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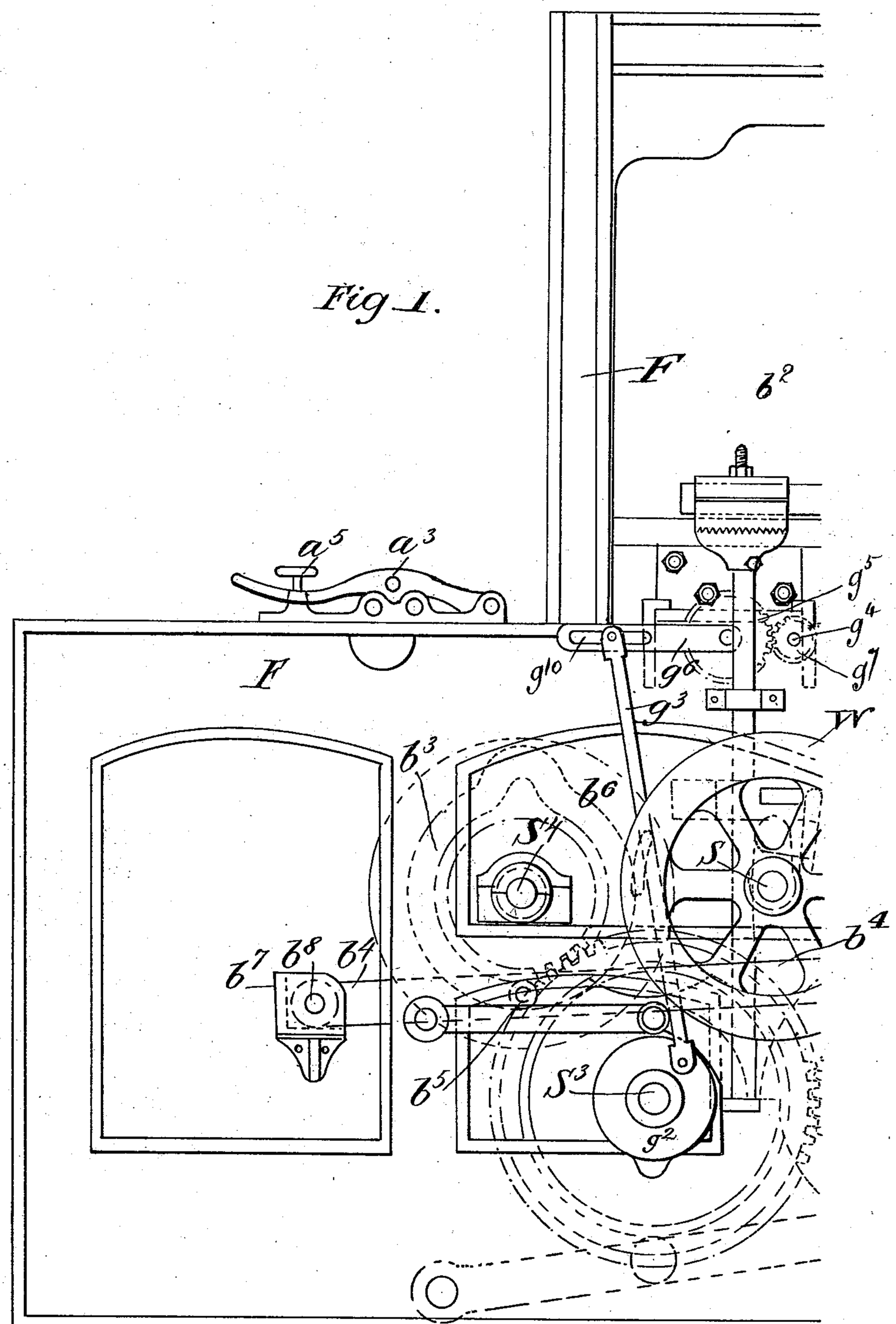
12 Sheets—Sheet 1.

E. HODDER.

LOOM FOR WEAVING COIR YARN MATS.

No. 550,174. Patented Nov. 19, 1895.

Fig 1.



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LOOM FOR WEAVING COIR YARN MATS.

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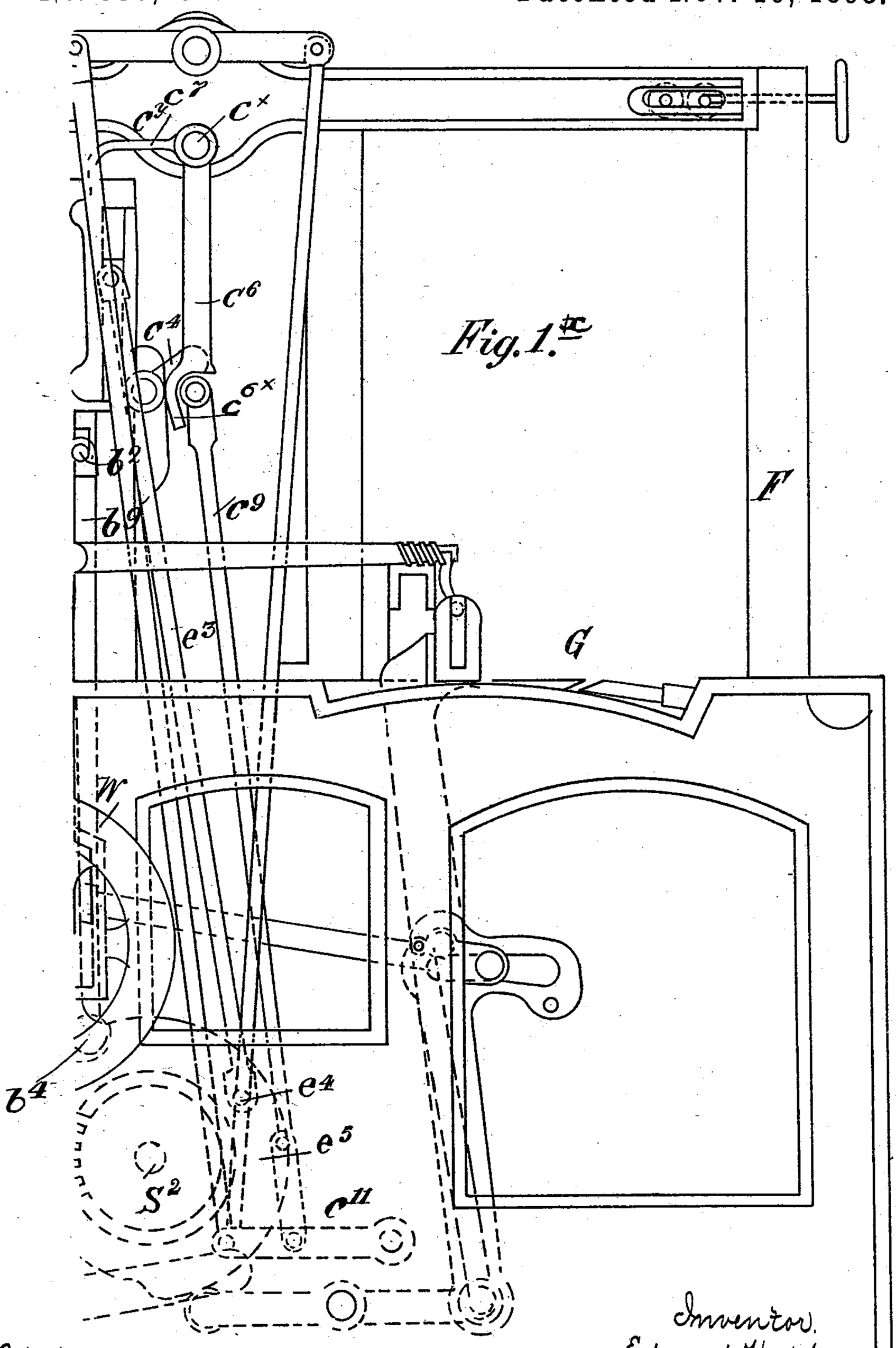

Fig. 1.

