No. 843,529. PATENTED FEB. 5, 1907.

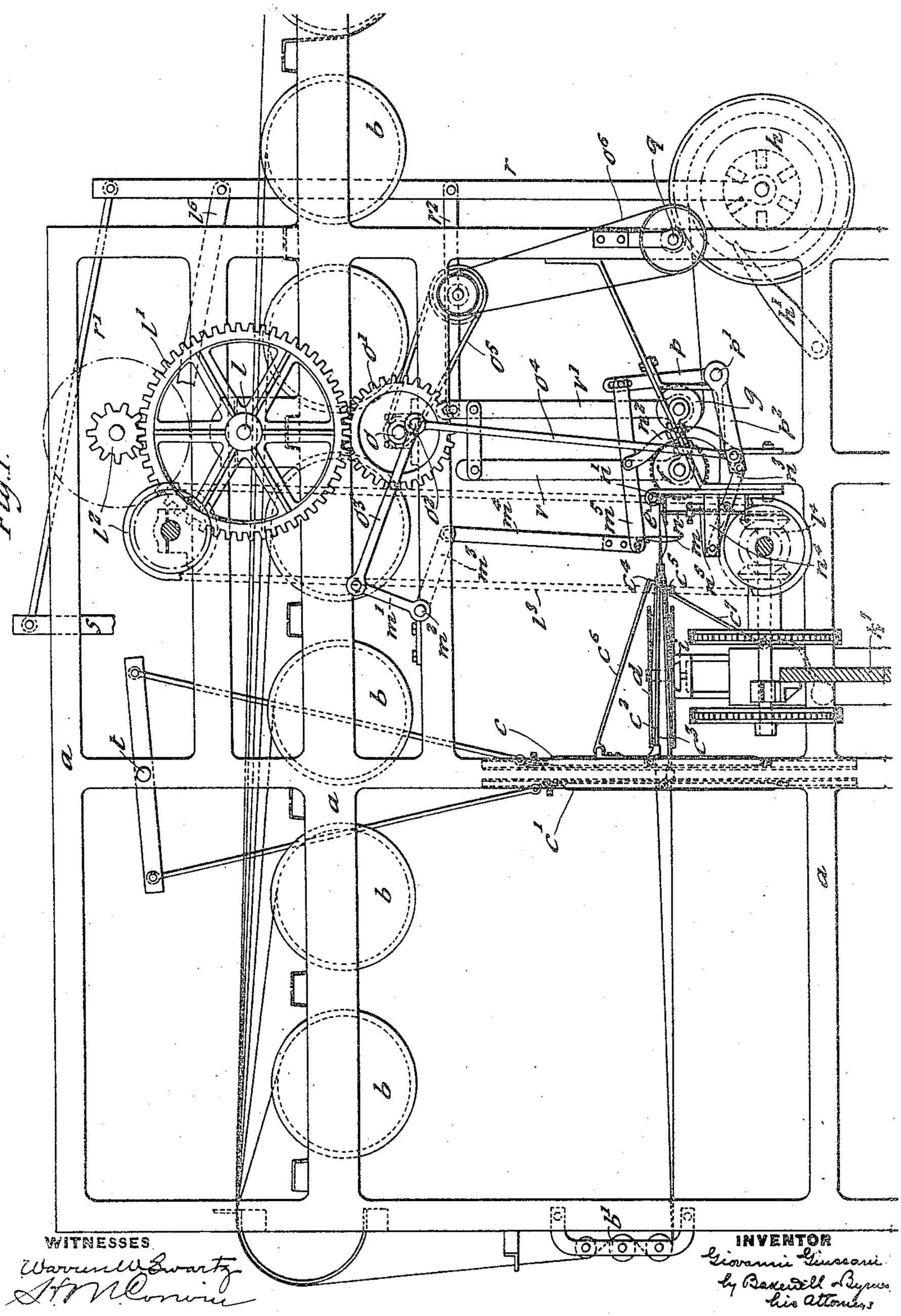
G. GIUSSANI.

LOOM FOR MAKING WIRE FABRIC.

APPLICATION FILED JULY 21, 1904.

4 SHEETS—SHEET 1.

Fig. 1.



