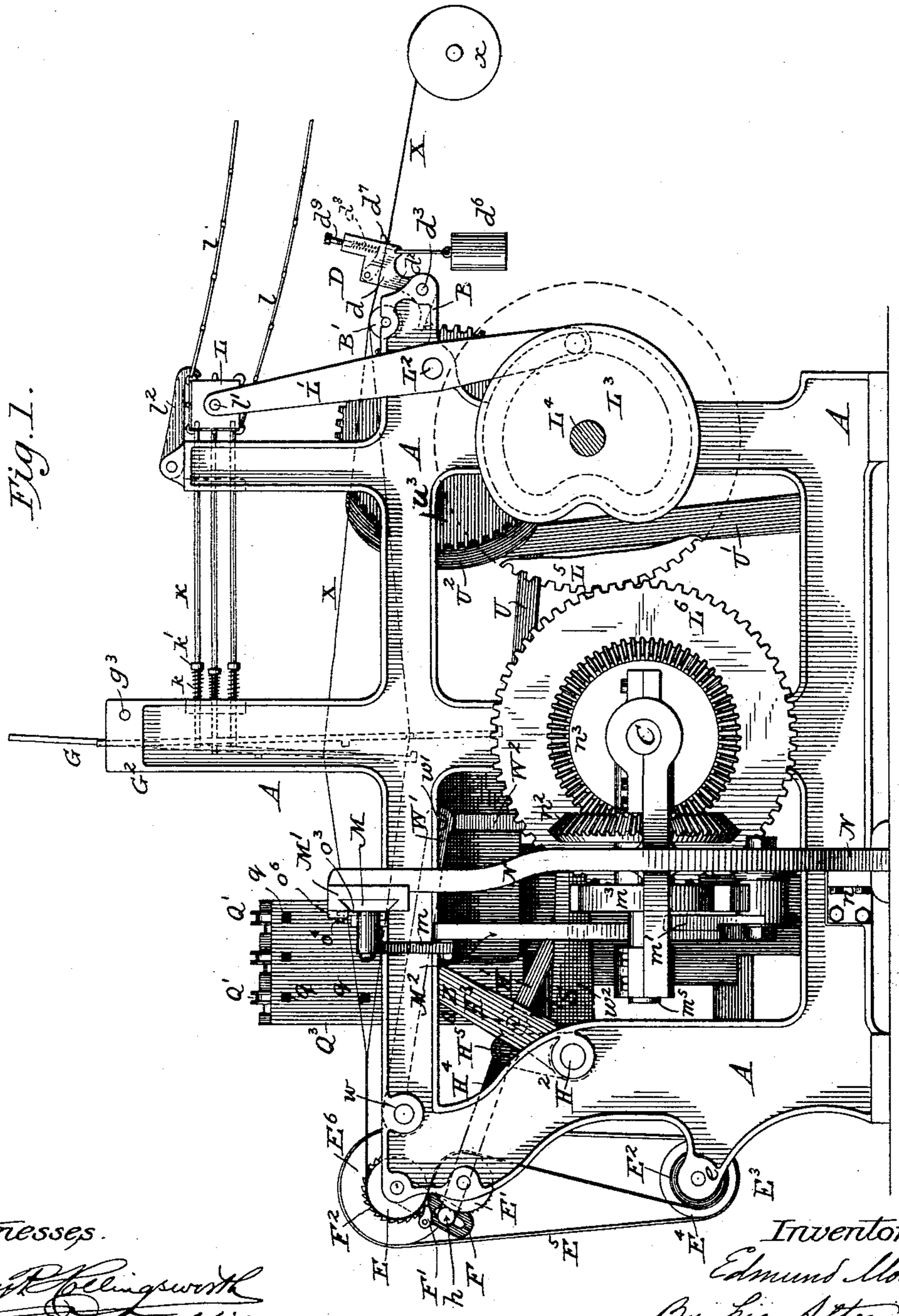
(No Model.) 6 Sheets—Sheet 1.

E. MORRIS.

LOOM FOR WEAVING CANE.

No. 547,884. Patented Oct. 15, 1895.

Fig. 1.



Witnesses.

Sidney R. Ellingsworth

H. Washington Miller.

Inventor,

Edmund Morris,

By his Attorneys.

Baldwin Davidson & Wright.

(No Model.) 6 Sheets—Sheet 2.

E. MORRIS.

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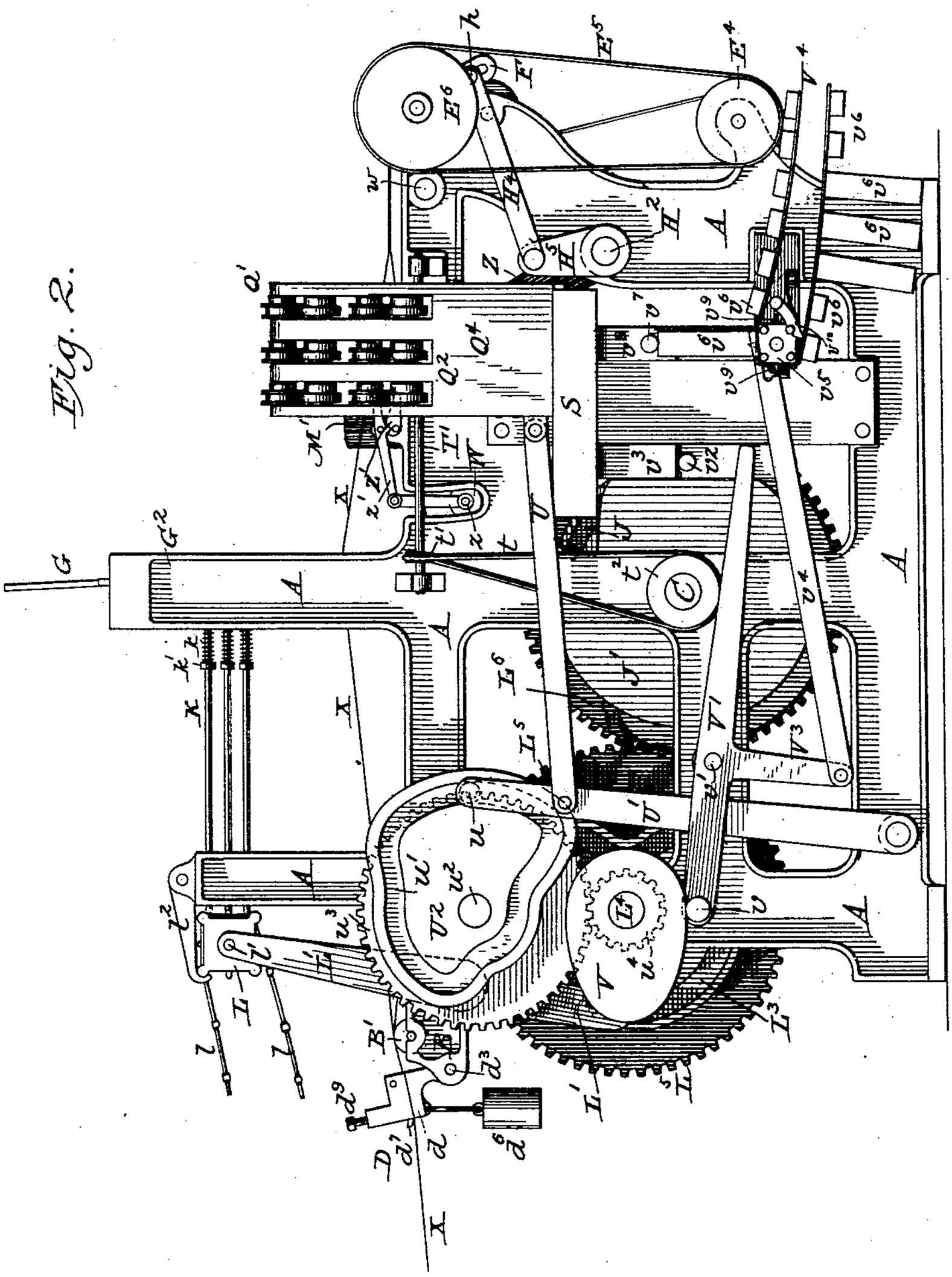
Fig. 2.