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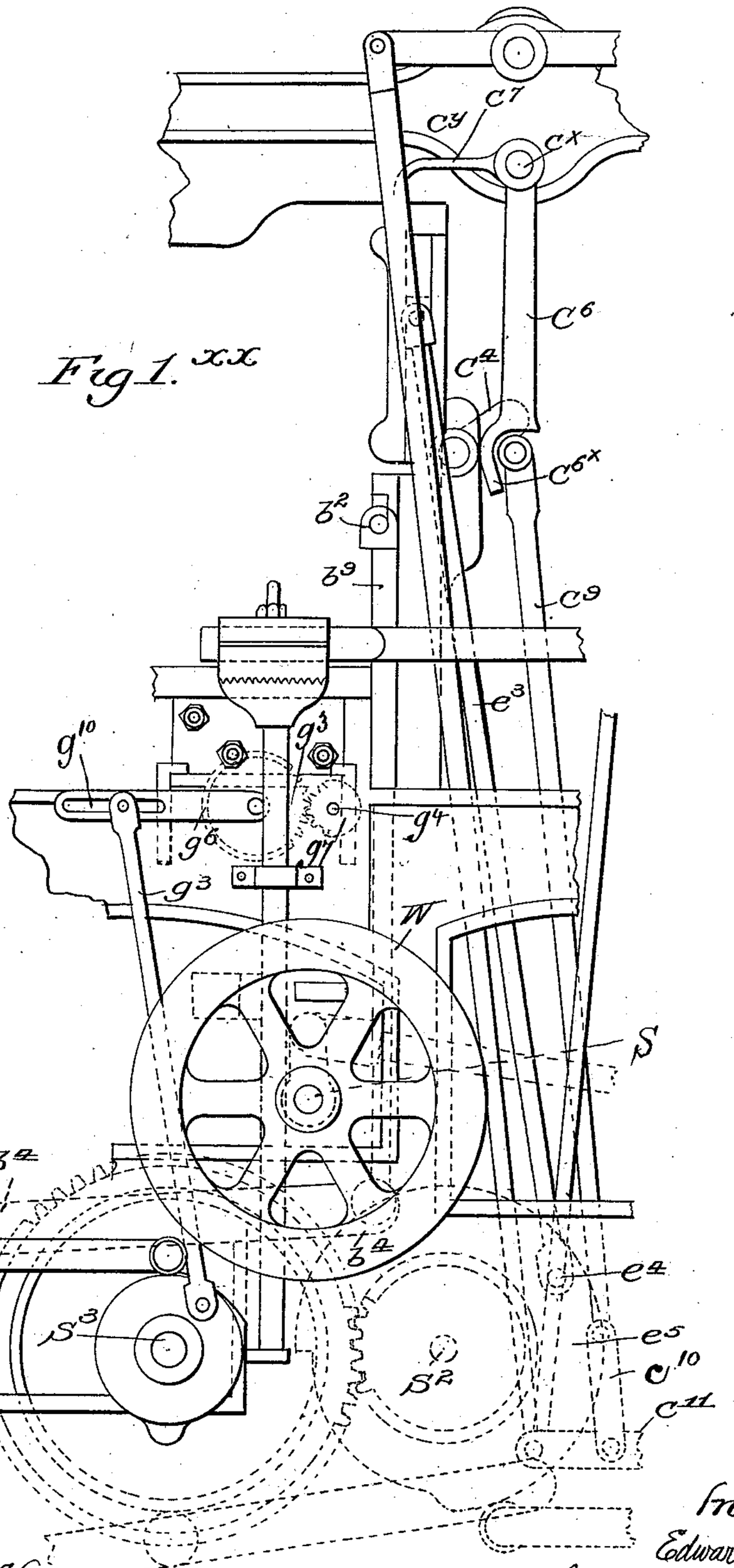
LOOM FOR WEAVING COIR YARN MATS.

No. 550,174. Patented Nov. 19, 1895.

Fig 1.



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(No Model.) 12 Sheets—Sheet 4.

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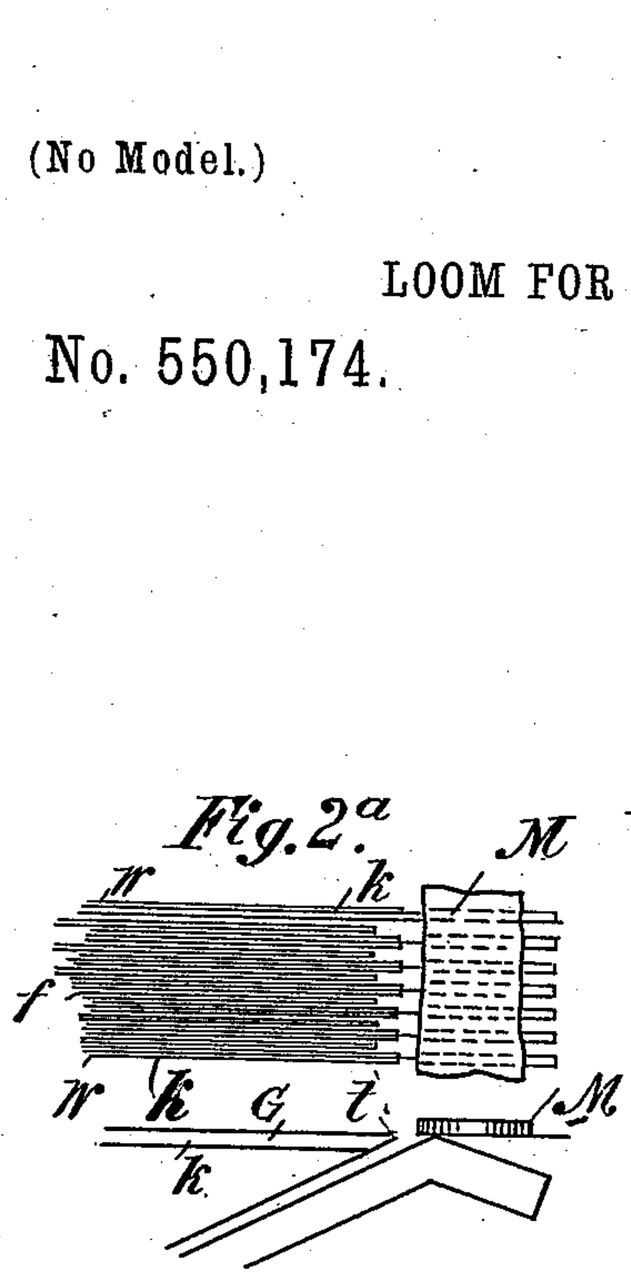
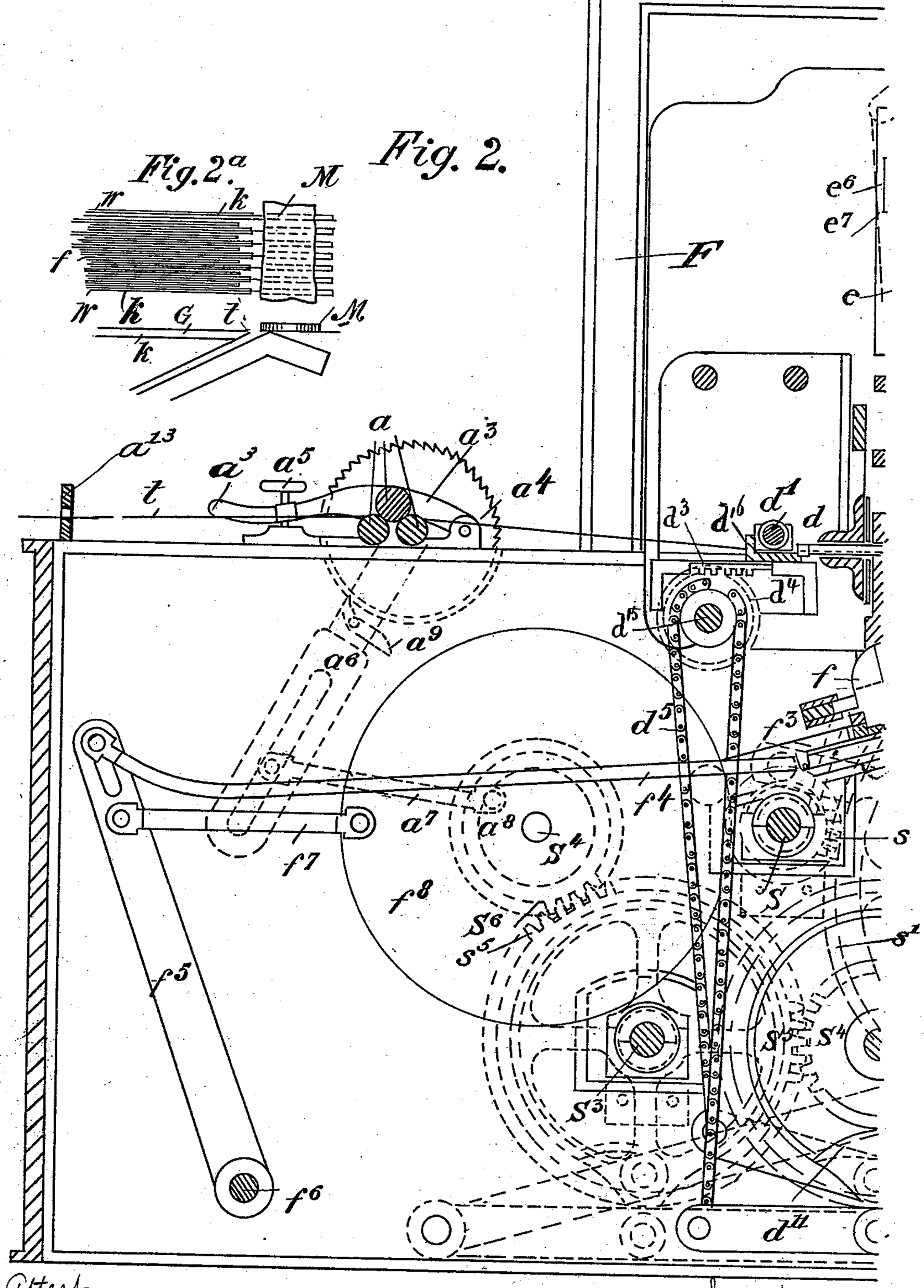
LOOM FOR WEAVING COIR YARN MATS.

No. 550,174. Patented Nov. 19, 1895.

Fig. 2.





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LOOM FOR WEAVING COIR YARN MATS.