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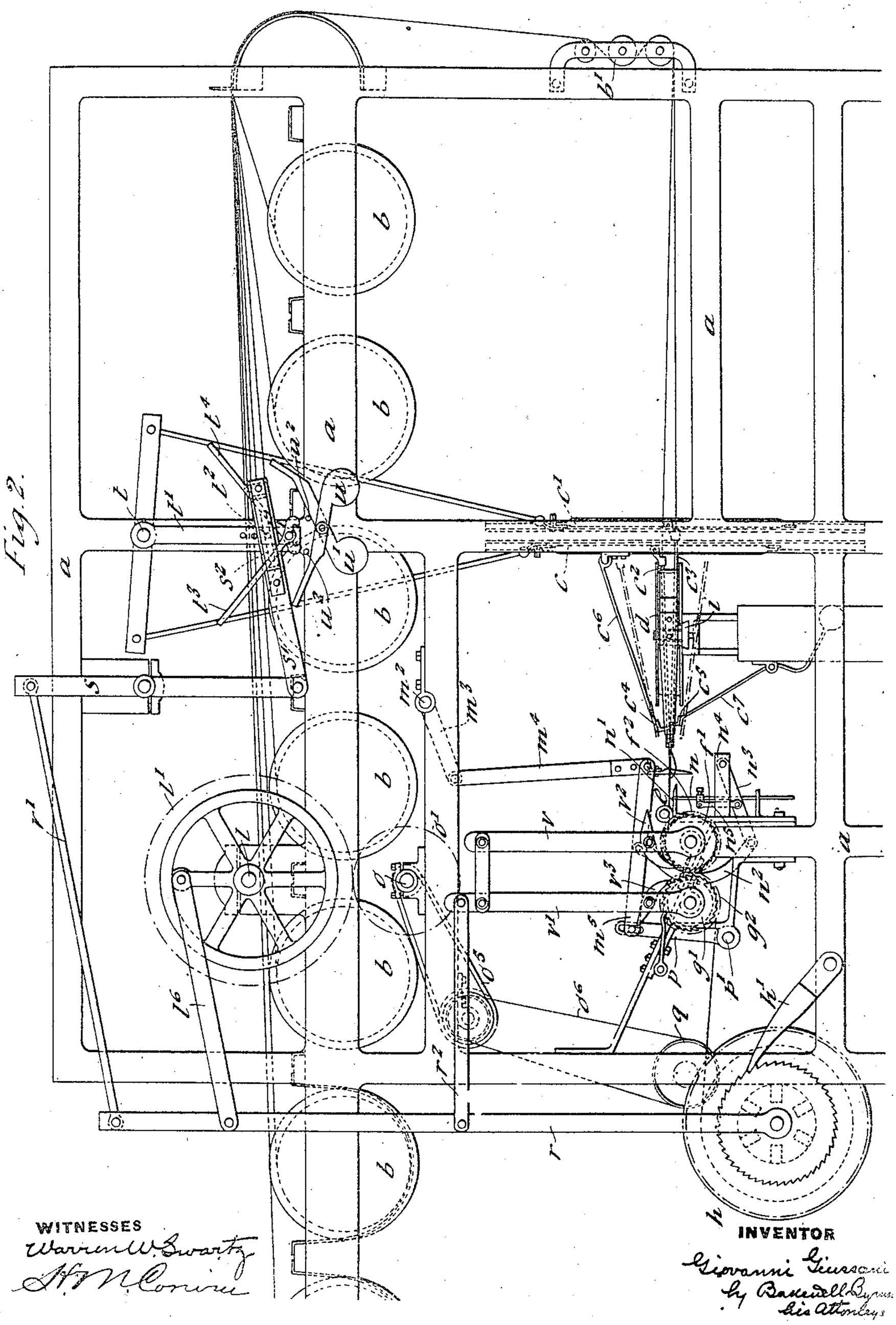
4 SHEETS—SHEET 2.

Fig. 2.