Witnesses.
Sidney P. Hollingsworth
Washington Miller.

Inventor.
Edmund Morris,
By his Attorneys,
Baldwin Davidson & Wright

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E. MORRIS.

LOOM FOR WEAVING CANE.

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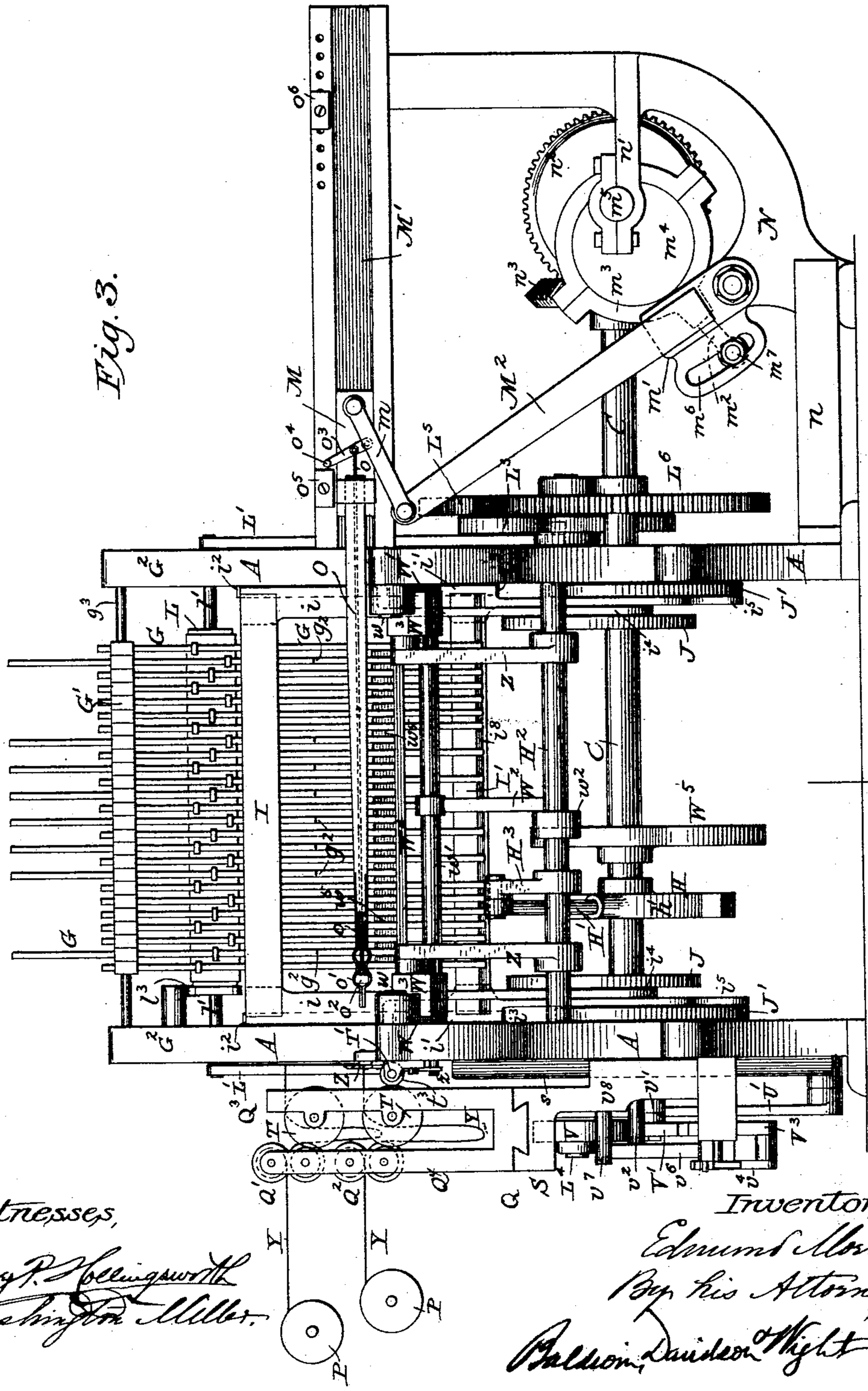
Fig. 3.



Witnesses,
Sidney P. Hollingsworth
B. Washington Miller.

Inventor,
Edmund Morris
By his Attorneys
Baldwin, Davidson & Wright

(No Model.)

6 Sheets—Sheet 4.

E. MORRIS.

LOOM FOR WEAVING CANE.

No. 547,884. Patented Oct. 15, 1895.

