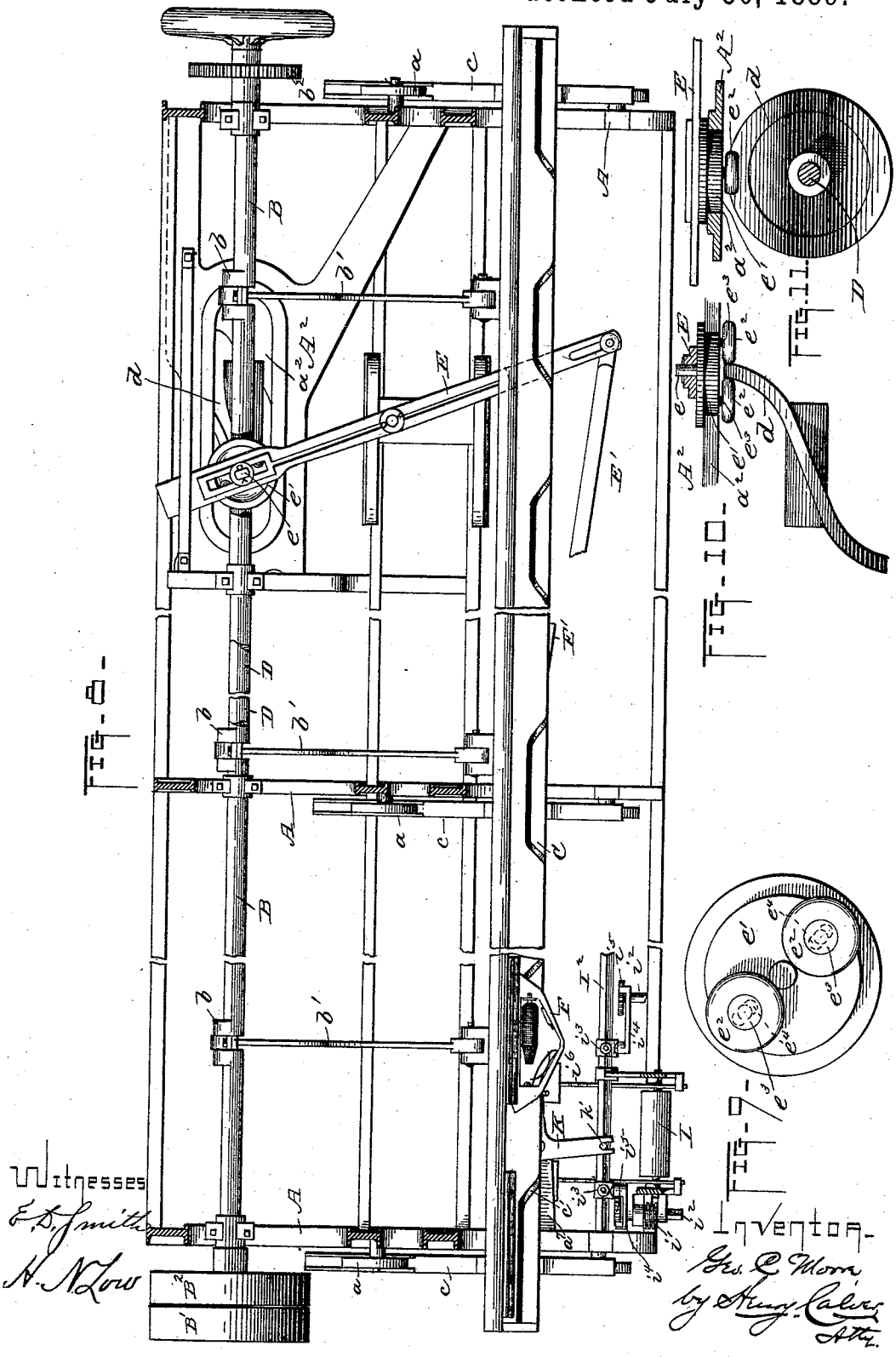

FIG. 10.

FIG. 11.

FIG. 9.

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(No Model.)

7 Sheets—Sheet 6.

G. C. MOORE.

NARROW WARE LOOM.

No. 407,872. Patented July 30, 1889.