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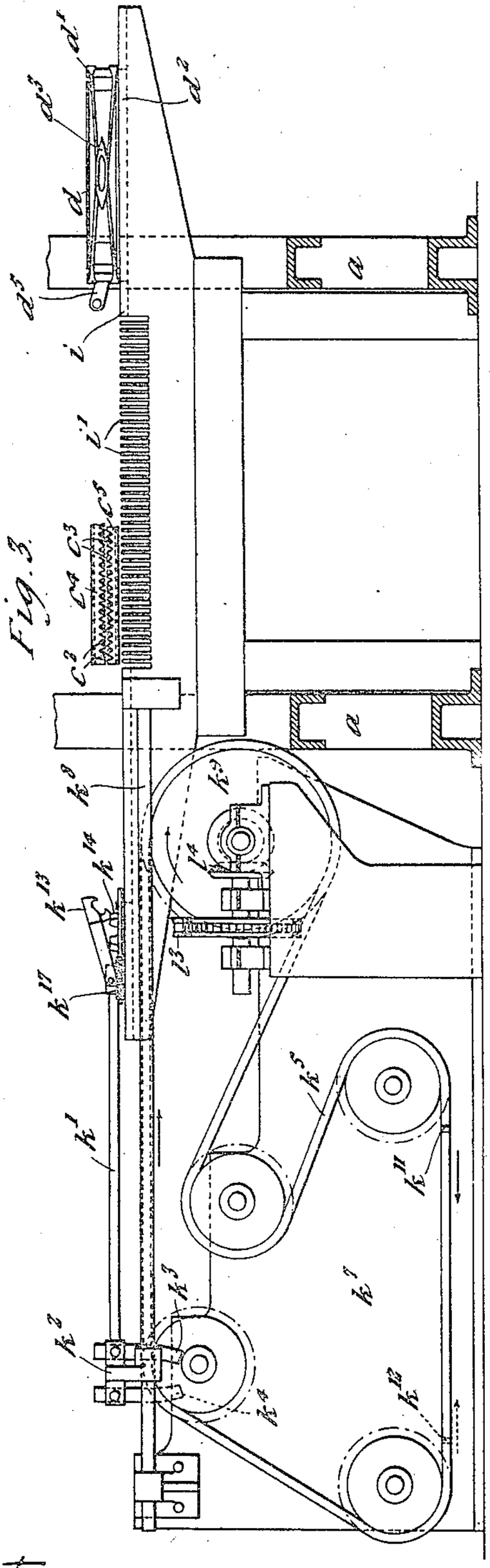
4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