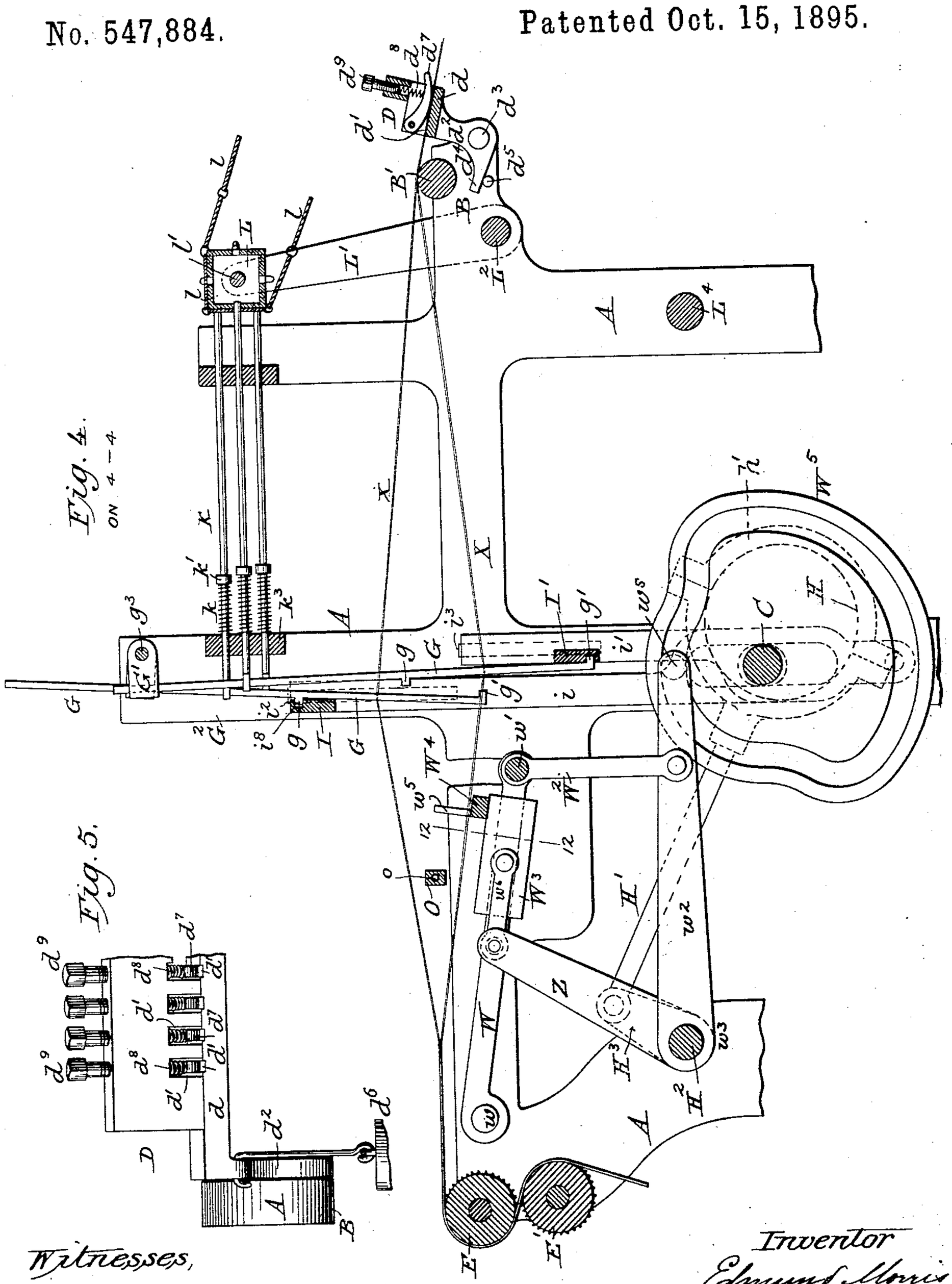


Fig. 4.

ON 4—4

Fig. 5.

Witnesses,

Sidney P. Hollingsworth

B. Washington Miller.

Inventor

Edmund Morris

By his Attorneys

Baldwin, Davidson & Wright

(No Model.) 6 Sheets—Sheet 5.

E. MORRIS.

LOOM FOR WEAVING CANE.

No. 547,884. Patented Oct. 15, 1895.

Fig. 8.

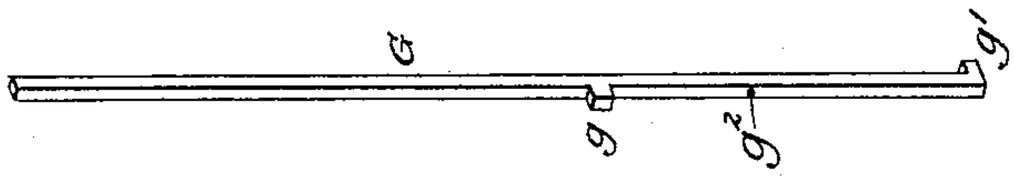


Fig. 6.

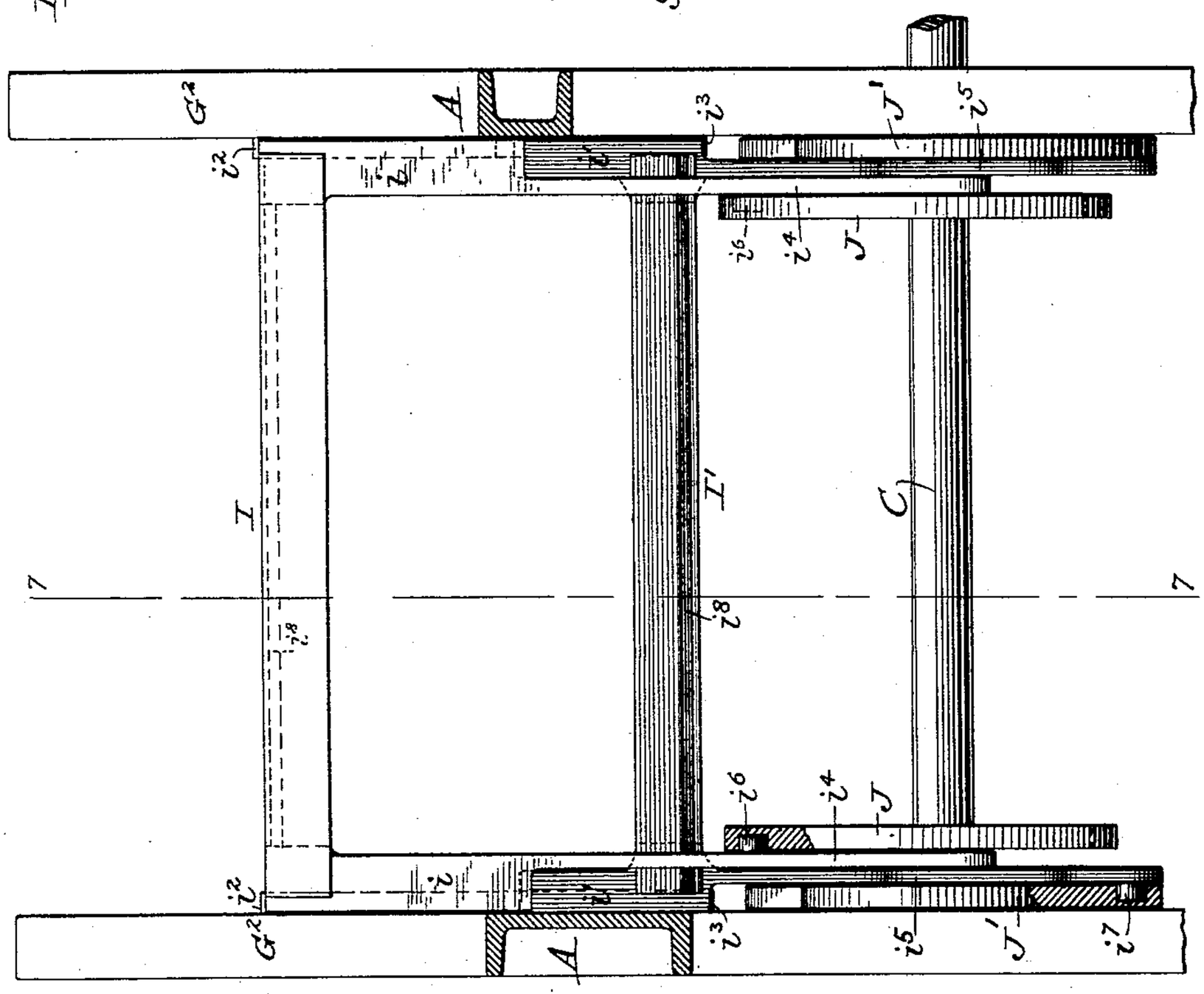
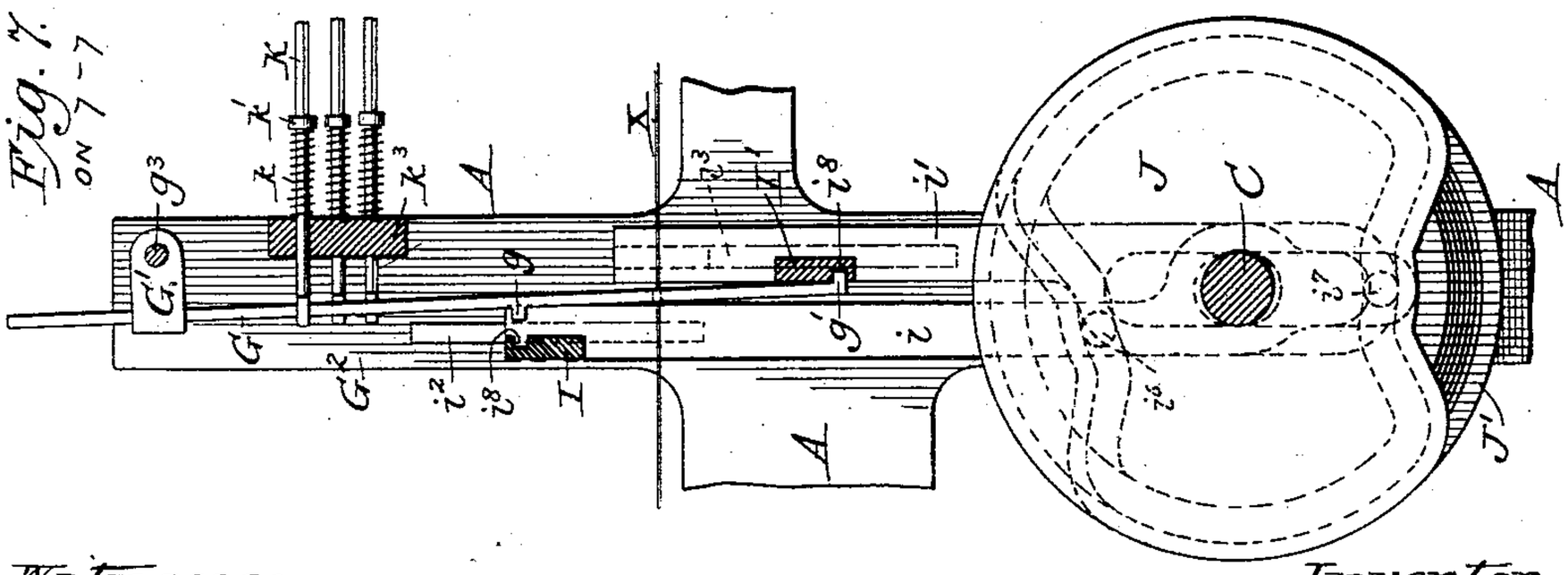