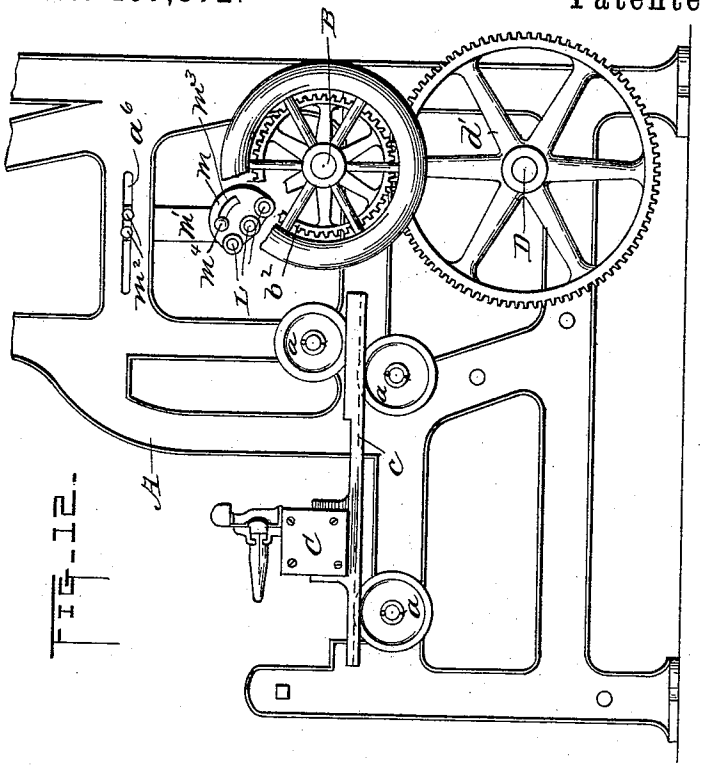

FIG. 12.

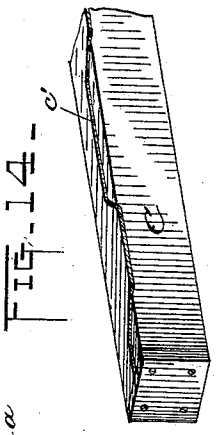

FIG. 14.

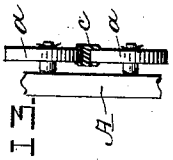

FIG. 13.

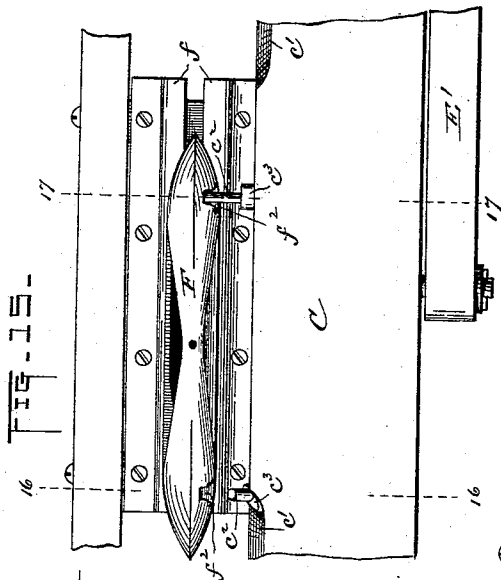

FIG. 15.

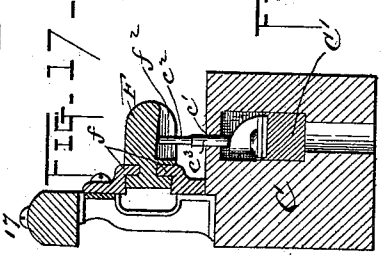

FIG. 17.

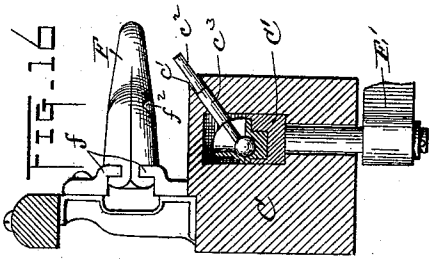

FIG. 16.

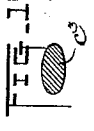

FIG. 19.

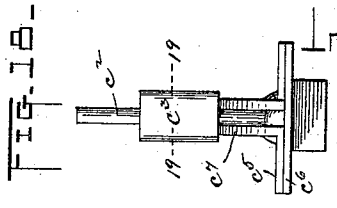

FIG. 18.