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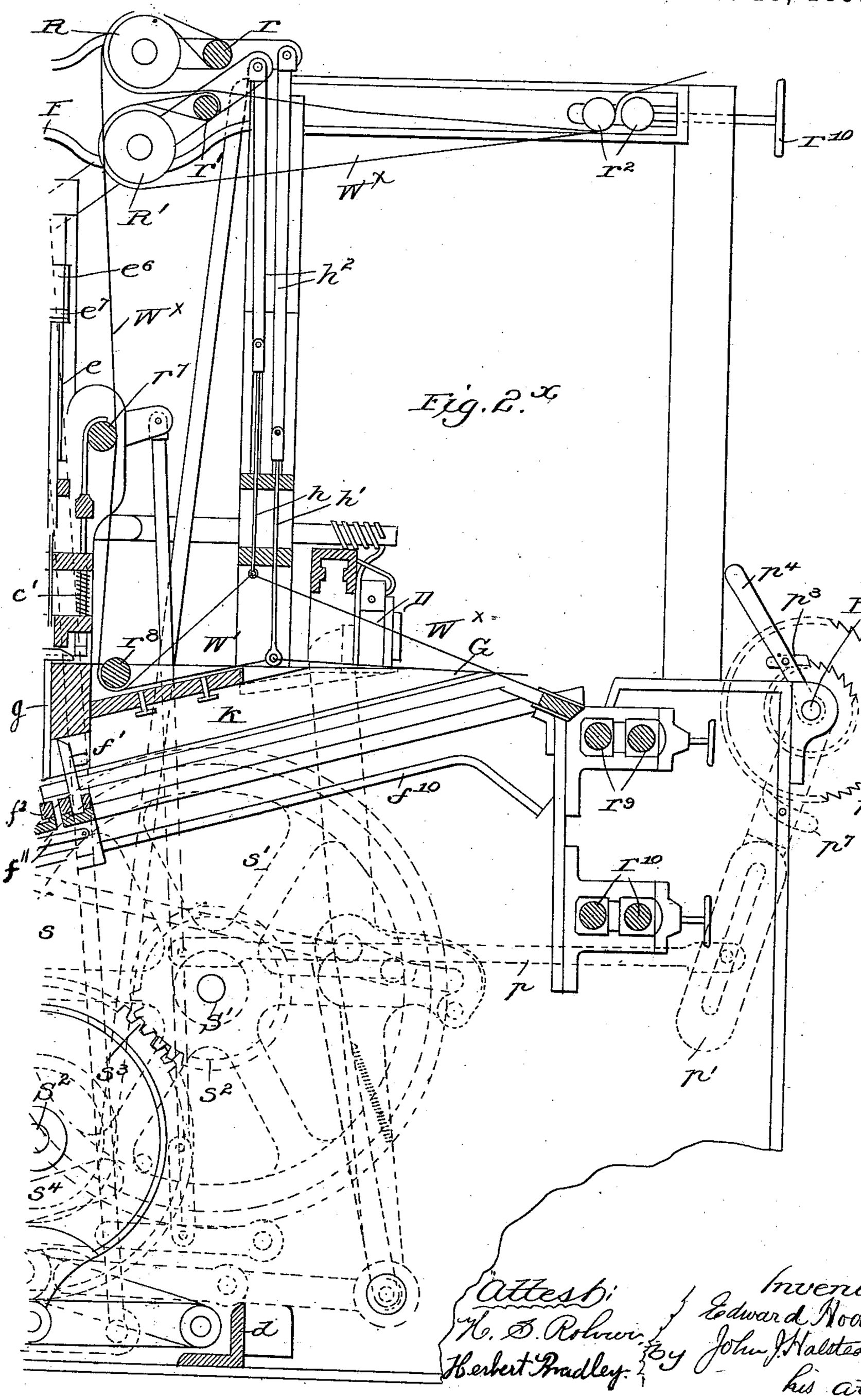

Fig. 2. X

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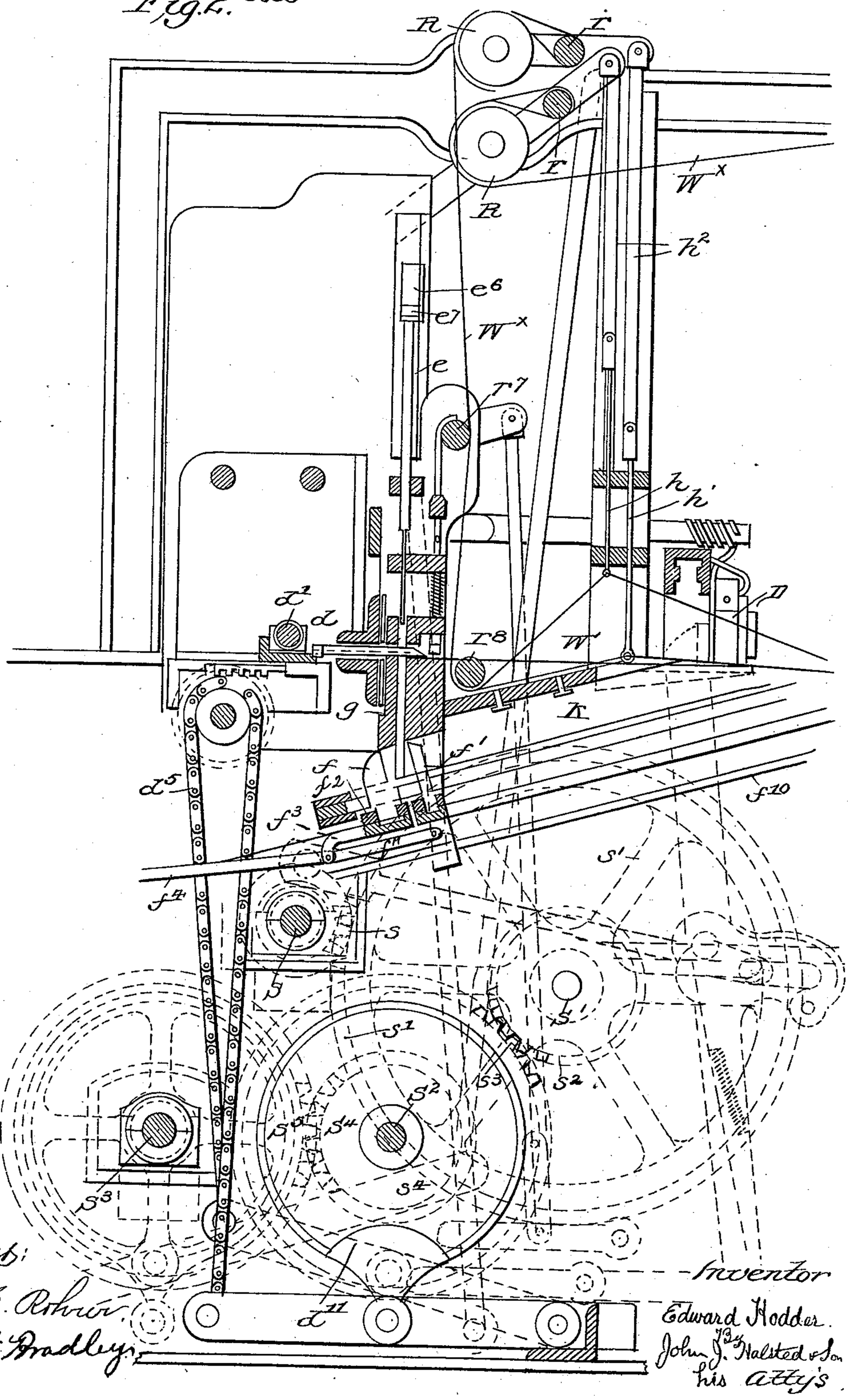
LOOM FOR WEAVING COIR YARN MATS.

No. 550,174. Patented Nov. 19, 1895.

Fig. 2. xx



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LOOM FOR WEAVING COIR YARN MATS.

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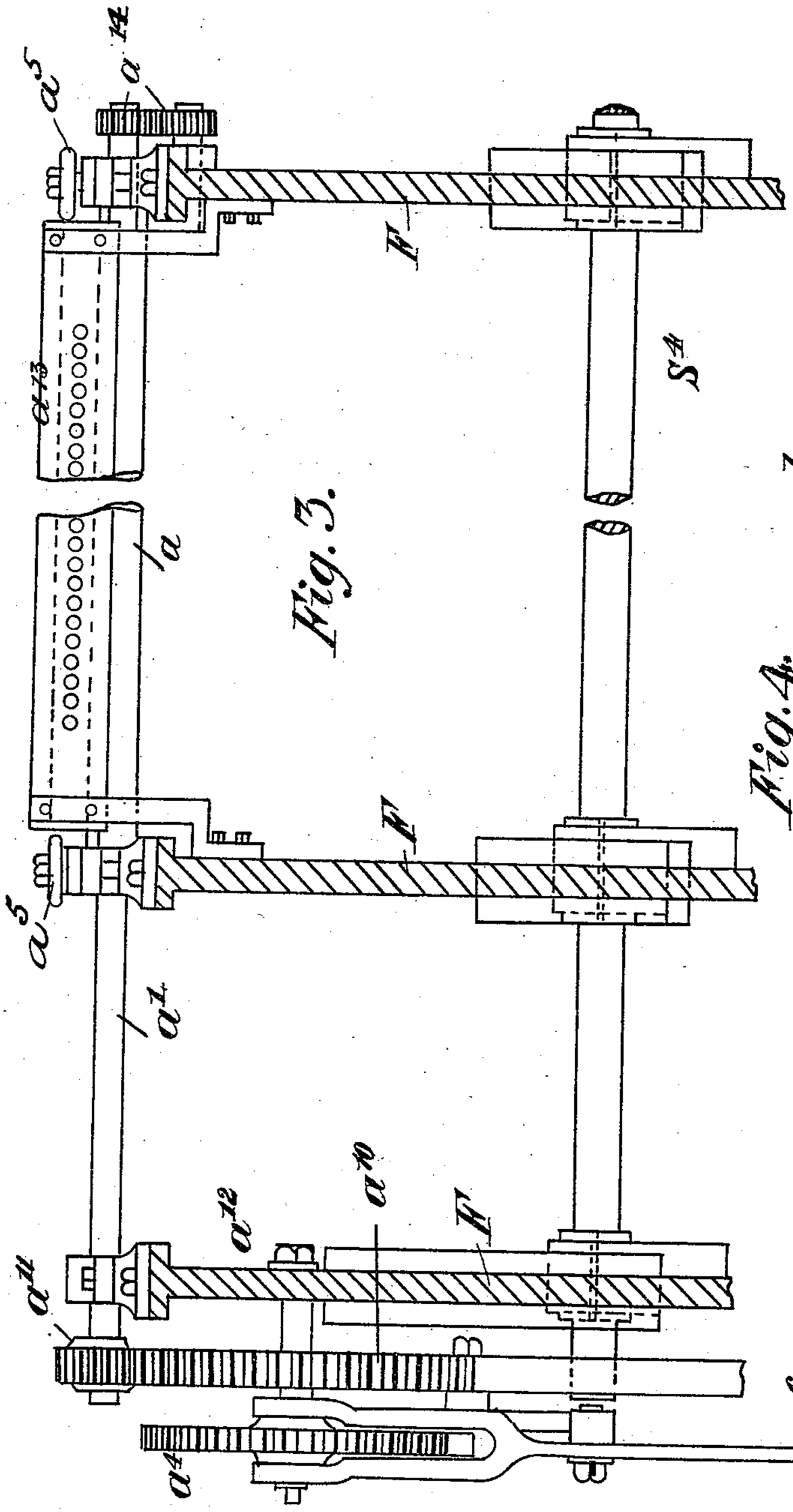