Fig. 7. on 7-7



Witnesses,

Sidney P. Hollingsworth

B. Washington Miller.

Inventor,

Edmund Morris

By his Attorneys,

Baldwin Davidson & Wright

(No Model.) 6 Sheets—Sheet 6.

E. MORRIS.

LOOM FOR WEAVING CANE.

No. 547,884. Patented Oct. 15, 1895.

Fig. 11

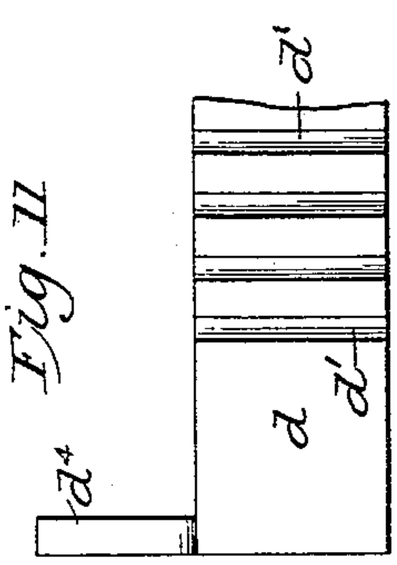


Fig. 12.

ON 12-12

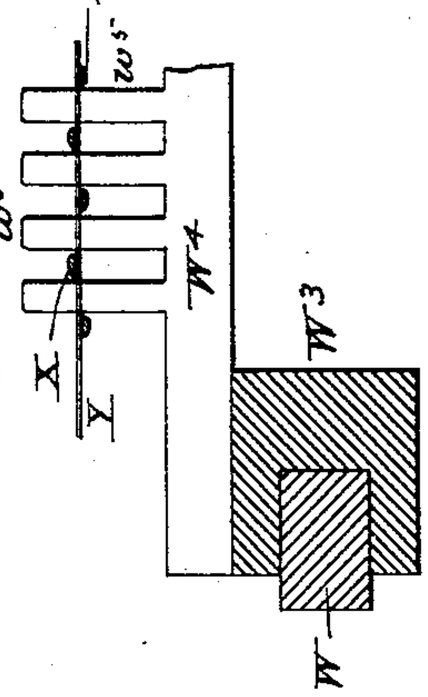


Fig. 13.

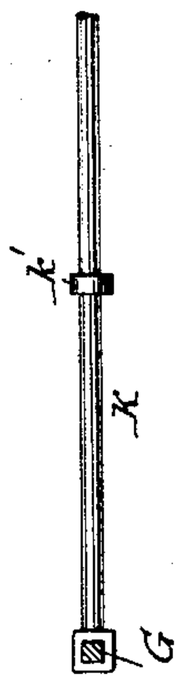


Fig. 10

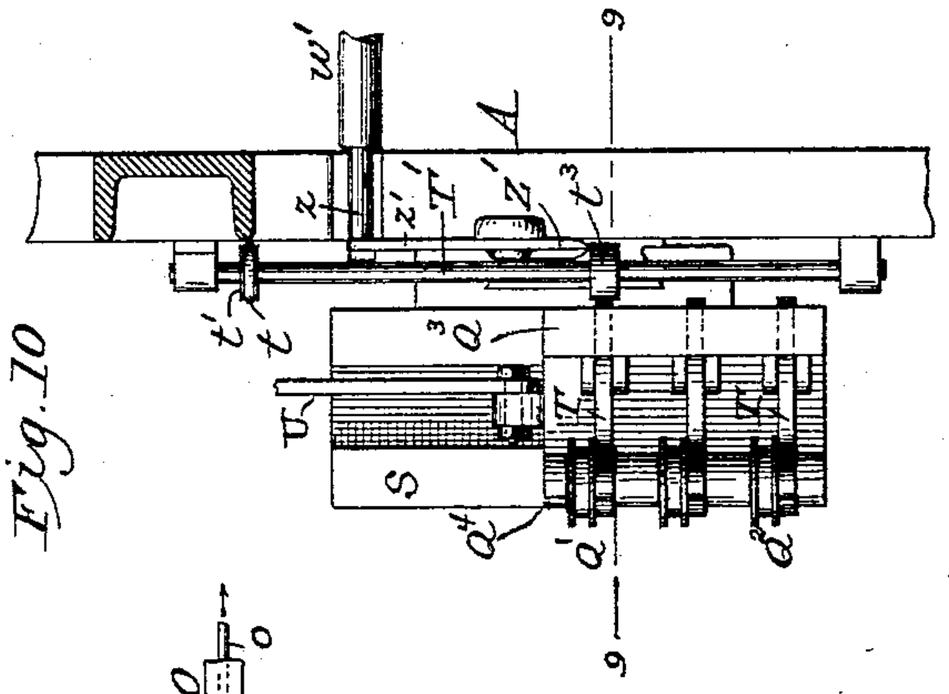
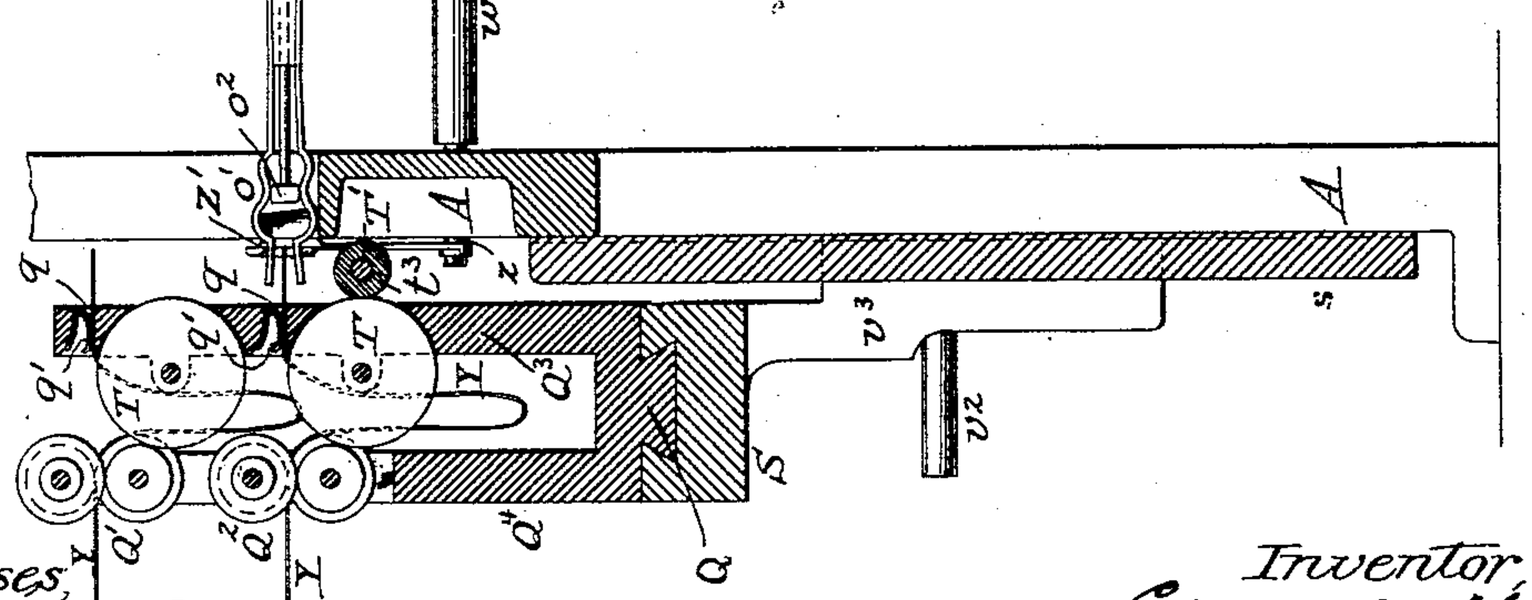