Witnesses.

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(No Model.)

7 Sheets—Sheet 7.

G. C. MOORE.

NARROW WARE LOOM.

No. 407,872. Patented July 30, 1889.

FIG. 23.

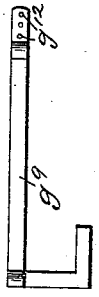


FIG. 22.

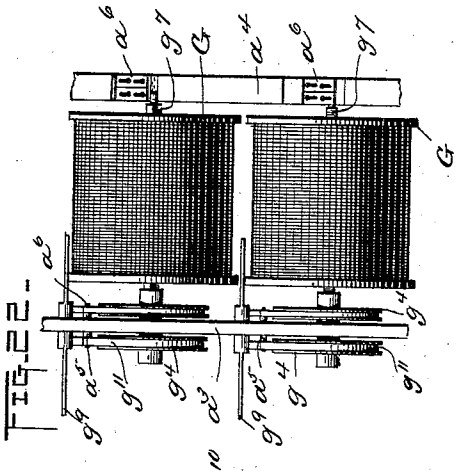


FIG. 21.

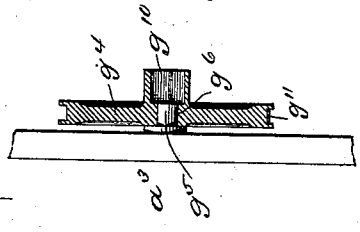


FIG. 20.

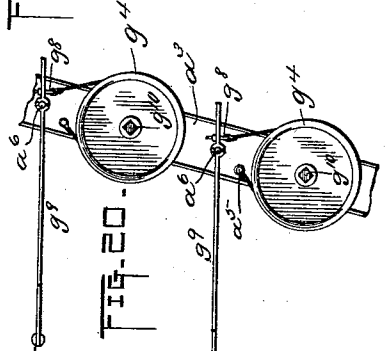


FIG. 26.

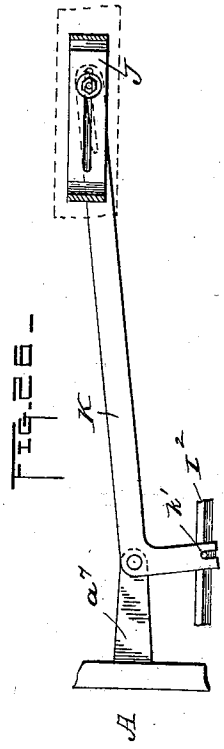


FIG. 27.

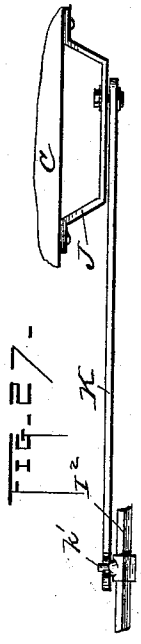


FIG. 24.

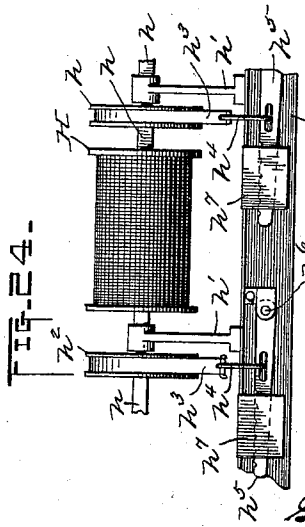
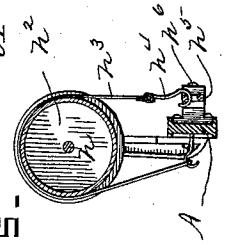


FIG. 25.



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N. PETERS. Photo-Lithographer. Washington, D. C.

UNITED STATES PATENT OFFICE.

GEORGE C. MOORE, OF EASTHAMPTON, MASSACHUSETTS, ASSIGNOR TO JOSEPH W. GREEN, JR., AND THE GLENDALE ELASTIC FABRIC COMPANY, BOTH OF SAME PLACE.

NARROW-WARE LOOM.

SPECIFICATION forming part of Letters Patent No. 407,872, dated July 30, 1889.

Application filed August 13, 1888. Serial No. 282,626. (No model.)

