(No Model.) 5 Sheets—Sheet 1.

J. H. GREENLEAF.

LOOM FOR WEAVING WITH SHORT WEFTS.

No. 421,270. Patented Feb. 11, 1890.

Fig. 2.

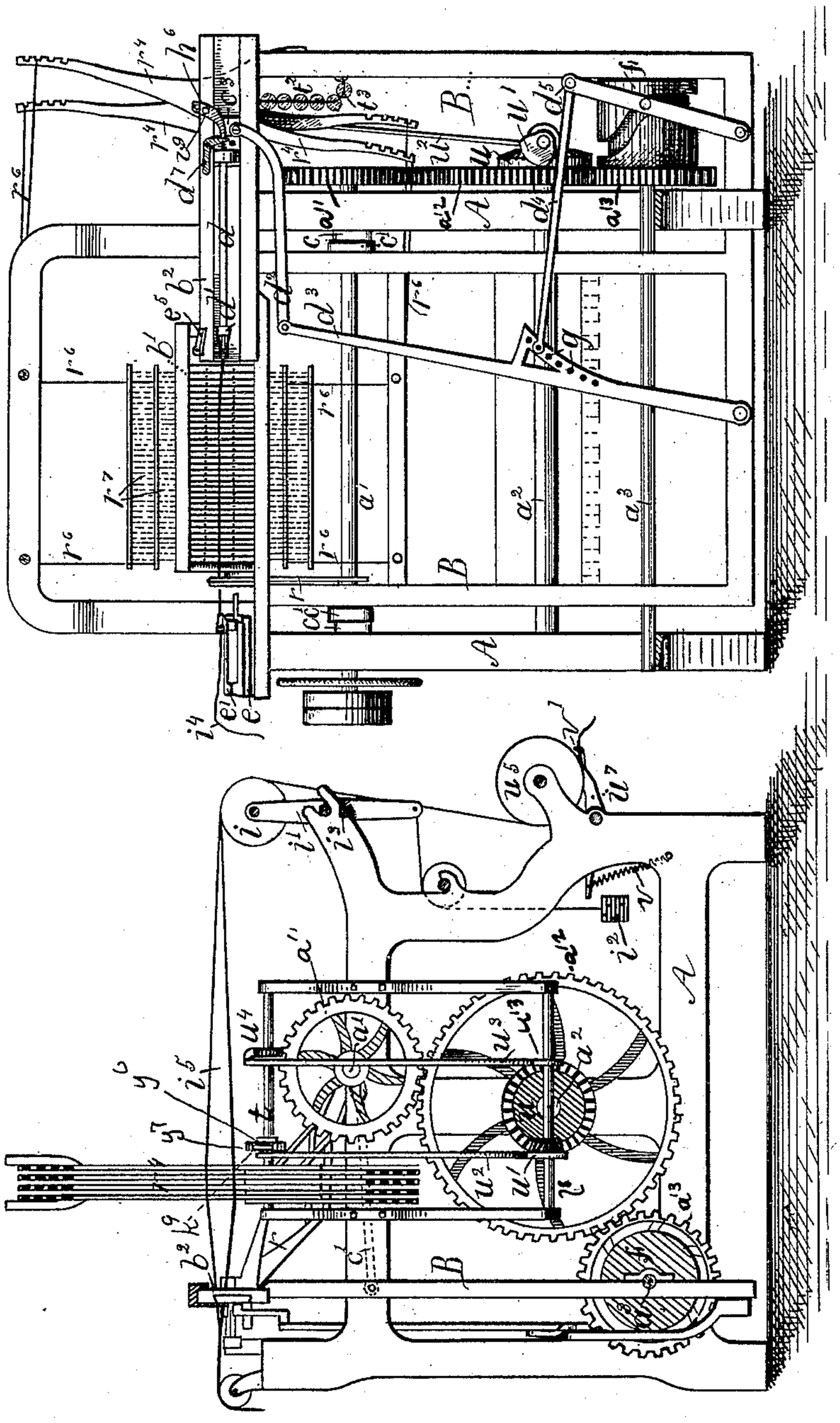

Fig. 1

WITNESSES:

George L. Barnes

Benjn. Brown

INVENTOR

Joseph H Greenleaf

BY Julius Tavies.