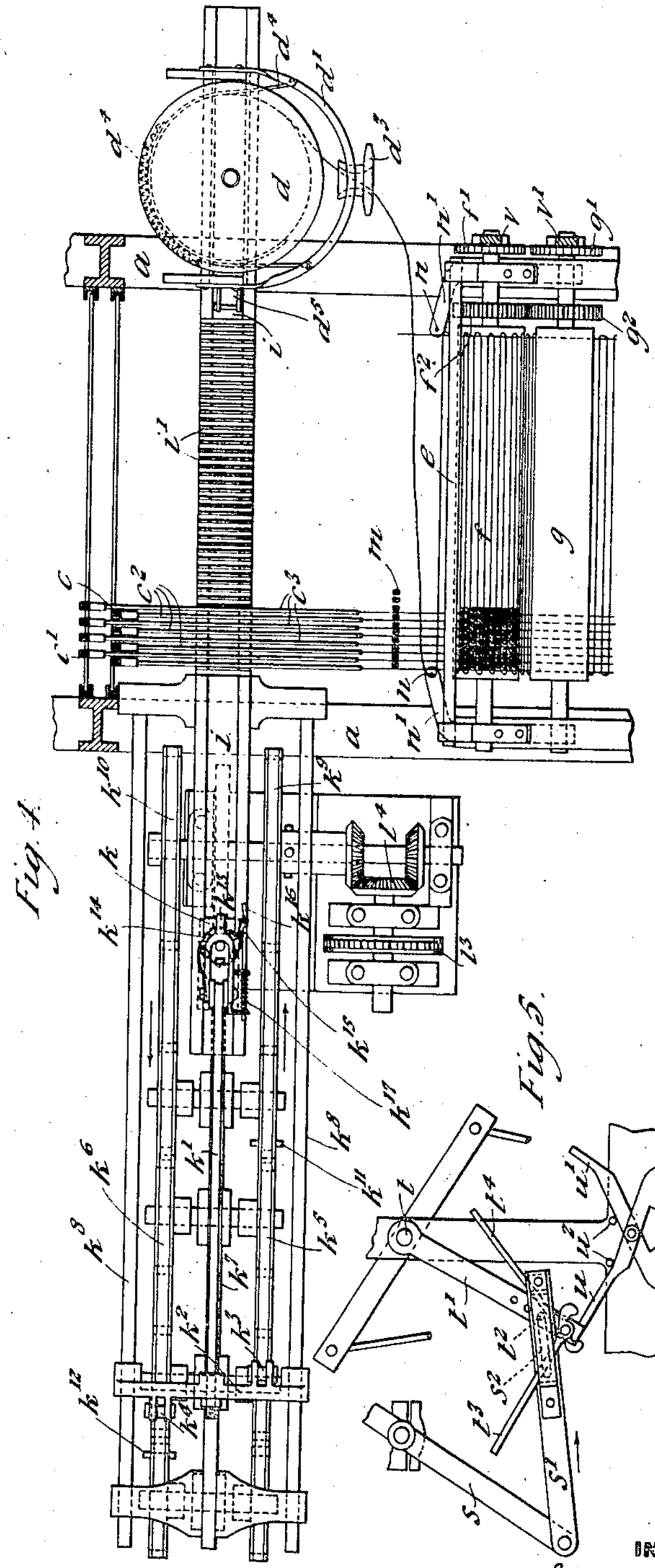

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

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LOOM FOR MAKING WIRE FABRIC.

No. 843,529. Specification of Letters Patent. Patented Feb. 5, 1907.

Application filed July 21, 1904. Serial No. 217,462.

To all whom it may concern:

Be it known that I, GIOVANNI GIUSSANI, engineer, a subject of the King of Great Britain and Ireland, residing at 6 Church Gardens, Ealing, London, England, have invented certain new and useful Improvements in Looms for Making Wire Fabrics, of which the following is a specification.

Sheets or nets made of helically-twisted wire have hitherto been manufactured on a loom wherein the wires forming the warp are arranged and operated upon in a manner closely resembling that adopted in an ordinary weaving-loom. The weft, however, is put in by hand, the end of a long wire being introduced into the shed from one side of the loom and cut off at that side while it is being beaten up by the lay. Thus each weft is a separate wire.

The present invention relates to the manufacture of sheets of helically-twisted wire in which the weft is continuous, so that the sheet has a selvage and is correspondingly stronger. For this purpose the wire that forms the weft is wound on a substitute for a shuttle, which is passed through the shed after each beat up of the lay, the wire being turned round a pin projected at the correct moment at the side of the loom, so as to form the selvage.

The invention includes machinery suitable for this manufacture, as will be described with reference to the accompanying drawings, in which—

Figures 1 and 2 are elevations of opposite sides of a loom comprising the elements of the invention, the devices for moving the shuttle-drum having been removed in Fig. 1. Fig. 3 is a transverse section showing the mechanism for moving the shuttle-drum. Fig. 4 is a plan of Fig. 3, and Fig. 5 is a detail sectional view of the mechanism which produces a pause in the movement of the healds after the formation of each shed.

As in other looms, in the framework a of the loom are mounted on suitable axles drums b, each carrying a supply of helically-twisted wire to form a warp-thread. When the loom is started, these warp-wires are brought down over guide-rollers b', but instead of or in addition to being passed through holes or loops in the healds $c\,c'$, as in a common loom, they are passed through tubes $c^2\,c^3$, hinged to the healds $c\,c'$, respectively, those passing through tubes c^2 alternating with those passing through tubes c^3. These tubes form the shed through which the shuttle-drum d is passed and are necessitated by the difficulty of keeping taut such a heavy warp-thread as helically-twisted wire. In order to keep them from moving laterally, two combs $c^4\,c^5$ are provided, the former carried by a bar c^6, hinged to the heald c, the latter carried by a counterweighted bar c^7, pivoted to a part of the framework. When the healds are moved in opposite directions to make the shed, as in a common loom, the comb c^4 rests on the ascending tubes, each of the latter being thus kept in place between two teeth of the comb. The descending tubes rest on the comb c^5 and are similarly kept in place. From these tubes the warp-wires are passed beneath a roller e, over a roller f, presently to be described, and under a roller g, being finally fastened to the drum h, whereon the sheet is to be wound as it is made.

The weft-wire is wound on the drum d, mounted to rotate in a horizontal plane on a slide d^2, Fig. 3, which moves in a guideway i, extending transversely of the loom. This guideway has transverse grooves i', one corresponding with each of the tubes $c^2\,c^3$ to accommodate the tube in its downward movement.