Fig. 3.

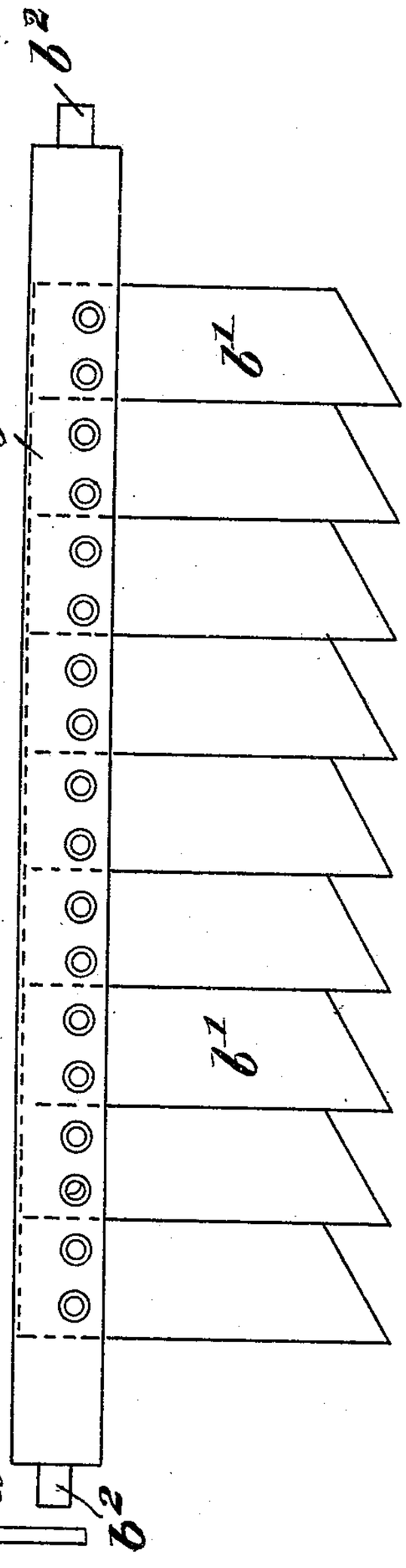

Fig. 4.

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Fig. 5.

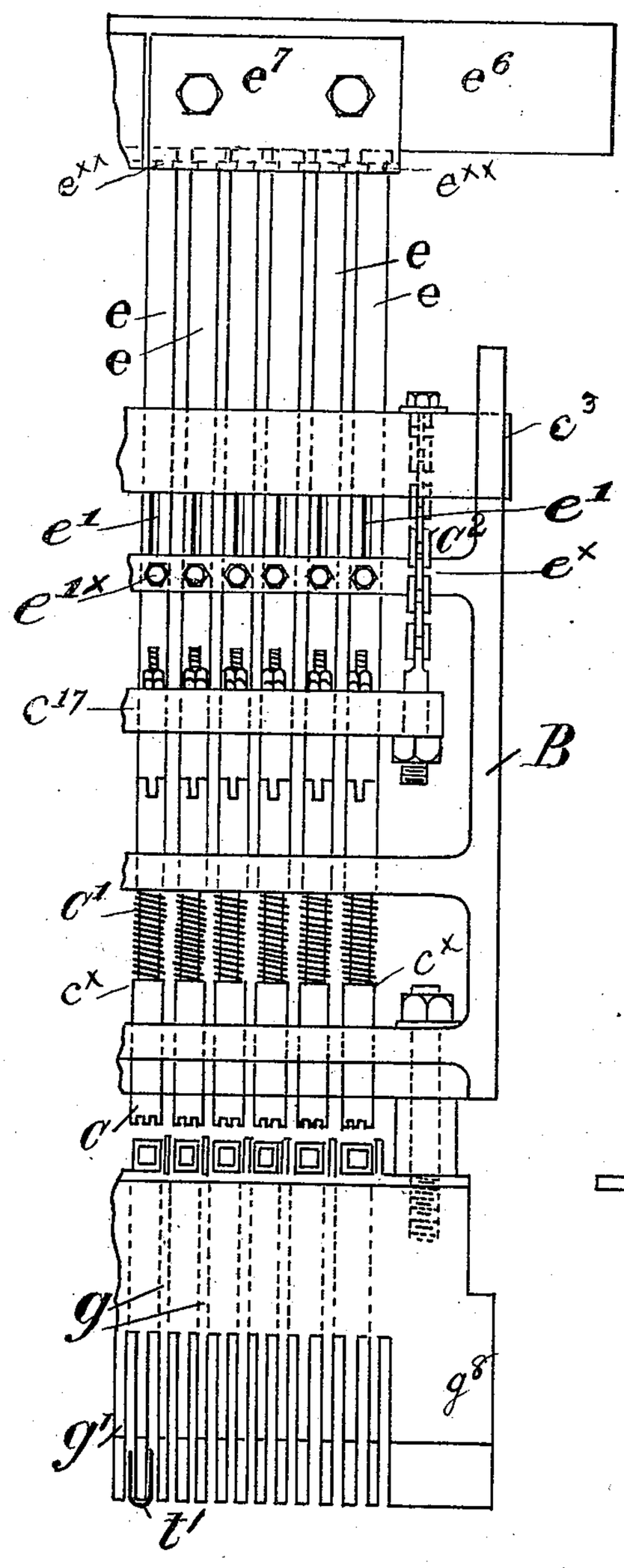
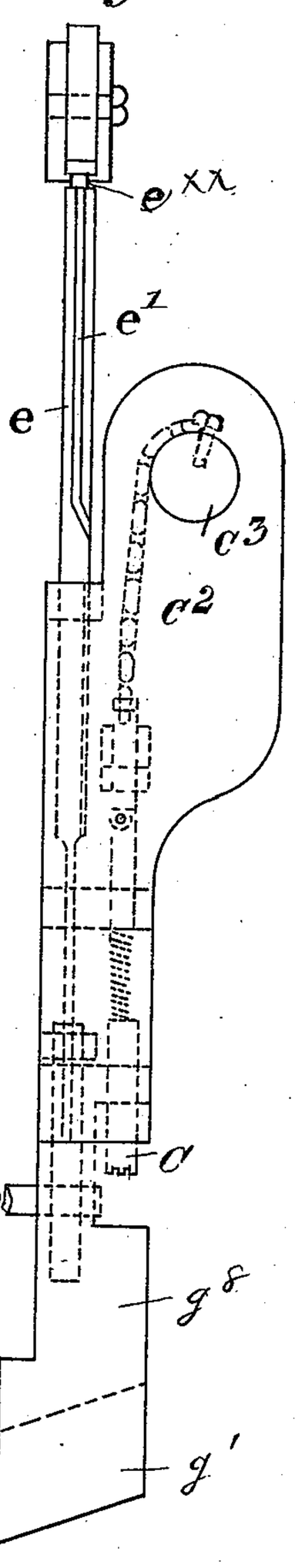


Fig. 6.