To all whom it may concern:

Be it known that I, GEORGE C. MOORE, a citizen of the United States, residing at Easthampton, in the county of Hampshire and State of Massachusetts, have invented certain new and useful Improvements in Narrow-Ware Looms, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to a loom for simultaneously weaving a series of narrow fabrics, and is more particularly intended for weaving that class of narrow elastic fabrics known as "goring," and used for forming elastic gores in "Congress" gaiters or boots, or for other purposes.

The object of my invention is to provide a narrow-ware loom in which the different movements will be strong and positive, and in which the different parts of the loom will be conveniently arranged and adapted to perform their several functions in the most efficient manner, so that the loom may be run at high speed with comparatively little power.

In the accompanying drawings, Figure 1 is a broken-out front elevation of the lower part of my improved loom. Fig. 2 is a similar elevation of the upper part of the same. Fig. 3 is a central sectional view of the lower part of the loom. Fig. 4 is a central sectional view of the upper part thereof. Fig. 5 represents the harnesses and their operating mechanism in elevation. Fig. 6 is a plan view of the harnesses, showing also their guiding-rolls and central steadying-guide. Fig. 7 is a detail view of one of the adjustable connections of the two-part bars joining the harnesses with their operating-levers. Fig. 8 is a broken-out plan view, with the frame in section, of the lower part of the loom to show the shuttle and lay operating mechanisms. Fig. 9 is a detail bottom view of the roller slide on the lever which operates the shuttle-driving bar. Figs. 10 and 11 are detail views showing the cam for operating the shuttle-driving-bar lever and the connections of the said lever with said cam. Fig. 12 is a partial end elevation of the loom, looking from the right, Fig. 1. Fig. 13 is a detail sectional view of one of the guide rails or bars for the lay in connection with the guide-rolls on which said rail or bar runs. Fig. 14 is a detail perspective view showing one of the cam-slots in the lay for causing the shuttle-driving pins to engage and disengage the shuttle. Fig. 15 is a detail front view of a portion of the lay, showing one of the shuttles. Fig. 16 is a section on line 16 16, Fig. 15, and Fig. 17 a section on line 17 17, Fig. 15. Fig. 18 shows one of the shuttle-driving pins and the plates in which it is socketed. Fig. 19 is a cross-section of one of the shuttle-driving pins on line 19 19, Fig. 18. Fig. 20 is a detail view illustrating the tension device for the non-elastic warp-beams. Fig. 21 is a detail sectional view to show the construction of the warp-beam tension-pulleys. Fig. 22 is a detail elevation from the rear of the loom to show the warp-beams for the non-elastic warps. Fig. 23 is a plan view of one of the tension-levers for the non-elastic warp-beams. Figs. 24 and 25 are detail views showing one of the beams for the elastic warps and the tension device therefor. Figs. 26 and 27 are detail views showing the take-up operating-lever and its connection with the lay and the pawl operating bar.

A denotes the frame-work of the loom, and B the driving-shaft extending lengthwise of the loom and provided with usual fast and loose driving-pulleys B′ B² and with cranks *b*, connected by pitmen *b′* with the lay C. The lay, instead of swinging in the arc of a circle, as is usual, is mounted on bars or rails *c*, which are secured thereto, and which run back and forth in a right line horizontally on anti-friction guide-rolls *a*, turning on bolts or studs fixed to the frame-work of the machine. The bars or rails *c* are preferably provided with flanges embracing the rolls *a* and forming grooves for the reception of the said rolls, as shown by the detail view, Fig. 13.

By reciprocating the lay back and forth in a right line I avoid the objection incidental to swinging lays, (particularly in weaving elastic fabrics,) which results from carrying the shuttles at varying heights through different parts of their traverse, the shuttles being too

near the sets of warps forming the tops of the sheds at some parts of the swing of the lay and too near the sets of warps forming the bottoms of the sheds at the other parts of the swing of the lay. Thus if the lay be carried by arms pivoted at the bottom of the loom the shuttles will be considerably higher in the center of the back-and-forth movements of the lay than they will be at the ends of such movements, and the said shuttles will, when at the centers of the lay movements, be liable to strike any of the upper warps, which, owing to frictional contact with other warps occasioned by knots or imperfections in the yarns, may be a little too low, or the shuttles, when the lay is at or near the ends of its movements, will be liable to strike any of the lower warps which may be a little too high. This difficulty is lessened or avoided by reciprocating the lay back and forth in a straight line, as above described.