ATTORNEY

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Fig. 3

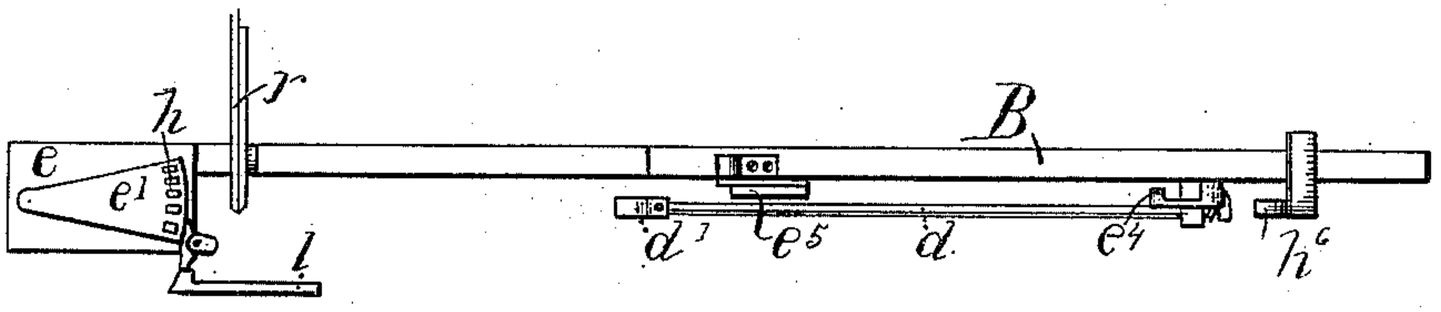


Fig. 4

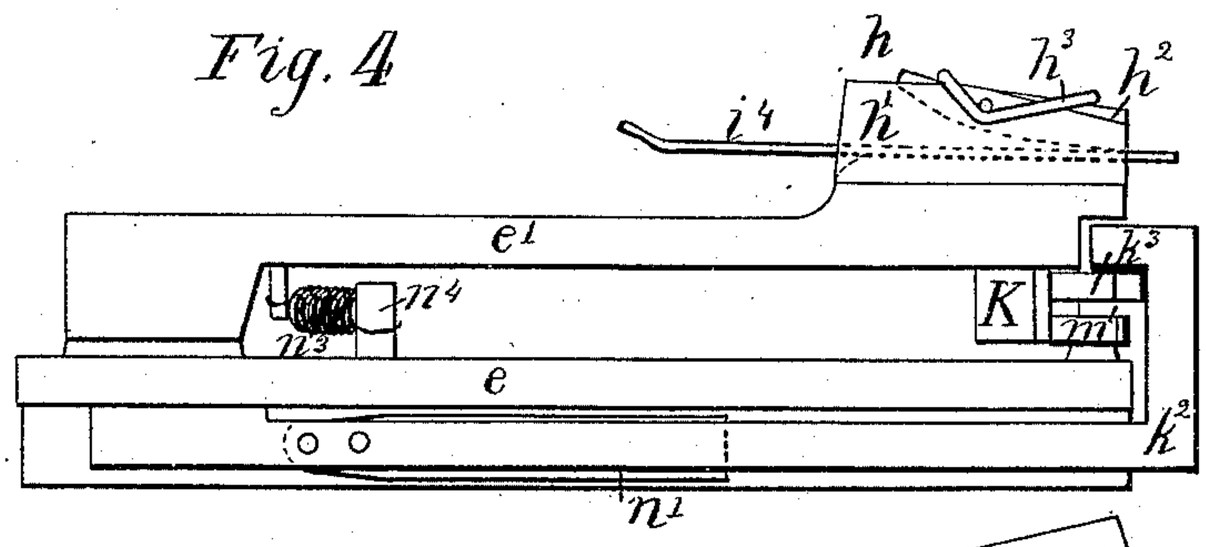