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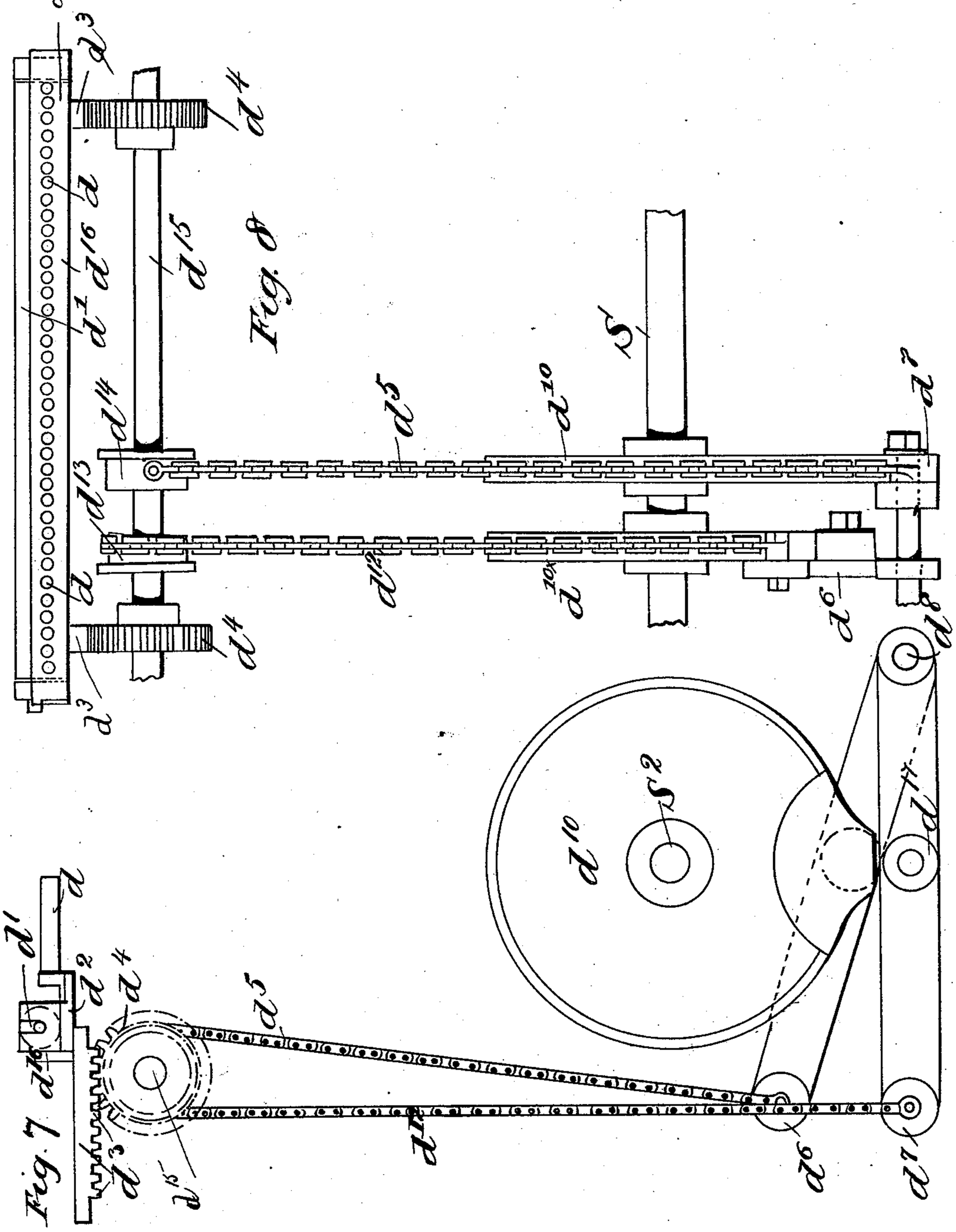

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LOOM FOR WEAVING COIR YARN MATS.

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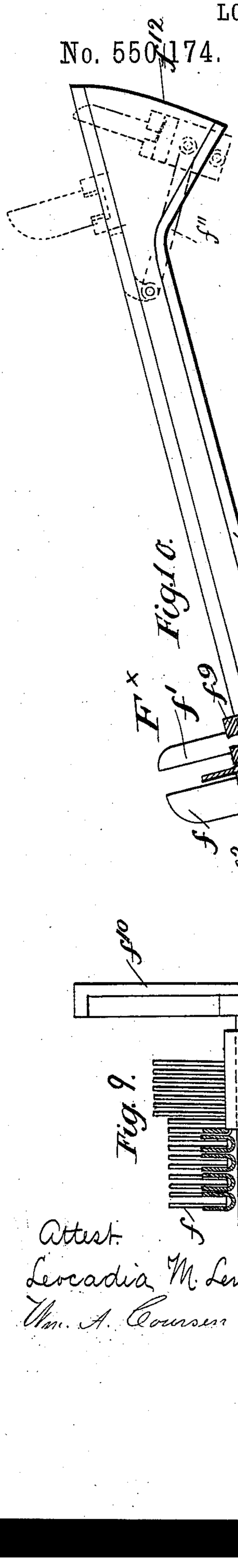

Fig. 10.

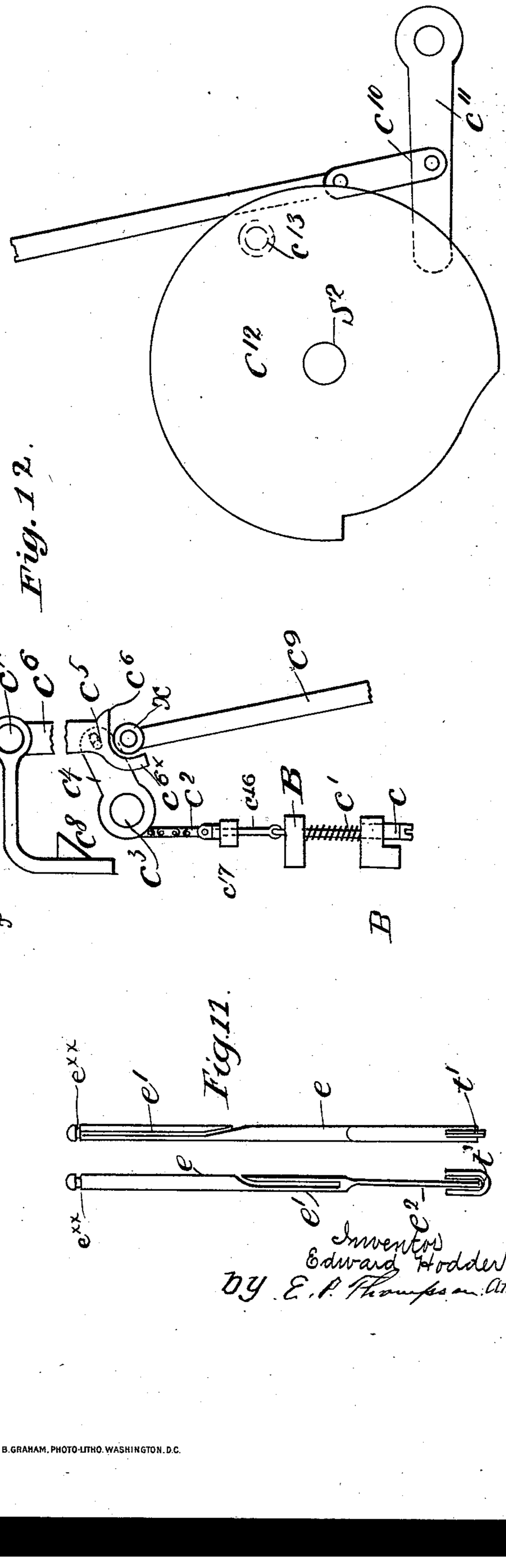

Fig. 12.

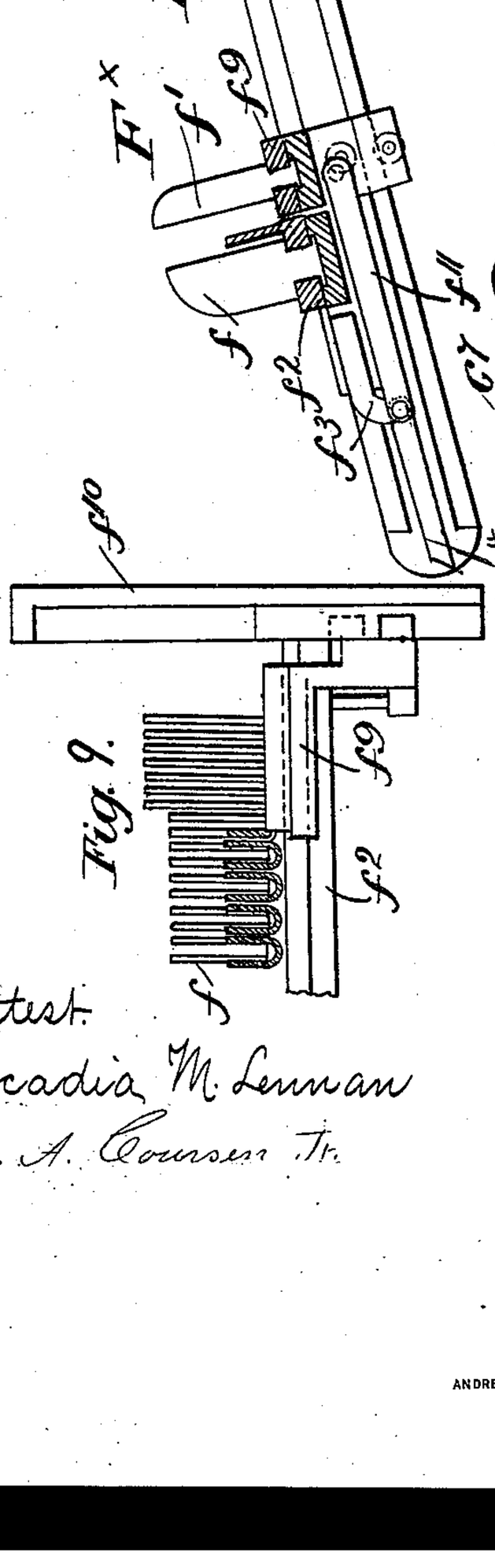

Fig. 9.

Fig. 11.

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LOOM FOR WEAVING COIR YARN MATS.