Fig. 9

ON 9-9



Witnesses,

Sidney B. Collingworth

B. Washington Miller

Inventor,

Edmund Morris

By his Attorneys,

Baldwin, Davidson & Wright

UNITED STATES PATENT OFFICE.

EDMUND MORRIS, OF MICHIGAN CITY, INDIANA.

LOOM FOR WEAVING CANE.

SPECIFICATION forming part of Letters Patent No. 547,884, dated October 15, 1895.

Application filed February 13, 1895. Serial No. 538,277. (No model.)

To all whom it may concern:

Be it known that I, EDMUND MORRIS, a citizen of the United States, residing at Michigan City, in the county of La Porte and State of Indiana, have invented certain new and useful Improvements in Looms for Weaving Cane, of which the following is a specification.

The object of my invention is to produce by machinery figured cloth made of split cane, rattan, or other like stuff and inelastic material. Such material cannot be woven in looms as ordinarily constructed for the weaving of cotton, worsted, and the like, the threads of which are round, more or less elastic, and comparatively small. Threads of cane, on the other hand, being flat, wide, and inelastic, it is desirable, and in fact imperative, for efficient work that special means should be provided for holding the warp-threads under proper uniform tension both while being fed longitudinally through the loom and also during the operation of shedding. It is also necessary to provide specially-constructed mechanism to feed the weft-threads to the picker in such manner as not only to supply the demand for rapid working, but also in such manner as to prevent the fracture of the threads when they are fed in continuous lengths, as they are in my machine.

My invention therefore comprehends novel devices for applying a proper tension to the warp-threads individually, improved Jacquard mechanism for forming the shed, and novel mechanism for supplying the weft or filling to the picker. The warp-threads are drawn from spools instead of from a warp-beam, as usual, and each thread, before it reaches the heddles, passes under an adjustable spring-pressed finger arranged in a groove in a hinged weighted bar. The heddle-bars are not mounted in frames and moved in groups, as usual, but each heddle-bar has a movement independent of the others. They are under the control of Jacquard needles, which determine their movement, whether it shall be up or down, mechanism being provided for moving all the heddles at each pick of the loom, some upward and the others downward, in order to hold the warp-threads at all times taut and prevent them from being reversed or twisted. Suitable take-up mechanism is provided and the lay and comb are suitably arranged and operated to beat up the wefts as they are inserted. Instead of supplying the wefts in short lengths I supply them from spools. A single continuous weft-strand might be employed to form a figured cane cloth, but I desire to give to my loom the capacity of weaving a cloth with threads of different widths or different artificial colors and also the capacity of supplying weft-strands of different natural colors or qualities. It is well known that the split cane ordinarily used in the manufacture of close-woven fabric for the backs and seats of chairs is of varying quality and color. Most of it has a light yellow tint, but much of it is dark yellow or light brown. The fabric is often marred in appearance when strips of discolored cane are formed by using a series of discolored adjoining weft-threads. I therefore provide a series of spools for supplying the wefts and employ mechanism for drawing the weft-threads from all the spools successively or from any desired set of spools. Such mechanism is under the control of suitable patterns that determine the nature or color of the weft-strands to be inserted, and the insertion of a series of adjoining discolored strands may thus be avoided.

My invention comprehends not only the main features above outlined, but also certain novel organizations of instrumentalities and details of construction, which are illustrated in the accompanying drawings and hereinafter specifically described and claimed.

The accompanying drawings show my improvements embodied in a loom in the best way now known to me. Some of said improvements may, however, be used without the others and in machines differing to some extent in their details of construction from that herein shown. Unless otherwise indicated the parts are of usual approved construction.

That end of the loom at which the fabric is wound up after being formed I term the "front;" the opposite end, the "rear." That side of the machine on which the picker-block is located I term the "right;" the opposite side "the left."

Figure 1 is a right-hand side elevation, and Fig. 2 is a left-hand side elevation of a loom embodying my improvements. Fig. 3 is a

front elevation with the take-up mechanism removed. The remaining views are on an enlarged scale. Fig. 4 is a detail view in longitudinal section on the line 4 4 of Fig. 3, showing particularly the Jacquard mechanism for forming the shed, the lay, and its operating mechanism. Fig. 5 is a detail view of the tension devices. Fig. 6 is a view, partly in front elevation and partly in section, of the cross-bars for lifting and lowering the heddle-bars and the mechanism for operating these cross-bars. Fig. 7 shows a section of the same on the line 7 7 of Fig. 6. Fig. 8 is a perspective detail view of one of the heddle-bars. Fig. 9 is a detail view in section on the line 9 9 of Fig. 10 of the mechanism for delivering the filling to the picker. Fig. 10 shows a plan of the same. Fig. 11 is a detail view of the tension devices. Fig. 12 is a detail view in section on the line 12 12 of Fig. 4 of the lay; and Fig. 13 is a detail view of one of the Jacquard needles, showing its connection with a heddle-bar.

The main frame A is shown as consisting of two parallel substantially similar castings suitably constructed to support the working parts of the loom and having bearings for the main driving-shaft C arranged transversely in the lower portion of the frame and carrying gearing, hereinafter described, for actuating the various mechanisms.