Fig. 5

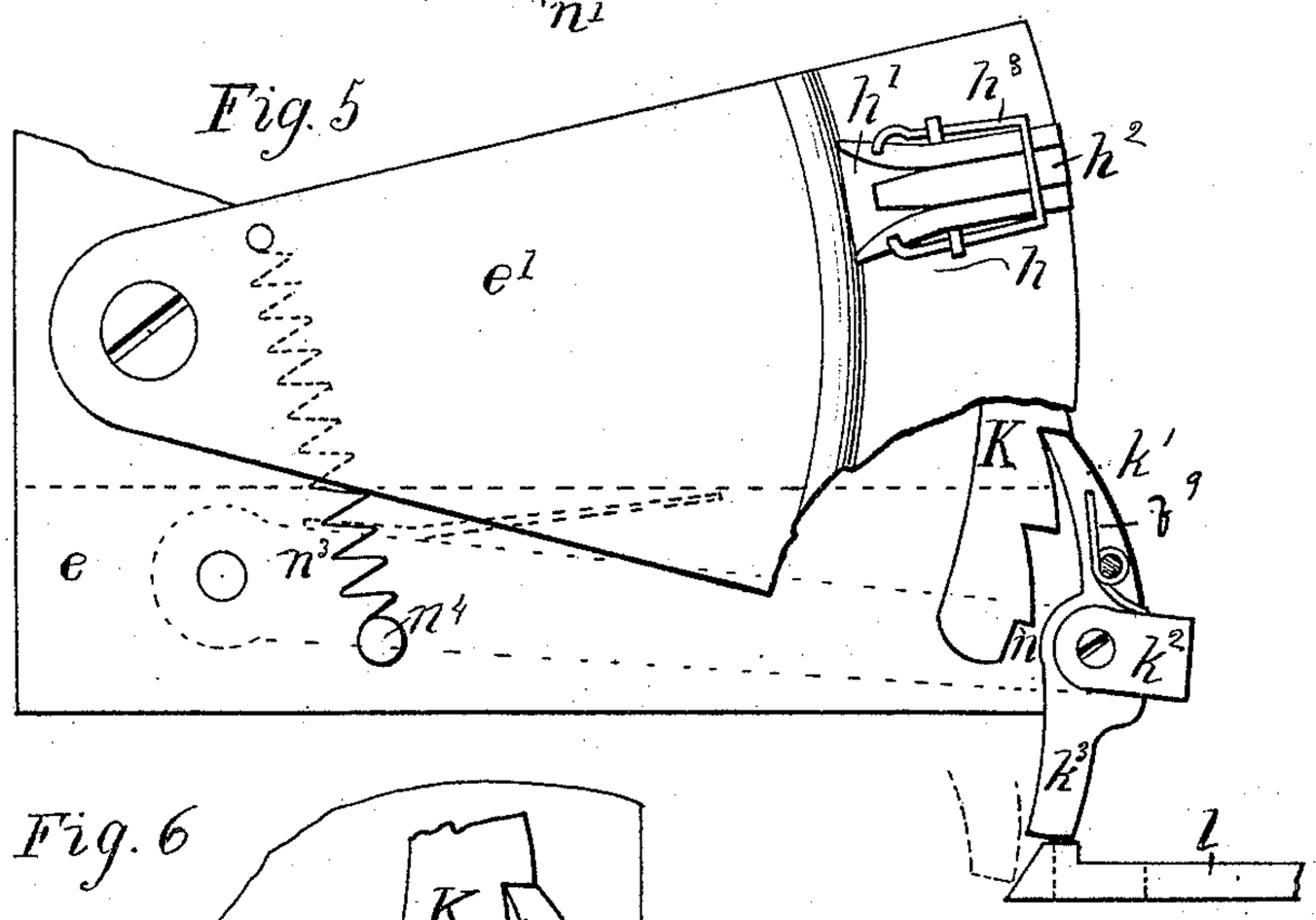


Fig. 6

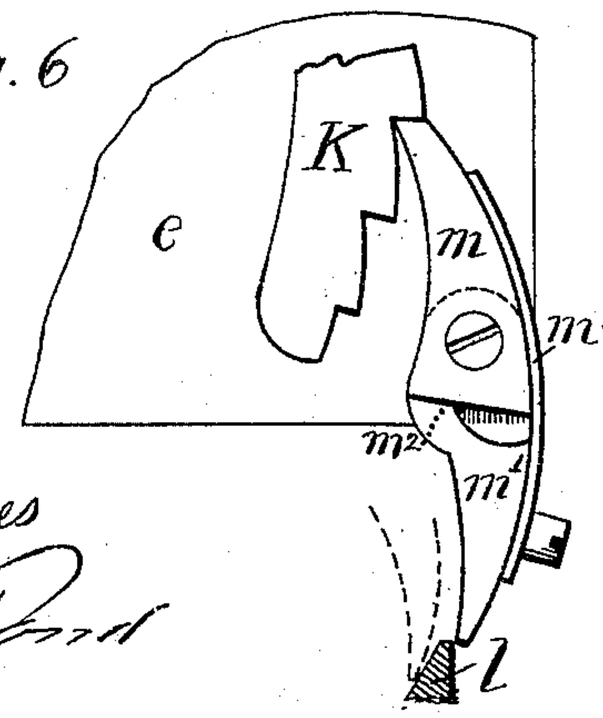
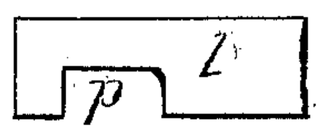


Fig. 7



WITNESSES:

George L. Barnes

Philip Reed

INVENTOR

Joseph H Greenleaf

BY Julius Tiros

ATTORNEY

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Fig. 8

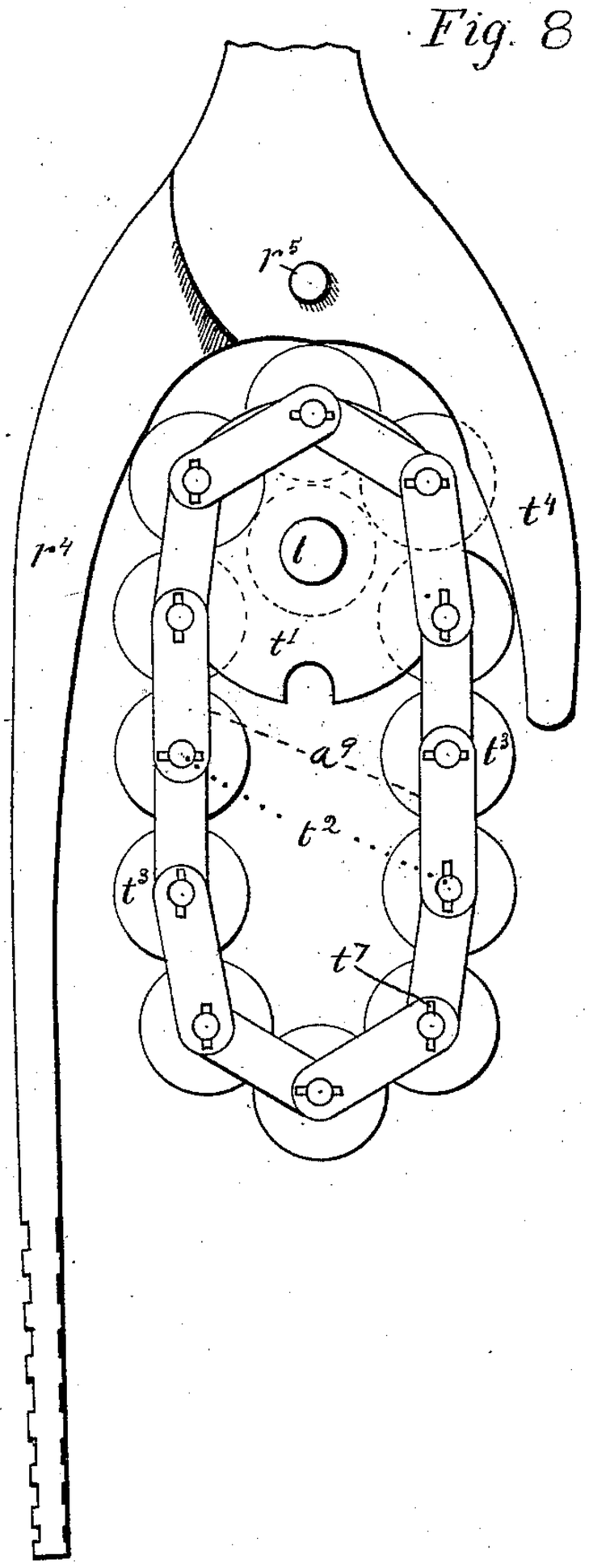