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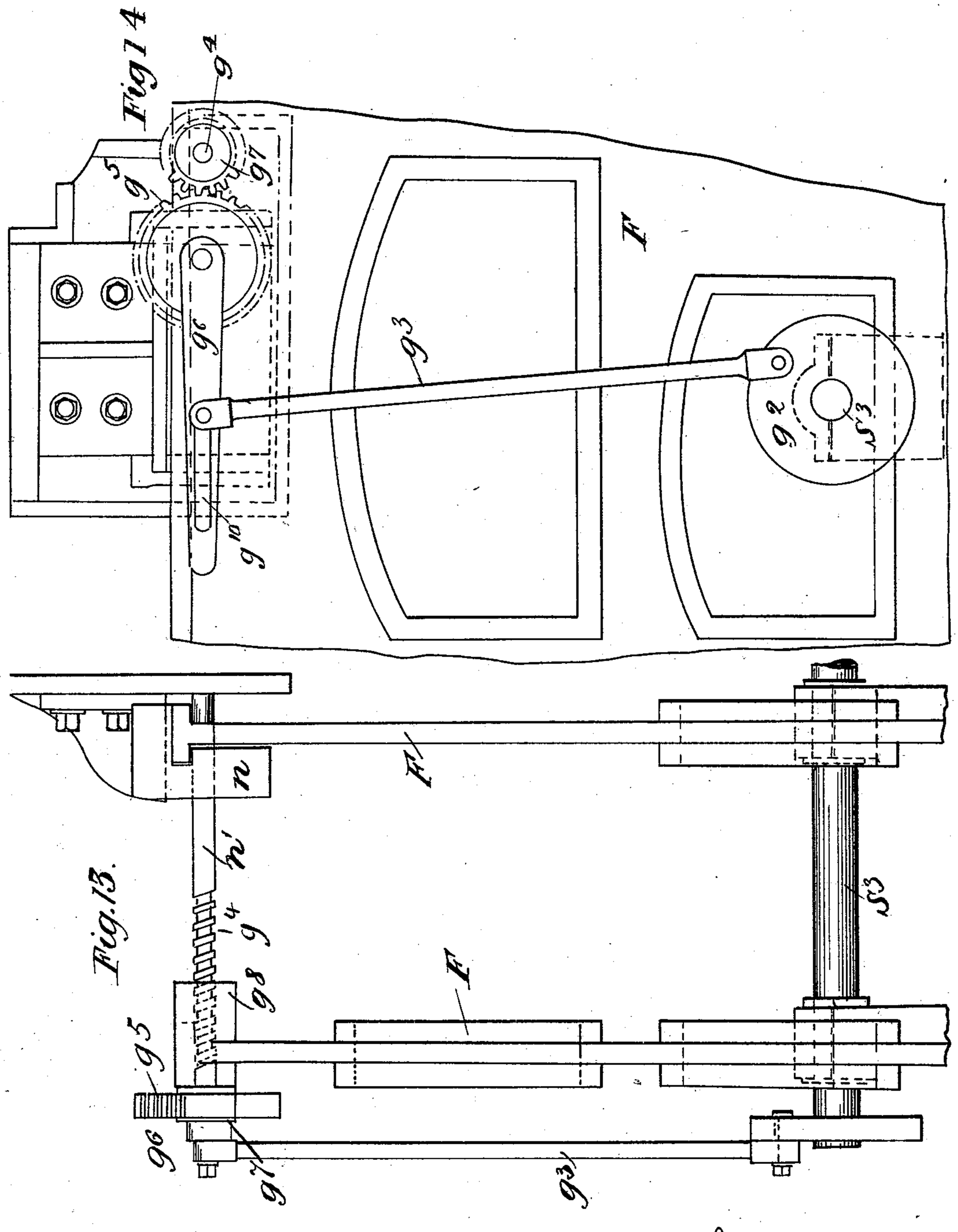

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No. 550,174. Patented Nov. 19, 1895.

Fig. 15.

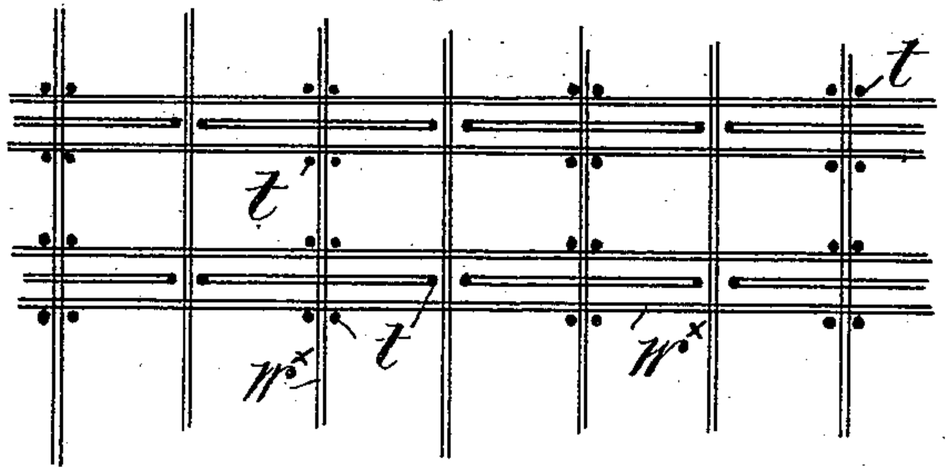


Fig. 16.

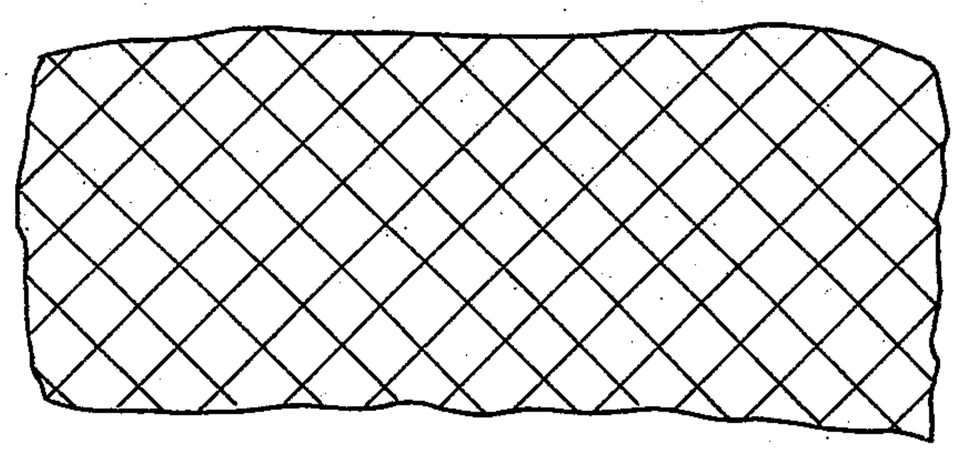


Fig. 17.

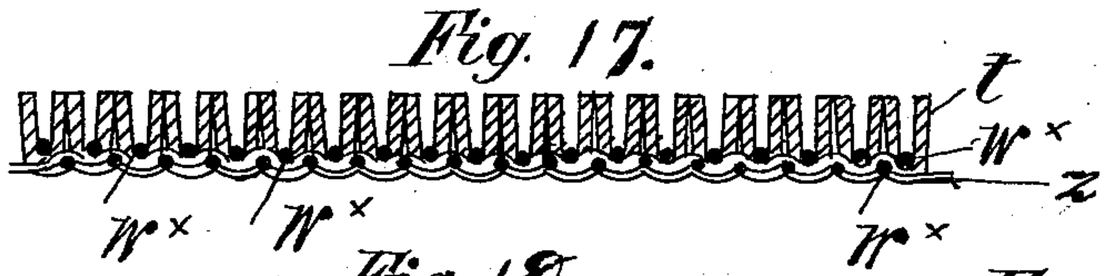


Fig. 18.

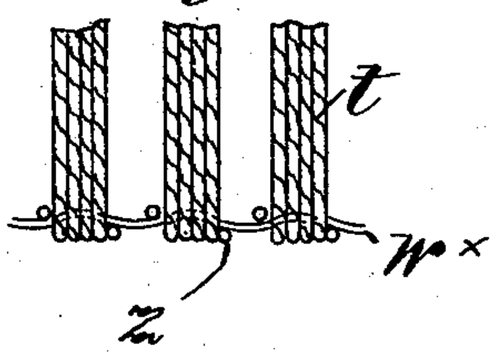
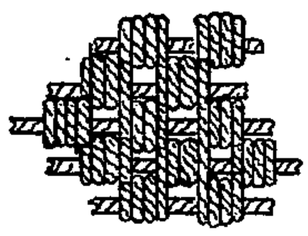


Fig. 19.



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UNITED STATES PATENT OFFICE.

EDWARD HODDER, OF MANCHESTER, ENGLAND.

LOOM FOR WEAVING COIR-YARN MATS.

SPECIFICATION forming part of Letters Patent No. 550,174, dated November 19, 1895.

Application filed March 6, 1893. Serial No. 464,820. (No model.) Patented in England March 23, 1889, No. 5,062.

To all whom it may concern:

Be it known that I, EDWARD HODDER, a subject of the Queen of Great Britain and Ireland, residing at Manchester, in the county of Lancaster, England, have invented new and useful Improvements in Looms for Weaving Coir-Yarn Mats and other Similar Fabrics, (for which I have obtained a patent in Great Britain, No. 5,062, dated March 23, 1889,) of which the following is a specification.

The nature and particulars of my invention will clearly appear from the following description, the mechanism having been devised by me for effectively making by machinery fabrics—such as mats, rugs, &c.—from coir-yarn, cocoanut fiber, and other fibers.