The driving-shaft B carries at its end opposite the driving-pulleys a gear-wheel b^2, meshing with a larger gear-wheel d' on a counter-shaft D, which carries a cam d for operating the shuttles. The cam d is preferably in the form of an irregular plate or flange cast integral with the hub by which it is secured to said shaft. The gears b^2 d' are so proportioned that the counter-shaft rotates at half the speed of the driving-shaft. Pivoted to a support forming part of the machine-frame is a lever E, connected by a pitman E′ with the shuttle-driving bar C′, reciprocating back and forth in the lay. The pitman E′ forms a rigid and positive connection between the lever E and the shuttle-driving bar C′, thus avoiding the use of straps or other loose connections in the shuttle-operating mechanism. The lever E carries a pin e, on which is mounted a roller-slide e', working back and forth in a guide slot or opening a^2 in a horizontal plate or bracket A^2, attached to the frame of the machine. To the roller-slide e' are attached two bowls or anti-friction rolls e^2, which embrace the flange or rim of the cam d, so that as the latter rotates the lever E will be vibrated back and forth to give the proper reciprocating movements to the shuttle-driving bar C′, said cam being so formed that the lever E will have an intermittent movement occasioned by a dwell at the end of each stroke. As the end of the flange-cam d at which the sharp curves occur passes the bowls e^2, the roller-slide e' will turn partly on its pin e when the dwell of the lever E occurs, so that the said bowls can accommodate themselves to the sharp curves of the said cam, and any binding of the parts is thereby prevented, while said bowls will always be in proper contact with both sides of the cam-flange, thus insuring strong and steady movements. The studs or bolts e^3, on which the bowls e^2 are mounted, preferably pass through slots e^4 in the roller-slide e', so that the bowls may be adjusted to take up wear.

Instead of the flange-cam and the roller-slide and bowls on the lever E just described, a grooved cam or slot in a cam-cylinder and pin or roller stud fixed to the lever E may be employed; but the flange-cam, bowls, and roller-slide are preferred, as they insure smoother and easier movements.

The lay C is provided with a series of cam-slots c', in which work the shuttle-driving pins or drivers c^2, having universal-joint connections with the driving-bar C′, said drivers being preferably provided with elliptical or flattened portions c^3, working in said cam-slots. The universal-joint connections of the shuttle-drivers is secured in the present instance by providing said drivers with balls or spherical heads c^4 at their lower ends fitting in sockets in plates c^5 c^6, screwed to the driving-bar C′. The upper plates c^5 have slotted projections or standards c^7, which receive and embrace the lower parts of the driving-pins c^2, and which serve as guides to steady said pins as the latter vibrate back and forth, the ball-and-socket connections of the said driving-pins with the shuttle-driving bar permitting said pins to swivel and turn slightly as the flattened or elliptical parts c^3 thereof pass into and out of the cam-slots c' of the lay.

The shuttles F are guided back and forth on the lay in the usual manner in this class of looms by means of lipped or flanged guides or shuttle-supports f, which enter grooves j in the shuttles, and the latter are provided in their bottoms near their opposite ends with slots f^2 for the reception of the driving-pins c^2, said slots being open to the fronts of the shuttles.

From the foregoing it will be apparent that as the shuttle-driving bar is reciprocated from the lever E the shuttle-driving pins working in the cam-slots c' will be moved alternately into and out of contact with the shuttles, the upper ends of the said driving-pins swinging forward, so as to pass freely beneath the woven fabric or web as they reciprocate with the driving-bar, one of the drivers or driving-pins swinging up into engagement with one end of a shuttle just before the driver at the opposite end of the shuttle swings forward clear of the shuttle to pass under the web, and thus each shuttle will always have a positive connection with the driving-bar through one or the other of its driving-pins.

The shuttles F are each provided with a cop containing a large quantity of yarn, as fully shown and described in my application No. 282,264, filed simultaneously herewith.