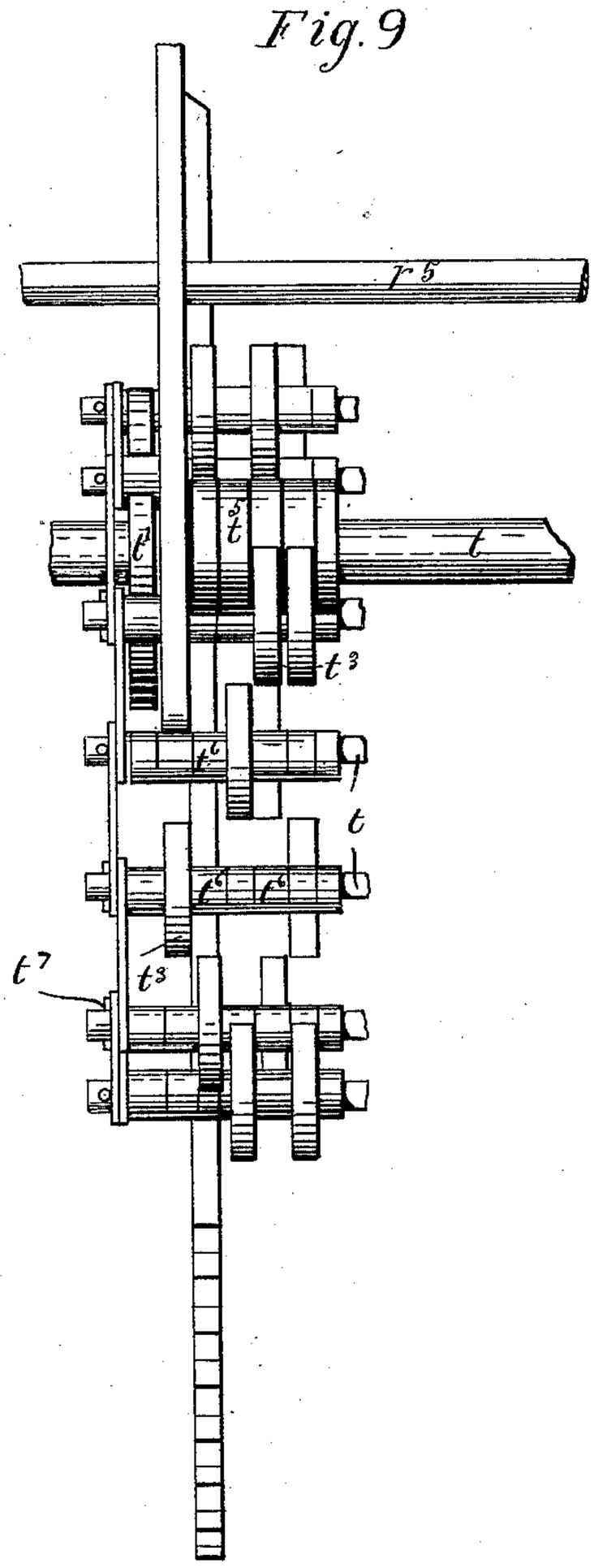


Fig. 9



WITNESSES:

George L. Barnes

Philip Pond

INVENTOR

Joseph H Greenleaf

BY Julius Irvine

ATTORNEY

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J. H. GREENLEAF.