The leading features of my invention relate to the manner of and devices for severing the given lengths of and for doubling and partially twisting the tufts of coir-yarn, and to other devices incident thereto, and also to certain details in the construction of the machine.

In the accompanying drawings, in which like letters of reference indicate corresponding parts throughout the figures, Figures 1 and $1^{\times}$ show a side elevation, and Fig. $1^{\times\times}$ shows in elevation the central portions of the loom, its right and left hand portions being omitted; Figs. 2 and $2^{\times}$, a vertical section of my improved coir-yarn mat-making loom; Fig. $2^{\times\times}$, a vertical section on the same scale as Figs. 2 and $2^{\times}$, showing the central portion of the loom, but omitting some of the details at the right and left of such center, already fully shown in those figures. Fig. 2^{a} is a detail of the grid. Fig. 3 is a part section, on an enlarged scale, of the feeding and regulating mechanism. Fig. 4 is an elevation of the knives and knife-bar. Figs. 5 and 6 are a rear and side elevation, respectively, of a part of the thrum-box. Figs. 7 and 8 are a side and an end elevation of the mechanism operating the tubes. Figs 9 and 10 are a front elevation of a part of the carriers and slide and a side elevation, partly in section, of the same, respectively. Fig. 11 shows two views of a plunger. Fig. 12 is a side elevation of the clip mechanism. Figs. 13 and 14 are an end and a side elevation, respectively, of the thrum-box mechanism. Figs. 15, 16, 17, 18, and 19 are views illustrating the mode of formation of the mats.

My improved loom consists of a framework F, carrying five shafts, the main or driving shaft S carrying a pulley and the four shafts S' S^2 S^3 S^4. The driving-shaft S, as seen in Figs. 2 and $2^{\times\times}$, imparts a motion to the shaft S' by means of a pinion *s*, mounted on the former shaft and gearing with the large tooth-wheel s', keyed on the shaft S', which carries a pinion S^2, gearing with the toothed wheel S^3, mounted on the shaft S^2. The latter carries a pinion S^4, gearing with the spur-wheel s^5, keyed on the shaft S^3, which thus receives a motion from the former shaft. The spur-wheel s^5 gearing with the pinion s^6, mounted on the shaft S^4, the latter is thus set in motion by the shaft S^3.

The yarn *t*, serving to form the tufts, enters the machine through the perforated plate a^{13}, and then passes through the feed-rollers *a*, as clearly shown in Fig. 2. These feed-rollers allow of only a certain length of yarn to be fed to the tubes *d*, this being effected by the mechanism shown separately in Fig. 3, that shown in Fig. 2 being a simplified form thereof. The three rollers *a* are arranged, two at the bottom and one at the top, in bearings fixed to the rear at the top of the frame F, their proximity being adjusted by the lever or arm a^3, in which said upper roller *a* is journaled, as seen in Fig 1, which can be raised or lowered by the hand-wheel a^5, having a screw-spindle, as clearly seen in Figs. 1 and 2, screwing through said arm a^3 into the frame. The axis a' passes through one of the rollers *a* and carries at the right hand a toothed wheel a^{14}, gearing with two similar wheels mounted on the axis of the other two rollers *a*, as seen in Fig. 4, this axis carrying at the other side a toothed wheel a^{11}, gearing with the gear-wheel a^{10}, mounted on the shaft a^{12}, on which is also keyed a ratchet-wheel a^4, in the teeth of which engages the pawl a^9, fixed to the lever a^6, Fig. 3. On the shaft a^{12} is mounted the forked upper end of the lever a^6, slotted at its outer end to receive one extremity of the connecting-rod a^7, the other extremity of which is secured to the pin of a crank-disk a^8, mounted on the shaft S^4. The end of the connecting-rod a^7 is adjustable in the slot of the

lever a^6, so as to be able to regulate the feed. In this figure a^{15} indicates in dotted lines any suitable friction-brake, secured on the frame and adapted to bear on one of the rollers a^{11}. During half a revolution of the disk a^8 the pawl a^9 turns ratchet-wheel a^4 a few teeth, and through the wheel a^{10} imparts motion to the three rollers a, which now feed a length of yarn forward to the tubes d; but during the second half-revolution of the crank-disk a^8 the pawl slips along the teeth of the ratchet-wheel without any motion being imparted to the said wheel. The disks a^8 and f^8 are both on the same shaft S^4.

In the arrangement shown in Fig. 2 the ratchet-wheel is mounted directly on the axis a'. The yarns pass farther under a guide-roller d', Fig. 2, and then through the tubes d, which feed at each forward motion the length of yarn required to make one tuft and supplied by the feed-roller a. The motion of these tubes is carried out by the mechanism shown separately in Figs. 7 and 8. The tubes d are fixed to a transverse bar d^2, secured at each end to a rack d^3, actuated by the toothed wheels d^4, which are mounted on the shaft d^{15}, carrying likewise two wheels d^{13} d^{14}, upon which are fixed the upper ends of the chains d^5 and d^{12}, their lower ends being attached to the extremities of the levers d^6 d^7, pivoted at d^8, the chain d^5 running on wheel d^{14} and chain d^{12} on wheel d^{13}, as shown in Fig. 8. One lever d^6 is lowered by the cam d^{10}, mounted on the shaft S^2, acting on the roller d^{17}, while the other d^7 occupies its uppermost position, the other lever being depressed by a similar cam $d^{10\times}$, and also mounted on shaft S^2, as seen in Fig. 10. The position of these levers being reversed at each successive operation thus imparts first a forward motion to the tubes d', which deliver the yarn to the clips c, and then a rearward motion to allow the knives b' to cut the length of yarn required to make one tuft. The clips, which drop down on one end of the yarn fed by the tubes in order to hold it while the knives b' cut the same at the tube ends, (after these tubes have receded,) are operated by mechanism shown separately in Fig. 12 and consisting of an arm c^7, furnished with a triangular projection c^8 and mounted on an axis $c^\times$, secured to the top of the frame F of the machine, and carrying, moreover, an upright arm c^6, which is terminated with a rounded projection $c^{6\times}$. c^4 is a crank mounted on the axis c^3, carried by the thrum-box B and pivoted at c^5 to the arm c^6.

In order to allow some play, if needed, between the jointed arms c^4 and c^6, inasmuch as these arms move in different arcs, the pivot-hole for the pivot c^5 may be slightly elongated. The thrum-box is made of such size and form as to afford supports for these parts and also for the chain c^2 and the clips c and is arranged in the machine near the plunger. The clips c consist of rods having preferably serrations or teeth (see Fig. 5) on their lower ends, and they are mounted in proper guide-ways in the thrum-box B, as shown. To the crank c^4 is fixed one end of the chain c^2, connected at the other end to the clip c, upon the stem of which is wound a spiral spring c'. These springs c', which have a tendency to pull the clip down by virtue of the shoulders $c^\times$ on the clip, bear at one end against a horizontal bar of the thrum-box in which the clip is guided.

The rotation of the cam c^{12}, Fig. 12, causes the pin c^{13} thereon to bear upon the crank or cam c^{11}, and the link c^{10} being pivoted to the lower end of the rod c^9 and also to cam c^{11} this lever, which normally prevents any operative action of the arm c^6, is thus withdrawn, so that as the plunger-actuating rod c^3, Fig. $1^\times$, ascends its upper end strikes the projection c^8 of the arm c^7 and causes one end of crank c^4 to be raised, rocking the shaft or axis c^3, and thereby allowing the chain c^2 and the clips c to drop down under the action of the springs c'.

Fig. 12 relates to the mechanism required for operating the clips, of which there is a series, one immediately in front of each feeding-tube. The purpose which the clips c serves is to hold the ends of the pile-yarn while the tubes recede and the knife severs the yarn, when the clips c rise and allow the severed pieces of yarn to lie loosely immediately under the plungers, Fig. 11, so that the said severed pieces of yarn can be easily operated upon by the said plungers.

B B, Fig. 12, are two bars, forming the front of the thrum-box, each having a row of holes drilled therein, so that the shank of the clips c can pass through, as shown at c, Fig. 12, and when they are all in place each clip c will be immediately in front of the mouth of one of the feeding-tubes around the said shanks of clip c, and between the two bars B is mounted a spring, as shown at c', Fig. 12, the top end of this spring resting upon the top bar B, its bottom end resting upon the square of the clip c, thus forcing it downward. The shanks of the clips are provided at the top with a hole, so that the short rods c^{16} can be attached thereto, it being threaded at the upper end to receive a nut. c^{17} is a bar suspended by two chains c^2, Fig. 12, to the roller or shaft c^3 and pierced with a row of holes to receive the ends of the rods c^{16}, which are passed through the said holes and a nut screwed on their tops. The arm c^4 is connected to the upper end of rod c^9. It will now be evident that as the arm c^4, Fig. 12, is pulled down by the bowl c^{13}, attached to the cam c^{12}, and pressing down the lever c^{11}, (which lever is attached by a link c^{10} to the connecting-rod c^9, the upper end of which being connected, as above stated, to the said arm c^4,) this action causes the roller of the shaft c^3 to partly revolve on its axis and thus shorten the chain c^2, Fig. 12, and lift the bar c^{17}, which, having all the rods c^{16} attached to it, raises the clips c, compressing the springs c'.