The warp beams or spools G for the non-elastic warps are mounted in standards a^3 a^4 at the upper parts of the loom. The warps run from a warp-beam to an overhead pulley g, thence down to a lower weight-block pulley g', thence up over two other overhead pulleys g, and thence down to the web or fabric. Each of the lower pulleys g' is carried by a bracket or block g^2, having a hook supporting a weight g^3. The standards a^3

have studs g^5 to enter round holes g^6 in the inner sides of the tension-pulleys g^4, so that the said pulleys can turn on said studs, said pulleys having in their outer sides square holes or sockets g^{10} to receive the squared ends of the warp-beam shafts g^7, passing through square holes in the warp-beam. Around each of the tension-pulleys g^4 passes a metallic friction band or strap g^{11}, secured at one end to a stud or pin a^5 on the standard a^3 and at its other end to an eyebolt g^8, screwed into a weighted tension-lever g^9, pivoted on a stud a^6 in the said standard. The weighted or long ends of the tension-levers g^9 are above the blocks or brackets g^2, each of said brackets permitting the long arm of its corresponding lever g^9 to descend until the friction-strap g^{11}, attached to the short arm of the lever, is drawn tight enough on its tension-pulley to cause sufficient friction to counterbalance the weight carried by the corresponding bracket g^2. When this equilibrium is reached, the bracket g^2 and pulley g' will remain stationary, with a uniform tension on the warps, the latter running from the warp-beam over the warp-pulleys, as above described, and being drawn forward with the fabric by the positive take-up, which will be described hereinafter.

The frictional let-off above described obviates the necessity of using a positive let-off, which is objectionable in elastic-fabric looms, particularly in looms for weaving goring or wide elastic fabrics, and it has all the advantages in the smooth running of the warp-yarns of the weighted pulleys heretofore generally in use goring-looms without the inconvenience of requiring the operator to be constantly attending to the "letting down" of the warps from the warp-beams to lower the weighted pulleys as the latter are drawn up by the warps in the progress of weaving.

Variation of the tension of the warps may be provided for by using lighter or heavier weights g^3, or by providing the levers g^9 with several eyebolt-holes g^{12} at different distances from their fulcrums, (see Fig. 23,) or by both of these means.

The warp-beam shafts g^7 are secured in bearing-slots in the standards a^4 by sliding catches a^6, loosely held to said standards by screws passing through slots in said catches. By lifting one of these catches, a warp-beam shaft will be free to be inserted in its slot or removed therefrom in removing or inserting the warp-beams.

The rubber warp-beams H are mounted on square shafts h, having rounded ends journaled in bearings in the slotted upper ends of standards h', attached to the machine-frame. To each of the warp-beam shafts h is attached a tension-pulley h^2, around which passes a metallic friction-band h^3, attached at one end to a hook on the machine-frame and connected at its other end by a hook h^4 with a lever h^5, pivoted to a bracket h^6 and provided with a weight h^7, which may be adjusted toward and from the fulcrum of said lever to secure any desired tension on the elastic warps. The beams H slip on and off from the square shafts h, and the tension-pulleys are secured to said shafts by set-screws or in any other suitable way. Instead of this construction I may use for the elastic-warp beams independent shafts and pulleys like those above described for holding the non-elastic warps.

Each web or piece of woven fabric passes between a pressure-roll I and a positively-driven take-up roll I', to the shaft of which latter is attached a worm-wheel i, gearing with a worm i' on a shaft i^2, having a ratchet-wheel i^5. Pivoted to a bracket a^7 near one end of the machine is a bell-crank lever K, the long arm of which is jointed to a bracket J on the lay C, the short arm of said lever being forked to embrace a pin k', attached to a sliding bar I^2, extending the entire length of the loom and provided with a series of collars i^3, to which are pivoted pawls i^4, engaging the ratchet-wheels i^5 on the shafts i^2. Thus as the lay reciprocates the lever K will be vibrated to impart longitudinal movement to the bar I^2 to cause the pawls i^4 to turn the ratchet-wheels i^5 and thereby intermittingly rotate the take-up rolls through the worm-wheels i, worms i', and shafts i^2. The pressure-rolls I are forced downward against the take-up rolls I' by weighted levers i^6, bearing against the shafts of said rolls in the usual manner.

The warps in passing to the harnesses run below the warp-guide rolls L, journaled in adjustable bearing-plates m, secured to brackets or supports m', attached to the machine-frame by bolts m^2, passing through horizontal slots a^6 in said frame, said slots permitting said brackets to be adjusted horizontally to locate said guide-rolls nearer to or farther from the harnesses, as may be desired.