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Fig. 10

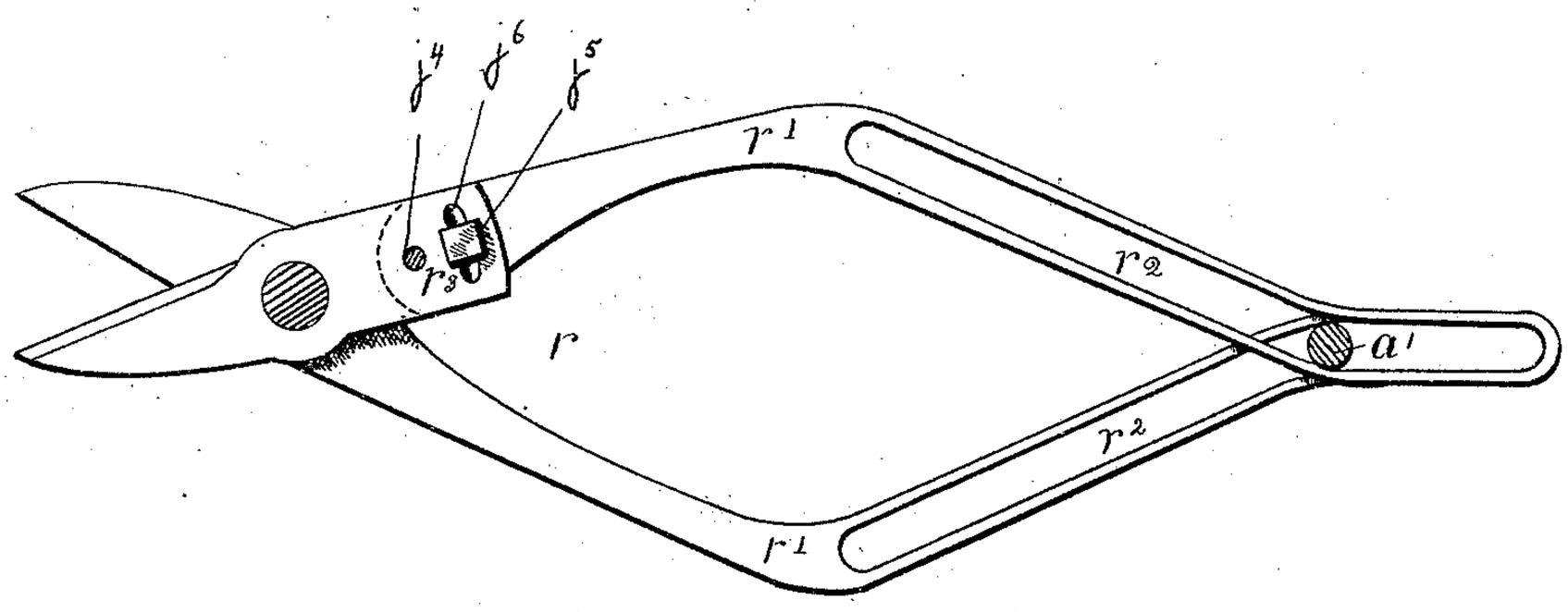


Fig. 11

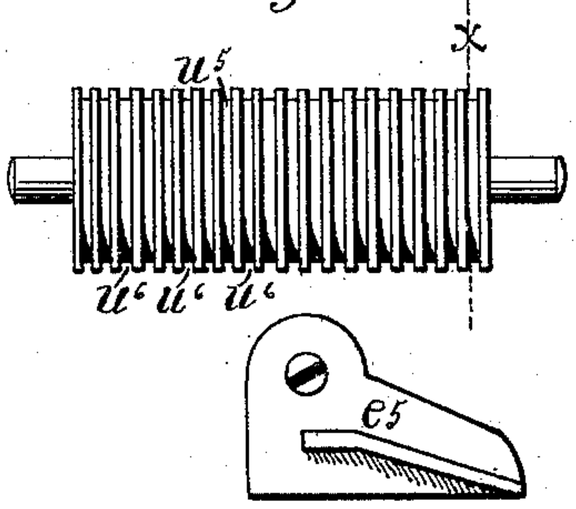


Fig. 12

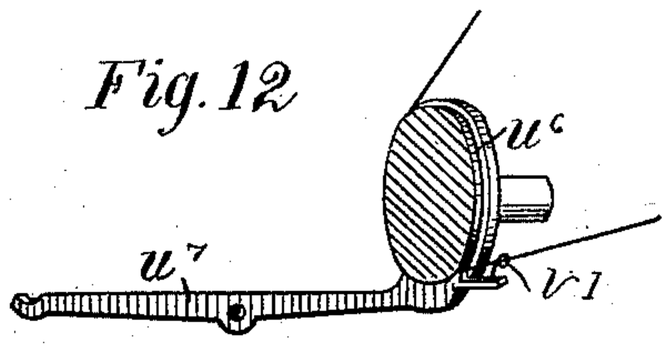


Fig. 13