The wire is guided from the drum by an eye d^3 in a frame d' and is kept in place on the drum by a spring-band d^4, Fig. 4.

The mechanism for moving the drum to and fro through the shed is shown in Figs. 3 and 4 and comprises a slide k, also moving in the guideway i, a rod k', connecting the slide with a cross-head k^2, downwardly extending projections $k^3\,k^4$ on the said cross-head, and an endless traveling chain $k^5\,k^6$ on each side of a frame k^7, which supports bars k^8, whereon the cross-head k^2 slides.

The endless chains are driven at a suitable speed in opposite directions, as indicated by the arrows in Fig. 4, by sprockets $k^9\,k^{10}$ and carry each a tappet $k^{11}\,k^{12}$.

On a horizontal pivot on the slide k turns a hook k^{13}, which in the position shown in Fig. 3 is resting on the tooth of a crown-wheel k^{14}, turning on a vertical pivot carried by the slide. A pawl k^{15}, pivoted to a push-rod k^{16},

engages with ratchet-teeth on the periphery of the crown-wheel k^{14}.

When in the course of its movement in the direction of the arrow the chain k^5 brings the tappet k^{11} against the projection k^3 on the cross-head k^2, the latter is moved to the right, pushing the slide k until the tappet leaves the projection on the cross-head. When this happens, the push-rod k^{16} is pressed against the frame d' and having moved rearward against the pressure of spring k^{17} has turned by its pawl k^{15} the crown-wheel k^{14} causing the hook k^{13} to fall from its supporting-tooth and to take into an eye d^5 on the frame d'. Immediately afterward the tappet k^{12} strikes the projection k^4 on the cross-head k^2 and moves the latter back again, bringing drum d with it. The play of the hook k^{13} in the eye d^5 is such that the beginning of the backward movement of the head k^2 relieves the pressure of the rod k^{16} against the frame d', thus allowing spring k^{17} to urge the rod forward, so that the pawl k^{15} takes into the next ratchet-tooth. The reciprocation of the head k^2 just described occurs during a pause in the movement of the healds, as will presently be explained, and the next shed is not formed until drum d is at the end of the guideway i opposite to that at which it is shown in Figs. 3 and 4. By the time this next shed is formed tappet k^{11} has again come against projection k^3 and the cross-head k^2 is moved to push the drum d back into the position shown in Figs. 3 and 4. The play of the hook k^{13} in the eye d^5 causes the initial movement of cross-head k^2 in the forward direction to press the rod k^{16} against the frame d', thus turning the crown-wheel k^{14} and causing the hook k^{13} to ride up to the top of the next tooth of the crown-wheel k^{14}, where it rests. In this position the hook is out of engagement with the eye d^5, so that when tappet k^{12} brings cross-head k^2 back again the drum d is left behind. After the parts have resumed the position shown in Figs. 3 and 4 the next shed is formed and the cycle of movements is repeated.

The sprockets k^9 k^{10} are mounted on coaxial shafts and are driven through differential gear l^4, sprocket-chain l^3, Fig. 1, and suitable speed-gear l^2 from the spur-wheel l' on the main shaft l.

During the formation of each shed the weft is beaten up by the reed m, and immediately after each beat-up the roller f is revolved one step to withdraw the weft which has just been beaten up from the sphere of action of the reed. For this purpose the surface of the roller f is so made that it engages with the meshes formed by the interweaving of the warp andweft. For instance, the roller may consist of a number of sprocket-wheels mounted on a shaft, so as to rotate therewith. Following this movement of roller f two pins n, one at each end of the weft that has just been beaten up and on the same side hereof as the guideway i, are projected upwardly through brackets n', fixed to the framework. When the drum d is made to pass through the shed that is next formed, the weft-wire is caught on the pin n on the side from which the drum is moving, and the selvage is thus properly formed. It remains to describe how these movements are effected. The spur-wheel l', Fig. 1, on the main shaft l drives a spur-wheel o', keyed to a countershaft o. A crank-pin o^2 on the wheel o' is connected by a link o^3 with an arm m' of a rocking shaft m^2. Another arm m^3 on this shaft is pivoted to the upper end of the lay m^4, carrying the reed m. The lower end of the lay is adjustably connected by link m^5 to an arm p on a rocking shaft p'. Another arm p^2 on this shaft is connected by link o^4 with the crank-pin o^2. It will be seen that these links and levers move the reed m in an elliptical path, causing it to rise free of the warp after each beat-up, to descend into the warp behind the weft-wire, and then to beat up this wire. As in the common loom, the ratio of the gear is such that this beat-up occurs twice in every revolution of the loom.