With long-fibered warps it is desirable that the different sets should be more widely separated from each other to make larger sheds than the short-fibered warps, and to this end it is necessary to make the upper and lower guide-rollers vertically adjustable. The middle guide-roll need not be vertically adjustable, as its lower edge should always be on a level with the weaving-line. To provide for the simultaneous adjustment of the upper and lower warp-guide rolls without changing the vertical position of the middle guide-roll, the bearing-plates m are provided with curved slots m^3, formed in the arc of a circle the center of which is coincident with the center of the middle guide-roll, and the bolts m^4, by which said bearing-plates m are attached to the brackets m', pass through said curved slots.

Thus by simply loosening the nuts of the bolts m^4 the plates m will be free to be turned on the curve of the slots m^3, thereby simultaneously raising or lowering the upper and lower guide-rolls, and thus spreading the warps guided by said rolls more or less to

make larger or smaller sheds, the vertical adjustment of the middle guide-roll being meanwhile undisturbed.

In order to operate the harnesses entirely from below and more steadily and positively than heretofore, they are connected at both ends by rigid links or bars n' with the harness-operating levers n^2 n^3. The levers n^2 are operated positively in both directions by the grooved harness-cams n^4, and the levers n^3 are positively connected with the lever n^2, (see Fig. 5,) so as to be operated thereby. The harness-cams are constructed in the usual manner to give two, three, or four throws to the harness-operating levers. The cam shown in detail, Fig. 5, gives four throws to the harness-operating levers at each revolution, as will be understood; but cams giving two, three, or other number of throws to said levers at each revolution are also employed, as is usual.

The links or bars n', connecting the harness-frames with the harness-operating levers, are preferably made in two parts joined together by right and left thumb-screws n^5, which may be secured in any position to which they may be adjusted by set-screws n^6. By turning the screws n^5 the harness may be raised or lowered to change the sheds. The harness-cams n^4 are carried by a shaft N, provided with a beveled gear n^7, meshing with a beveled pinion d^7 on the counter-shaft D. The harnesses are steadied and guided at their ends by anti-friction-rolls n^8, mounted on small rods supported by brackets a^7, attached to the machine-frame. The harnesses are also preferably steadied at their middles by a guide-bracket n^9, which may also have anti-friction-rolls n^{11}, to insure easy movements of the harness in contact therewith.

From the foregoing it will be apparent that as the harness-cams rotate the harness-operating levers will impart positive and steady movements to the harnesses, with both ends of which said levers are directly connected, without the intervention of the objectionable flexible straps or cords heretofore generally in use, and without requiring any connections from above, such upper connections being very much in the way in narrow-fabric looms requiring a large number of warp-beams containing the numerous warps. In my improved loom, having the harness mechanism entirely below the harnesses, the yarns coming down from above are brought far enough forward so that they can be conveniently reached by the attendant when necessary.

The general operation of my improved loom will be readily understood from the foregoing. When the power is applied, the driving-shaft B, through the above-described connections with the lay, reciprocates the latter back and forth, and the cam d on the counter-shaft D operates the shuttle-driving mechanism, the beveled pinion d^7 on said counter-shaft rotating the harness-operating shaft N through the beveled gear n^7, the take-up being operated from the lay, as above described.

I do not wish to be understood as confining my invention to all of the specific mechanisms hereinbefore described, as the details of my machine may be varied within the province of mechanical skill without departing from the spirit of my invention.

Owing to the fact that the shuttle and harness operating mechanisms of my loom are positive and direct, I am enabled to run my loom at about double the speed of other elastic-fabric looms heretofore constructed and at a great saving of power, the movements of my improved loom being so direct and easy that it requires only about half as much power to run it as is required for the old looms, and there is no lost motion in the harness and shuttle operating mechanisms. The warp-beams are of such a size that they will carry several times as much yarn as the old warp-beams, and frequent replacing of the warp-beams is therefore avoided. The guide-pulleys for the non-elastic warps are so arranged, owing to the peculiar shape of the upper part of the loom-frame, that the weights do not overhang the lower part of the frame, and as the weights are thus within the space occupied by the base of the loom the loom requires about a foot (in width) less of floor-space than the old looms, so that six of my improved looms can be placed in the space heretofore required for five of the old looms, which is quite a saving of floor-room in the mill. In fact, it may be briefly stated that the object of my invention is to provide a loom which can be run at high speed with comparatively little power and noise, owing to the direct, positive, and easily-running mechanisms employed, the working capacity of the loom being still further increased by the large capacity of the shuttle and warp beams for yarn, thereby avoiding frequent stoppages of the loom for new supplies of yarn for the shuttles and warp-beams.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination, with the lay and a shuttle-driving bar fitted to reciprocate therein, of a horizontal lever pivoted near its center, a pitman connecting the forward end of said lever with the said driving-bar, a cam at the rear end of said lever for operating the same, and a shaft by which the said cam is carried, substantially as set forth.