When the clips c are at their highest, the

arm c^6 falls over the bowl X, attached to the top of the connecting-rod c^9, and the said arm c^6 naturally falls to this position on account of its crooked limb, to which the lug c^8 is attached, being part and parcel of the same forging, and its weight being greater than the straight limb c^6 it remains in this position until the head of the connecting-rod E^3, Fig. $1^\times$, ascending, strikes the lug c^8, Fig. 12, and pushes it aside, causing the arm c^6 to release the bowl X and allow the springs c' to come into play and force the clips c downward. These motions are all so timed that the clips c, Fig. 12, shall fall at the precise moment that the pile-yarn is passed underneath them, and rise again as soon as the knife has severed the yarn.

When the chain c^2 drops under the action of the springs c', the knives b' come into operation to sever the lengths of yarn required to form the tufts. These knives are secured to a knife-bar b, Fig. 4, furnished with journals b^2, whereby they are attached to vertical rods b^9, Fig. 1, connected at their lower extremities, as seen in dotted lines in Fig. $1^\times$, to a lever b^4, pivoted at b^8 in the frame b^7, Fig. 1. These levers are actuated by cam-disks b^3 b^6, mounted at each end of the shaft S^4 and provided with grooves b^3, with which engage pins or rollers b^5, mounted on said levers b^4, so as to bring the knives down, the latter returning immediately after to the raised position under the action of the said levers.

The plungers e slide vertically and have a thin edge, and are connected by means of their annularly-grooved head $e^{\times\times}$ to a cross-bar e^6, and are now forced down by means of the rod e^3 in order to come into operation to push the tufts at the middle of their lengths to give them the necessary **U** shape and to force them down and with their ends upward into the holes or channels g, Fig. 2. This downward movement of the plungers serves also, by means of the spiral portion of their grooves e' and the pins $e'^\times$, to turn and partially twist each of the tufts near its bight or bend, so as to place such loop or bend into proper position for the thrum-carrier $F^\times$ to carry and present them subsequently under a row of alternate warp-threads on the grid G.

The plungers e are shown in Fig. 11 in two different positions folding the tuft lengthwise in the middle and making it assume a **U** shape. These plungers are furnished with a helicoidal groove e', wherein engages a pin $e'^\times$, fixed to a bar $e^\times$, secured in front of the plungers to the thrum-box, as seen in Fig. 5, so that when the ends e^2 of these plungers descend upon the tuft-length they are turned around all the time that they push the tuft down the passage g, Fig. 2. The plungers are guided through the horizontal bars of the thrum-box and are connected to a bar e^6 at the top and held by the two bars e^7, the bar e^6 being capable of sliding on suitable movable guides formed in the framework of the machine, so as to enable the plungers e to move to and fro with the thrum-box B (containing the knives b' and the spring-clips c^6) and the tubes d, for the purpose of feeding each successive row of tufts upon a row of alternate warp-threads w on the grid G.

The thrum-box B is mounted on the main frame and is moved forward and back by means of a screw-rod g^4 and other devices stated below, and the purpose of such movement is that it may carry with it the knives, clips, and tubes, as already mentioned.

The bar e^6 is connected at each end to a connecting-rod e^3, fixed at its lower end e^4 to a crank-disk mounted on the shaft S^2, which thus imparts an up-and-down movement to the plunger e.

The to-and-fro motion of the thrum-box is carried out by the mechanism shown in Figs. 13 and 14. To one side of the thrum-box B is secured, by a head n' moving in the box n, bolted to the thrum-box, the screw-rod g^4, mounted on the frame F of the machine, and carrying at its end a toothed wheel g^7, gearing into a large wheel g^5, upon the axis of which is mounted one end of a slotted lever g^6. A stud on the upper end of a link g^3 moves in the slot g^{10} formed in this slotted lever g^6, while its other end is connected to a crank-disk g^2, mounted on the shaft S^3. The rod g^4 is at one end rotatably supported by a bearing in and is thus held to the thrum-box B, while the other end is screw-threaded and can move to and fro in the nut g^8, rigidly fixed to the frame F of the machine. The motion of the lever g^6 imparts alternately a turn in one direction or the other, thus causing the screw-rod to turn in similar direction and to impart a to-and-fro motion to the thrum-box in a direction widthwise or crosswise of the machine. All the tufts being now placed in position in the channels g, they are moved on to the grid G by the carrier $F^\times$. (Shown in Figs. 9 and 10.)

The carrier consists of bases f^2 f^9, one of these f^2 supporting a series of vertical blades f, the other supporting pilot pieces or blades f', the piece f^9 being arranged, as shown in Fig. 10, to run on guideways f^{10}. This carrier moves in inclined guides f^{10}, arranged on both sides of the frame F and consists of a number of blades f for pushing the edge of the **U**-shaped tufts through the reed g^8, secured to the bottom of the thrum-box B, Fig. 5, each blade f moving one of the branches of the **U**-shaped tuft t', Fig. 9, these tufts being inserted between the bars of the divided grid G, Fig. $2^\times$, on which bars are placed the warp-threads, the rounded ends of the tufts thus abutting against the under side of the bars, from which they are afterward removed into the mat after a weft has been thrown by a shuttle.

To insure that the warp-threads may be properly separated for the insertion of the tufts, I use a pilot-carrier f', the object of which is to separate the threads, if need be, (when moved to the farther end of its travel,)

this carrier *f* dropping down in the expanded or enlarged front end f^{12} of the guides f^{10} out of the way of the carrier *f*, to which it is connected by the rods f^{11} and f^{3} hinged together, as clearly shown in Fig. 10, the carriers *f* and *f'*—that is to say, the row of blades of which this carrier consists—are each composed of a series of thin sheets arranged side by side to form a sort of comb or group of blades, as shown, and secured at their lower ends in the basis of f^{2} and f^{9}, respectively. The rod f^{3} is jointed to the connecting-rod f^{4}, secured at its other end to the lever f^{5}, pivoted at f^{6} and connected at the rod f^{7} to the large crank-disk f^{8}, mounted on the shaft s^{4}, the rotation of which thus imparts a forward and backward motion to the carriers *f f'*. The warp W× reaches the loom between the rollers r^{2} r^{2}, Fig. 2×, made adjustable in a slot by means of a hand device r^{10}, and this warp passes around the rollers R R', located at the top of the loom, and thence around the rods *r r'* near these rollers and over the guide-rollers r^{7} and r^{8} beneath said top rollers and thence through the heads *h h'* alternately, and along the grid-bars K, Fig. 2ª, terminating in the mat M, which passes between the two pull-off rollers r^{9}. To allow the shuttle to pass through a row of alternate warp-threads, the healds *h* and *h'* are alternately raised, as shown in Fig. 2×, where the healds *h* are raised while the healds *h'* are down. After each alternate row of tufts has been placed onto the warp-threads *w* on the grid G, the shuttle throws a weft-thread *z*, Figs. 17 and 18, and then the beater's reed is lowered into action, its teeth entering the intervals between the grid-bars K behind the row of tufts *t'* and driving the latter away from the rear part of the grid onto the mats which rest on the front part of the grid, which is separated from the rear part thereof, as clearly shown in Fig. 2ª.

Fig. 15 is a diagram showing the arrangement and relative positions of the warp *w* and weft *z* and tufts *t'*.

Fig. 16 shows the diamond shape of the back of the finished mat, more particularly exemplified in Fig. 19.

The mat passes through the adjustable tension or pull-off rollers r^{9} and r^{10} in Fig. 2, driven by chain-gearing (not shown in the drawings) by the shaft *p'*. The latter is actuated by hand with the aid of the handle p^{4}, the ratchet-wheel p^{5}, and the pawl p^{3}, or by power with the mechanism consisting of the ratchet-wheels p^{6}, the pawl p^{7}, and the lever *p'* and the connecting-rod *p*, attached to a crank-disk mounted on the shaft S', as shown in dotted lines in Fig. 2×. This pull-off motion is well known, and I lay no claim thereto.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a loom for weaving mats or fabrics of coir yarn, or cocoa-nut and other similar fabrics, provided with means for feeding and cutting the tuft threads, the described devices for doubling and giving a twist to a tuft, consisting of a vertically reciprocating chisel-edged plunger *e*, having its head hung to permit it to be turned, and having in its side a groove partially spiral, combined with suitable means for raising and lowering the plunger, and with a fixed pin engaging its grooves, all substantially as shown and described.

2. In a loom provided with means for feeding and cutting the tuft threads, grooved plungers *e*, severally having a grooved head, a spiral groove *e'*, and a thin or chisel edge as described, in combination with pins $e'^{\times}$, and with their carrying bar e^{6}, connecting rods e^{3}, and means substantially as described for actuating said rods.

3. In a loom, the described mechanism for forming tufts, consisting of the combination of feed rollers, the feeding tubes adjacent thereto and adapted to receive the yarn therefrom, the spring-pressed clips serving to hold the yarn at the end of each feeding operation, knives to sever short lengths of yarn, guides for the tufts, and thin or chisel-edged plungers playing in said guides and severally hung to turn in a plunger bar and having a groove partly straight and partly spiral working on a fixed pin, to double such lengths at their centers and to force them downward and give them a partial turn, the combination being and operating substantially as and for the purposes set forth.

4. In a coir-yarn loom, the combination of a plunger bar e^{6}, plungers hung thereon and having each a continuous straight and spiral groove, fixed pins each engaging with such groove, means for actuating the plungers to force down the severed tufts, means substantially as described for feeding the tuft threads, means for cutting such threads, the connecting rod e^{8}, shaft S^{2}, and the crank disk thereon, the combination being and operating substantially as and for the purposes set forth.

EDWARD HODDER.

Witnesses:
VINET HUGHES,
GEORGE PRINGLE.