The link m^5 is connected by a link n^2 with the end of a lever-arm n^3, centered on a bracket n^4 and adjustably connected by a link n^5 with the pin n. The link m^5, arm p, link n^2, lever n^3, bracket n^4, and link n^5 are repeated on the other side of the loom, so that twice in every revolution of the loom the pins are raised and lowered.

Through driving-belts o^5 o^6 the countershaft o drives a short shaft q, geared to the drum h, on which the sheet is wound as it is made and which is prevented from backward movement by pawl h'. The slipping of the belt o^6 prevents overdriving of the drum h when the tension on the sheet is considerable.

A crank-pin on the spur-wheel l', Fig. 2, is connected by link l^6 with an arm r, centered, for instance, on the shaft of the drum h. The arm r is connected by a link r' with one end of a lever s, the other end of which is connected with the rocking shaft t, that determines the crossing of the healds to form the sheds in a well-known manner. As already stated, it is necessary that there should be a pause at the end of each movement of the healds to allow for time for moving the drum d through the shed. For this purpose an arm t' on the rocking shaft t has an adjustable pin t^2, which engages with a slot s^2 in a link s', pivoted to the lever s. Pivoted independently of each other to the arm t' are two levers t^3 t^4, and pivoted independently of each other to the framework a are two weighted pawls u u'. The levers t^3 t^4 rest against the ends, respectively, of a slot formed by a strap fastened to the links s', and the pawls u u' rest against pins u^2 in the

framework. The position of these parts (shown in Fig. 2) is the central position when the healds are just about to cross each other. Presuming that the link s' is moving to the left, the position of the parts at the end of the present stroke will be that shown in the detail sectional view, Fig. 5. In the course of the movement from the position shown in Fig. 2 the end of the slot s^2 engages the pin t^2 and moves the arm t' to the position shown in Fig. 5, which corresponds with the formation of the shed. In this position the pawl u catches the end of the arm t', and the lever t^3 is in a nearly horizontal position. As the link s' now moves in the opposite direction—that indicated by the arrow in Fig. 5—it raises the lever t^3 so that its shorter end strikes against the pawl u and releases the end of the arm t'. Thereupon the latter immediately falls, together with the healds, to the central position (shown in Fig. 2) and remains there until the end of the slot s^2 engages with pin t^2. The arm r is also connected by a link r^2 with a couple of arms v v', fixed together and turning, respectively, on the shafts of rollers f and g, for instance. Fixed to the shaft of roller f are a ratchet-wheel f' and a gear-wheel f^2. The former is engaged by a pawl v^2, pivoted to the arm v, while the gear-wheel f^2 is in gear with a similar wheel g^2 on the shaft of the roller g, which shaft also carries a ratchet g', engaged by a pawl v^3, pivoted to arm v'. When arm r is rocked to the left by the crank-pin on wheel l', pawl v^2 turns roller f through a small angle, while when arm r is rocked to the right pawl v^3 turns through ratchet g', gear-wheel g^2, which turns gear-wheel f^2, and therefore roller f, through the same angle in the same direction as before, although pawl v^2 is inoperative during this movement. Thus roller f is driven two steps during each revolution of the loom, one after each beat-up.

In order to adapt this loom for making sheets of various widths, smaller than the widest for which it is constructed, it is only necessary to substitute longer brackets n' and to lengthen the pivot connecting each pin n with its link n^5.

Having thus described the nature of my said invention and the best means I know of carrying the same into practical effect, I claim—

1. A loom for the manufacture of fabric of helically-twisted wire in sheets having a selvage, comprising devices for stretching wires to form a warp, devices for forming successive sheds in such warp, a shuttle carrying a continuous weft-wire, a single device adapted to move the said shuttle through the whole of each shed and then to be withdrawn before the next shed is formed, and a device at each side of the warp adapted to intercept the continuous weft-wire at each passage.