2. The combination, with the lay and a shuttle-driving bar fitted to reciprocate therein, of a horizontal lever pivoted near its center and provided at its rear end with bowls or anti-friction rolls, a pitman connecting the forward end of said lever with said driving-bar, a flange-cam the edge of which is received between said bowls or rolls, and a shaft by which said cam is carried, substantially as set forth.

3. The combination, with the lay and its

operating mechanism, of a shuttle-driving bar fitted to reciprocate in the said lay, a lever having a roller-slide provided with bowls or anti-friction rolls, a pitman positively connecting said lever with said driving-bar, a plate or bracket having a guiding-slot in which said roller-slide works, a flange-cam the edge of which is embraced by said bowls or anti-friction rolls, and a shaft by which said cam is carried, substantially as set forth.

4. The combination, with the lay provided with cam-slots and the shuttle-driving bar reciprocating in said lay, of the vibrating shuttle-driving pins having universal-joint connections with said driving-bar and flattened or elliptical portions working in said slots, substantially as set forth.

5. The combination, with the cam-slotted lay and its operating mechanism, of the shuttle-driving bar fitted to slide back and forth in the lay, operating mechanism for said driving-bar, the ball-headed shuttle-driving pins having flattened or elliptical portions, and the plates attached to said bar and having sockets to receive the heads of said pins and slotted projections for guiding said pins in their back-and-forth vibrations, substantially as set forth.

6. The combination, with the lay having the cam-slots c', of the shuttle-driving bar C', having the plates c^5 c^6, the former having the slotted projections or standards c^7, the shuttle-driving pins c^2, having elliptical or flattened portions c^3 and ball-heads c^4, the latter socketed in said plates, and the shuttles F, having the open slots f^2 to receive the ends of said pins, substantially as set forth.

7. The combination, with the tension-pulleys g^4, having in their inner sides round holes to receive the stud on which they can turn and having in their outer sides square holes for the reception of square warp-beam shafts, of friction bands or straps passing around said pulleys and tension-levers with which said straps are connected, substantially as set forth.

8. The combination, with the warp-beam-supporting standards provided with round studs, of the tension-pulleys having on their inner sides round holes to fit said studs and on their outer sides square holes, the square warp-beam shafts fitting in the said square holes, the tension-levers supported by said standards, the friction-bands connected with said levers and passing around said pulleys, the pulleys g', the weighted brackets or blocks g^2, by which said pulleys are carried and which are arranged below the longer or outer ends of said levers, and the overhead guide-pulleys g, over which the warps pass, substantially as set forth.

9. The combination, with the lay and its operating mechanism, of the sliding bar I^2, the bell-crank lever K, operatively connected with the said lay and sliding bar and having a series of collars i^3, the pawls i^4, pivoted to said collars, the shafts i^2, having ratchet-wheels i^5 and worms i^7, the worm-wheels i, the take-up rolls I', with which said worm-wheels are connected, and the pressure-rolls I, substantially as set forth.

10. The combination, with the machine-frame, of the bearing-plates m, having the curved slots m^3, the warp-guide rolls L, journaled in said plates, the brackets m', and the bolts m^4, passing through said curved slots and adjustably securing said bearing-plates to said brackets, substantially as set forth.

11. The combination, with the harnesses, of the rigid links or bars n', connected with the opposite ends of the harness-frames, each of said links or bars being formed in parts and having right and left hand screws, whereby said parts are adjustably joined together, the levers n^2 n^3, positively connected to each other at their inner ends and having the said links connected at their outer ends, and the grooved cams, with which engage projections on one lever of each connected pair of levers n^2 n^3, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE C. MOORE.

Witnesses:
JOS. W. GREEN, JR.,
CHAS. H. JOHNSON.