The warp-threads X are drawn from separate spools x, mounted in any suitable way at the rear end of the loom. The warps being of split cane glazed on one side, it is important that they should be separated and should be prevented from slipping or twisting. The tension devices D, which I employ for this purpose, consist of the following instrumentalities: A horizontal bar d, arranged transversely on the machine, is provided on its upper surface with a series of longitudinal grooves or recesses d', corresponding in number and arrangement with the warp-threads X, there being one for each warp. Downwardly-projecting arms d^2 are pivoted at d^3 to rearwardly-extending portions B of the main frame, and forwardly-projecting fingers d^4 are adapted to abut against studs d^5, projecting from the frame. The grooved bar is free to turn about its pivots, its upward movement being limited by the studs d^5. One or more weights d^6 are attached to the bar and, tending to pull it downwardly, produce a tension on the warp-threads, which are held in contact with the bar by a series of pivoted curved fingers d^7, arranged in the grooves d', pressed toward the threads by springs d^8 and adjusted by set-screws d^9. By this mechanism tension is produced on the warp-threads by the spring-pressed fingers and at the same time a greater tension is produced by the weighted bar. By adjusting the screws d^9 the tension on the warp-threads may be made uniform. The grooves and the fingers are so shaped as to permit the warps to pass without undue friction, and yet they are prevented from twisting or turning, and are held taut during the operation of shedding.

From the tension devices the warp-threads extend over a roller B′, through the heddle-bars, and past the mechanism for inserting the filling, both of which will be hereinafter described; thence pass over and between feed-rolls E E′, armed with metallic points to insure the adherence of the fabric to them; thence to a take-up roll E^2, mounted on a shaft E^3, which is removable from its bearings e, in order that the roll of finished cloth may be carried away. The take-up roll E^2 is driven by a pulley E^4, actuated by a belt E^5, which latter receives its motion from a pulley E^6, located on the same shaft as the feed-roller E, which is actuated to feed the cloth forward at proper times by a lever F, furnished with a ratchet F′, engaging a ratchet-wheel F^2 on the shaft of the roller E. The lever F is actuated by an eccentric H, fixed upon the main shaft C and connected with the lever F by means of an eccentric-strap h' on the rod H′, arm H^3, shaft H^2, arm H^5, and rod H^4. The rod H′ connects with the short arm H^3 on the shaft H^2, and this is in turn connected by the arm H^5 with the rod H^4, which latter is adjustably connected at h with the arm F, in order that the feed may be varied. By this means a step-by-step forward movement is given to the fabric as the weaving progresses.

The devices just described constitute the warp-feeding mechanism preferably employed, the warp-threads being drawn thereby from their spools to and past the devices for forming the shed and inserting the filling, the completed fabric being wound up, as before explained. Any suitable mechanism for feeding the warps and winding the completed fabric may be employed.

For forming the shed I employ heddle-bars which are individually movable and are operated in such manner that all of the bars are moved simultaneously, some of them upwardly and some downwardly, thus causing all the warps to be held taut when the shed is formed. Each heddle-bar carries a single warp-thread, and its eye is movable across the horizontal plane of the fabric, or the plane in which the picker moves. The heddle-bars are operated by Jacquard mechanism, which controls their movement to produce the desired figure. Each heddle-bar G is provided with two laterally-projecting lugs g g', arranged one above the other and on opposite sides of the bar. Each bar is preferably square in cross-section, and it is stiff and sufficiently strong to be moved upwardly as well as pulled downwardly, and each is formed with an eye g^2 for its corresponding warp-thread. A series of blocks G′, hinged to a rod g^3, mounted in uprights G^2, are provided for supporting the upper ends of the heddle-bars, which extend through the blocks and are free to slide vertically therein, and with the blocks

are adapted to oscillate longitudinally of the machine, in order to engage with the mechanism for lifting or lowering them. The heddle-bars, it will be observed, are arranged in a single row transversely across the machine, and, as they are individually movable positively in opposite directions, some upwardly and some downwardly, the warp-threads are always held taut, and a capacity is given to the machine for forming a great variety of figures without twisting the cane-strips and without forming an irregular shed.

The mechanism for supporting and for lifting and lowering the heddle-bars is shown as consisting of two cross-bars I I′, the upper bar I being the lifting-bar and the lower one the lowering-bar. Sliding blocks $i\,i'$, to which the bars I I′ are secured, are adapted to move vertically on guide-rails $i^2\,i^3$. The blocks $i\,i'$ are provided with downwardly-extending arms $i^4\,i^5$, which are slotted to embrace the main shaft C, which acts as a guide for them. The arms i^4 are provided with friction-rollers i^6, which engage with grooves in cams J, secured to the shaft C on each side of the loom. The arms i^5 are provided with rollers i^7, engaging cams J′ on the shaft C. By this means the bars I I′ are moved vertically alternately in opposite directions. They are grooved longitudinally and horizontally at i^8 and are adapted to engage with the studs $g\,g'$ on the heddle-bars. The cams J J′ are arranged in pairs, one pair on each side of the machine. They are similar in construction and are disposed opposite to one another, so that when the cams J push the bar I upwardly the cams J′ will pull the bar I′ downwardly. This occurs at each pick of the loom. The arrangement is such that when the bars I I′ are in their normal position, which is when the bar I is depressed and the bar I′ elevated, the projections $g\,g'$ upon the heddle-bars are caused to engage the groove in one or the other of the bars I or I′. The heddle-bars extend vertically through perforations in the ends of the needles K, forming part of the Jacquard mechanism, and are free to move upwardly and downwardly therein. A spring k is interposed between a collar k' on each needle and a plate k^3, which extends transversely across the machine and is secured to the uprights G^2. The springs tend normally to move the needles and the heddle-bars connected therewith toward the rear end of the machine. A Jacquard cylinder or prism L is provided with cards l, which may be of usual construction and is perforated as usual, and the rear end of the needles are adapted to enter these perforations. The shaft l' of the prism is journaled in the upper ends of levers L′, secured at their lower ends to a transverse shaft L^2, journaled in the main frame. One of the levers L′ extends downwardly to a cam L^3 on a shaft L^4, mounted in bearings in the main frame and carrying a cog L^5, gearing with a cog L^6 on the shaft C. By this means the prism is reciprocated to operate the needles in the usual way. A pawl l^2, pivoted to the main frame, engages the prism in the usual way to cause it to turn at each operation to change the pattern. By this mechanism the shed is formed and changed at each pick of the loom in much the same way that it is done in looms of ordinary construction, there being this exception, that the heddles, instead of being arranged in groups, are independently movable and are positively operated in either one direction or the other at each pick of the loom. The bars I I′ support the heddle-bars, each of which is always connected with one or the other of them, but each heddle-bar is separable from the supporting-bar to which it may be attached and may be connected with the other supporting-bar.

To introduce the fillings or wefts, I employ a picker constructed and operated in much the same way as are pickers of ordinary construction. The picker-block M is mounted to slide in a raceway M′, and is connected by means of a link m with a picker-stick M^2, connected at its lower end with a lever m', pivoted to a standard N, connected at its lower end with the main frame by the tie-bar n, and its upper end connected with the outer end of the raceway M′. The lever m' is operated by an arm m^2, projecting from an eccentric-strap m^3, surrounding an eccentric m^4, secured to a shaft m^5, arranged in bearings on arms n', projecting from the standard N. The arm m^2 is connected with the strap, and it is also connected adjustably with the lever m' by means of a wrist-pin m^7, adjustable in a slot m^6. The shaft m^5 carries a miter-wheel n^2, gearing with a miter-wheel n^3 on the end of the main shaft C. By this mechanism the picker-block is reciprocated rapidly in the raceway M′.