2. A loom for the manufacture of fabric of helically-twisted wire in sheets having a selvage, comprising devices for stretching wires to form a warp, devices for forming successive sheds in such warp, a shuttle carrying a continuous weft-wire, a single device adapted to move the said shuttle through the whole of each shed and then to be withdrawn before the next shed is formed, a device at each side of the warp adapted to intercept the continuous weft-wire at each passage, a device for beating up the said weft-wire after each passage, and a device for taking up the woven fabric after the weft has been beaten up.

3. A loom for the manufacture of fabric of helically-twisted wire in sheets having a selvage, comprising devices for stretching wires to form a warp, devices for forming successive sheds in such warp, a shuttle carrying a continuous weft-wire, a single device adapted to move the said shuttle through the whole of each shed and then to be withdrawn before the next shed is formed, and a pin at each side of the warp adapted to be projected through the plane of the warp before each passage of the said weft-wire.

4. A loom for the manufacture of fabric of helically-twisted wire in sheets having a selvage, comprising devices for stretching wires to form a warp, devices for forming successive sheds in such warp, a shuttle carrying a continuous weft-wire, a single device adapted to move the said shuttle through the whole of each shed and then to be withdrawn before the next shed is formed, a device for beating up the said weft-wire after each passage and a pin adapted to be projected in rear of the said weft-wire after each beat-up through the plane of the warp at that side thereof from which the said weft-wire is next to be passed.

5. A loom for the manufacture of fabric of helically-twisted wire in sheets having a selvage, comprising devices for stretching wires to form a warp, devices for forming successive sheds in such warp, a shuttle carrying a continuous weft-wire, a single device adapted to move the said shuttle through the whole of each shed and then to be withdrawn before the next shed is formed, a device for beating up the said weft-wire, a pin at each side of the warp adapted to be projected through the plane thereof in rear of the weft-wire last beaten up, a shaft adapted to be rotated and a number of sprocket-wheels fixed on the said shaft and adapted to engage the mesh of the fabric as it is made.

6. A loom for the manufacture of fabric of helically-twisted wire in sheets having a selvage, comprising devices for stretching wires to form a warp, devices for forming successive sheds in such warp, a device for passing a continuous weft-wire to and fro through such sheds, a reed, mechanism for moving this reed in such a path that it descends in rear of the weft-wire, moves forward to beat up the weft, and then ascends, a pin at each side

of the warp adapted to be projected through the plane thereof in rear of the weft-wire last beaten up, a shaft adapted to be rotated and a number of sprocket-wheels fixed on the said shaft and adapted to engage the mesh of the fabric as it is made.

7. In a loom for the manufacture of fabric of helically-twisted wire in sheets having a selvage, in combination, warp-wires, healds and tubes hinged to the said healds through which tubes the said wires pass.

8. In a loom for the manufacture of fabric of helically-twisted wire in sheets having a selvage, in combination, a framework, warp-wires, healds, tubes hinged to the said healds through which tubes the said wires pass, and means carried by one heald and other means carried by the framework adapted to keep the said tubes from lateral movement.

9. In a loom for the manufacture of helically-twisted wire in sheets having a selvage, in combination, healds, tubes hinged to the said healds, a continuous weft-wire, a guideway extending transversely of the loom and transverse slots in the said guideway adapted to receive the said tubes.

10. A loom for the manufacture of fabric of helically-twisted wire in sheets having a selvage, comprising devices for stretching wires to form a warp, healds, tubes hinged to the said healds through which tubes the said warp-wires pass, means for keeping the said tubes from lateral movement, means for moving the said healds to form successive sheds, means for causing a pause at the end of each stroke of the said healds, a guideway extending transversely of the loom, transverse slots in the said guideway adapted to receive the said tubes, a slide adapted to move in the said guideway, a drum pivotally mounted on the said slide, there being a continuous weft-wire wound on the said drum, means for moving the said slide to and fro in the said guideway, a reed adapted to descend in rear of the said weft-wire and to beat it up, a pin at each side of the warp adapted to be projected through the plane thereof in rear of the said weft-wire immediately after it has been beaten up, a roller adapted to be rotated through a small angle after each beat-up, and means on the said roller adapted to engage in the meshes of the fabric as it is made.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GIOVANNI GIUSSANI.

Witnesses:
EDWARD GARDNER,
H. SIMMONS.