The picker O extends horizontally transversely across the machine when moved inwardly, and is caused by the reciprocation of the picker-block to pass through the shed formed in the warp by the action of the heddles. The picker is pierced longitudinally from end to end, and within it is located a rod o for opening and closing the picker-jaws o', which are located at the front end of the picker, and are preferably formed of steel plates attached to the sides of the picker and curved in the manner shown near their forward ends, their extreme outer ends being flat and normally closed in contact with each other. Within the picker-jaws o' is a block o^2, attached to the rod o, which, by being drawn backward or forward in the irregular space formed by the curvature of the jaws, causes them to open and close, and thus to grasp and release the cane-strip at the proper time. The rod o is connected at its opposite end with a short lever o^3, pivoted to the picker-block at its lower end and at its upper end provided with a stud o^4, adapted to strike one or the other of the blocks $o^5\,o^6$, arranged at opposite ends of the raceway. When the picker is advanced to its full extent, or nearly so, the lever o^3 strikes against the block o^5, which causes the rod o, attached to the lever,

to be moved to the right, as viewed in Fig. 3, the block o^2 on the end of the rod being shifted from its position on one side of the inwardly-curved portions of the jaws to the other side thereof, thus causing the jaws to quickly open and immediately close, grasping the thread before the picker begins to retreat. The picker on its backward movement inserts the weft-thread in the fabric. The picker is of well-known construction and operates in the usual way. The block o^2 is so shaped that when it is moved past the inwardly-curved portions of the jaws it will open them, but when between those portions of the jaws on opposite sides of the inwardly-curved portions the jaws are closed. As the picker approaches the extremity of its backward movement, the lever o^3 strikes the block o^6, thus shifting the block o^2, opening the jaws and releasing the filling. The block o^6 may be made adjustable in the manner shown, in order that the picker may be made to release the filling at any point desired to accommodate the length of the filling to the width of the fabric to be woven. Instead of feeding the cane in short lengths to the picker I glue together short strips of cane, forming a long strip, which is wound on a spool. Several of such spools of cane P may be mounted in any suitable frame adjacent to the left-hand side of the loom. These rolls of cane may be of different colors, sizes, tints, or qualities, and the filling may be drawn from them successively in a manner hereinafter described. A series of pairs of feed-rolls are mounted on a carriage, consisting preferably of two uprights Q^3 Q^4 and a base-piece O. Any number of pairs of feed-rolls may be employed. In the drawings I have shown two horizontal ranks of feed-rolls and three vertical series.

The strips of cane Y are led through the feed-rolls Q′ Q^2 and project into guide-openings q in the upright Q^3. There are as many openings q as there are pairs of feed-rolls, and at all times the ends of the cane-strips project through these openings, which are provided with springs q', that bear at all times on the ends of the strips and hold them in place, but permit of their being drawn rapidly through the openings when seized by the picker. The carriage is mounted on a vertically-sliding bracket S, with which it has a dovetail connection. Mechanism is provided for reciprocating the carriage horizontally on the bracket, and other mechanism is provided for moving the bracket S vertically. The bracket is guided vertically by a dovetailed guide s, secured to the main frame A. Each pair of feed-rolls engages with a friction-wheel T, mounted in the frame Q, there being one such friction-wheel T for each pair of feed-rolls. A shaft T′, mounted in bearings on the main frame, is driven by a belt t, gearing with pulleys t' t^2 on the shafts T′ and C, respectively. The shaft T′ revolves continuously, but has no endwise movement. It is provided with a roller t^3, adapted to engage frictionally successively with the friction-wheels T. When the roller t^3 engages with a friction-wheel T, it drives a corresponding set of feed-rolls and feeds the cane forward toward the picker. The arrangement is such that the feed-rolls operate while the picker is moving backward, each time feeding about enough cane for one weft, but care is taken that there shall always be a slack portion equal to or more than enough for one weft. This may be effected by drawing out a slack portion somewhat more than enough to form a filling from each supply-roll before the machine begins to operate, as is illustrated in Figs. 3 and 9. The object of this arrangement is to enable the picker to rapidly pull the cane forward without being obliged to unwind it from the spools, the inertia of which might cause the cane to break. The feed-rolls belonging to any particular strand must not be continuously operated to feed slack cane, as the picker is apt to demand far more cane from one spool than from others, varying of course with the figure to be woven. As shown, the machine is arranged to feed from feed-rolls arranged in three vertical series and two horizontal ranks; but by suitable mechanism the machine may be made to feed from one, two, or three vertical series or from one horizontal rank or from a single set of feed-rolls. Preferably the feed-roll carriage is always reciprocated to the same extent; but when, for instance, it is desired to feed from one set of feed-rolls only this set of rolls only is allowed to "dwell" in front of the friction-roll t^3 to cause the rolls to feed, by which means an unnecessarily long slack portion is avoided.

The carriage is reciprocated horizontally by means of a pitman U, connected to an upright lever U′, having a boll u working in a cam-groove u' in a cam U^2 on a shaft u^2, which is geared by a cog u^3 with a pinion u^4 on the shaft L^4. The cam-groove u' is so shaped as to cause the several vertical rows of feed-rolls to be brought into line with the picker successively and to provide for a dwell of the rolls in line with the picker long enough to feed a sufficient quantity of the weft. The shape of the cam, which is a pattern-cam, of course governs the horizontal movement of the rolls and the dwells of the rolls in front of the picker, the cam being changed whenever it is desired to so change the pattern as to necessitate a different horizontal movement of the feed-rolls.

An up-and-down movement is given to the bracket S by the following mechanism: The shaft L^4 carries a cam or wiper V, operating upon a roller v on the end of a lever V′, pivoted at v' to the main frame and at its opposite end extending under a pin v^2 on an arm v^3, extending downwardly from the bracket S. The lever V′ has an arm V^3, pivotally connected with a pitman v^4, engaging a prism v^5, carrying a pattern-chain V^4. The pattern-chain is provided with a series of blocks v^6 of varying lengths, (in this instance two different

lengths are shown,) adapted to move under a pin v^7 on the arm v^8, projecting downwardly from the bracket S. The prism v^5 may be provided with projecting points v^9 to engage with corresponding notches or recesses in the inner portions of the blocks v^6. A spring-pressed pawl v^{10} holds the prism steady, but permits it to be moved step by step by the pitman v^4. The lever V′ is operated by the wiper to lift the bracket S to its full extent at each operation, the return movement being limited, however, by the blocks v^6, the longer blocks holding the bracket at its highest elevation and the shorter ones holding it at its lowest elevation. By this mechanism the feed-rolls are reciprocated back and forth and up and down and brought to rest at any desired point. The cam U^2 and the pattern-chain V^4 may be changed at pleasure and may be of such a construction as to produce any desired movement of the feed-rolls to take the wefts from any one, any two, or any desired number of them and also to take the wefts from them in any desired succession. The cane which is feed into the rolls of the lower rank is, or may be, of a different color from that which goes into the upper rank of feed-rolls, and by the sudden elevation and depression of the bracket S the color of the cane presented to the picker is changed, it being observable, however, that the same horizontal motion is necessary to distribute the fillings in the case of dyed cane as in that which is white or bleached, since it seldom happens that two strands or samples of this article are of sufficiently-even color to bear weaving in together in a mass without affecting the appearance of the fabric; but they should always be distributed by keeping constantly in motion the feeding arrangements which present them to the picker.

To beat the filling home I employ a lay constructed as follows: Arms W W′, pivoted at w, extend rearwardly beyond the line of movement of the picker and are provided with a cross-bar w'. An upright arm W^2, secured to the cross-piece w', is connected at its lower end with and operated by a lever w^2, pivoted at w^3 to the shaft H^2 and having at its inner end a roller w^5, engaging a cam W^5 on the shaft C. By this means the arms W W′ are rocked vertically and are made to rise and fall into and outside the shed. On the arms W W′ are mounted sliding blocks W^3, adapted to reciprocate on the arms as guides. They are provided with a cross-piece W^4, from which project upwardly a series of teeth w^5, between which the warps extend and which form a comb for beating the filling into place. The sliding blocks are connected by links w^6 with levers Z, secured to the shaft H^2, which is operated by the arm H^3, rod H′, and cam H, as heretofore explained, the arrangement being such that the lay is alternately lifted and depressed to clear the picker and also reciprocated back and forth to beat up the filling. On the end of the cross-piece w' is a rod z, connecting with the rearwardly-extending arm z' of the shears Z′, which are placed between the feed-rolls and the picker. Each time that the lay is elevated to beat home a weft-thread the shears are operated to sever it from the continuous length of the weft.

The several parts of the loom are timed to operate harmoniously, rapidly, and efficiently to weave the cloth, any desired figure being produced by a change in the pattern-cards, cams, &c.

The details of construction may be varied without departing from my invention.

What I claim is—

1. The combination, with the warp-feeding and shed-forming mechanism of a loom, of a rising and falling grooved carrier bar individually movable tension devices mounted in the grooves of the bar and each bearing on its respective thread, and a roller interposed between the tension devices and the shed-forming mechanism and traversed by the warp threads.

2. The combination, with the warp-feeding mechanism of a loom, of a rising and falling carrier-bar, having guide grooves for the warps, and individually-movable, spring-controlled tension devices, mounted in the grooves of the bar.

3. The combination, with the warp-feeding mechanism of a loom, of the rising and falling carrier-bar, having guide grooves for the warps, a weight suspended from the carrier bar and individually-movable, spring-controlled tension devices, mounted in the grooves of the bar.

4. The combination, with the warp-feeding mechanism of a loom, of individually-movable heddle-bars, each having an eye movable across the horizontal plane of the fabric, or the plane in which the picker moves, and each carrying a single warp thread, mechanism for moving the heddle bars in opposite directions to form the shed, Jacquard mechanism for deciding which bars are to be elevated and which depressed, and individually-movable tension devices, each acting on its proper thread.

5. The combination, with the warp-feeding mechanism of a loom, of individually-movable heddle bars, corresponding in number with the number of warp threads, and each carrying its respective warp thread, the supports to which each of the heddle bars is removably connected, mechanism for moving each or any of the heddle-bars from engagement with one support into engagement with the other support, and mechanism for moving the supports in opposite directions to move all of the heddle bars simultaneously to form the shed, substantially as described.

6. The combination, with the warp-feeding mechanism of a loom, of individually-movable heddle bars, each having an eye for a single warp thread, and which is movable across the horizontal plane of the fabric, or the plane in which the picker moves, mechanism for operating all of these bars simultaneously to move

their eyes in opposite directions across the horizontal plane of the fabric, and Jacquard mechanism for deciding which bars are to be elevated and which depressed.

7. The combination with the warp-feeding mechanism of a loom, of individually-movable heddle bars, each carrying a warp thread, the upper end and lower grooved cross bars each of which is adapted to support any or all of the heddle bars, mechanism for moving the cross bars vertically, and mechanism for moving any or all of the heddle bars into engagement with either of the cross bars.

8. The combination, with the warp-feeding mechanism of a loom, of individually-movable heddle bars, each carrying a warp thread, means for actuating these bars to form a shed, and a series of pivoted blocks through each of which a heddle bar slides longitudinally.

9. The combination with the warp-feeding mechanism of a loom, of individually movable heddle-bars, each carrying a warp-thread, a series of pivoted blocks through each of which a heddle-bar slides longitudinally, upper and lower grooved cross-bars with which laterally projecting lugs on the heddle-bars are adapted to engage, mechanism for moving the cross-bars alternately in opposite directions relatively to the warp, Jacquard mechanism for oscillating the heddle-bars toward and from the lifting bars, and means for actuating the Jacquard mechanism.

10. A heddle-bar having laterally projecting lugs on its opposite sides, one above the other, and an eye intermediate the lugs for the passage of a warp-thread.

11. A heddle-bar, angular in cross section, having laterally projecting lugs on its opposite sides, one above the other, and an eye intermediate the lugs for the passage of a warp-thread.

12. The combination with warp-feeding and shed-forming mechanism, of the picker, a weft-thread carrier, and positively driven rolls for drawing the weft thread from its carrier to feed the picker.

13. The combination with warp-feeding and shed-forming mechanism, of the picker, a series of weft thread spools or carriers, and positively driven rolls for drawing the weft threads from their carriers to feed the picker.

14. The combination with warp-feeding and shed-forming mechanism, of a picker, a weft-thread carrier, positively driven rolls for drawing said thread therefrom to feed to the picker, and means for severing the weft-thread inserted in the fabric from the other portion thereof.

15. The combination with warp-feeding and shed-forming mechanism, of the picker, a weft-thread carrier, devices for feeding the weft-thread from its carrier and producing a slack portion thereof, and means for supporting the end of the thread in the line of movement of the picker.

16. The combination with warp-feeding and shed-forming mechanism, of the picker, weft-thread carriers, positively driven rolls for feeding the weft threads to the picker, rolls for supporting the ends of the weft-threads, and means for moving the weft-thread feeding devices relatively to the line of movement of the picker.

17. The combination with warp-feeding and shed-forming mechanism, of a sliding carriage supporting a series of rolls for feeding the weft-threads, a picker, and means for positively actuating said rolls, carriage and picker.

18. The combination with warp-feeding and shed-forming mechanism, of a picker, a sliding carriage supporting a series of devices for feeding the weft-threads toward the picker, and means for positively actuating said feeding devices, carriage and picker.

19. The combination with warp-feeding and shed-forming mechanism, of a picker, a sliding carriage supporting a series of devices for feeding weft-threads toward said picker, means for positively actuating both the picker and weft-thread feeding devices, and mechanism for moving the sliding carriage both horizontally and vertically.

20. The combination with warp-feeding and shed-forming mechanism, of a picker, means for actuating it, a sliding carriage supporting two or more series of ranks of weft-thread feeding rolls, means for positively actuating that pair only of rolls opposite the line of movement of the picker, and mechanism for moving the carriage both horizontally and vertically.

21. The combination with warp-feeding and shed-forming mechanism, of a picker and means for actuating it, a sliding carriage, a series of ranks of weft-thread feeding rolls carried thereby, friction wheels engaging the rolls, a shaft carrying a single friction wheel adapted successively to engage with the friction wheels which drive the rolls, and means for driving said shaft.

22. The combination with warp-feeding mechanism, of a picker, means for actuating it, individually movable heddle-bars, means for actuating them, a weft-thread carrier, and devices for drawing the weft-thread therefrom to feed the picker.

In testimony whereof I have hereunto subscribed my name.

EDMUND MORRIS.

Witnesses:
ARTHUR N. GITTINGS,
HENRY W. JOHNSON.

Corrections in Letters Patent No. 547,884.

It is heroby certified that in Letters Patent No. 547,884, granted October 15, 1895, upon the application of Edmund Morris, of Michigan City, Indiana, for an improvement in "Looms for Weaving Cane," errors appear in the printed specification requiring correction, as follows: In line 10, page 1, the word "stuff" should read *stiff;* in line 37, page 4, the reference letter "O" should be *Q;* in line 101, same page, a comma should be inserted between the words "only" and this; in line 8, page 6, the word "end" should be stricken out; in line 69, same page, the word "rolls" should read *devices*, and in line 72, same page, the word "devices" should read *rolls;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 29th day of October, A. D. 1895.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

S. T. FISHER,
Acting Commissioner of Patents.