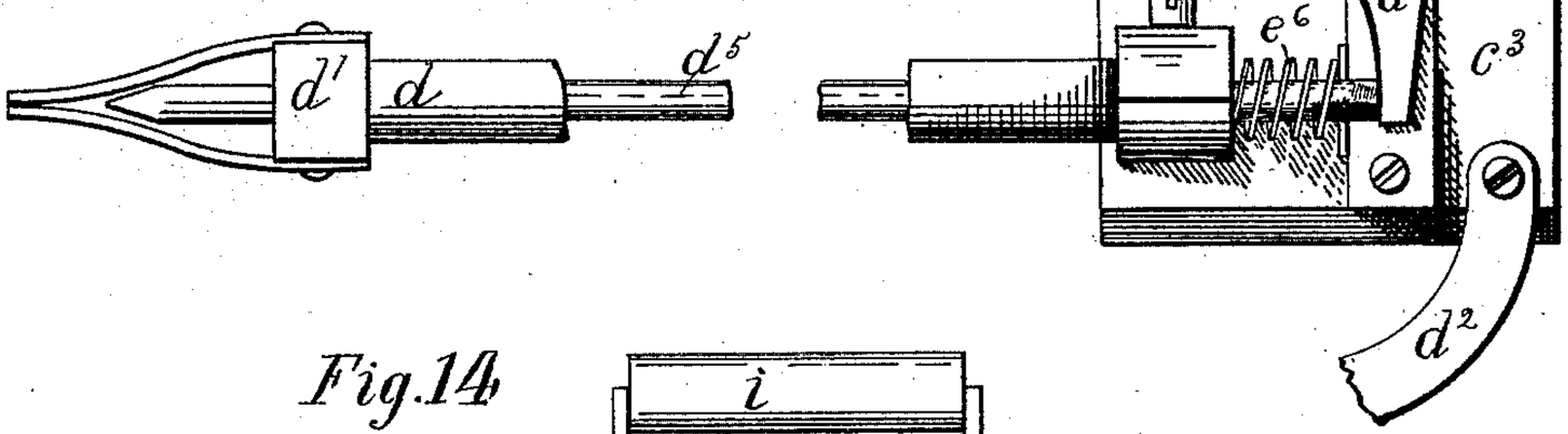
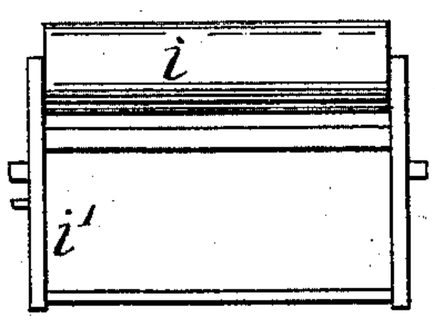


Fig. 14



WITNESSES:

George L. Barnes

INVENTOR

Joseph H Greenleaf

BY Julius Trive.

ATTORNEY

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Fig. 15

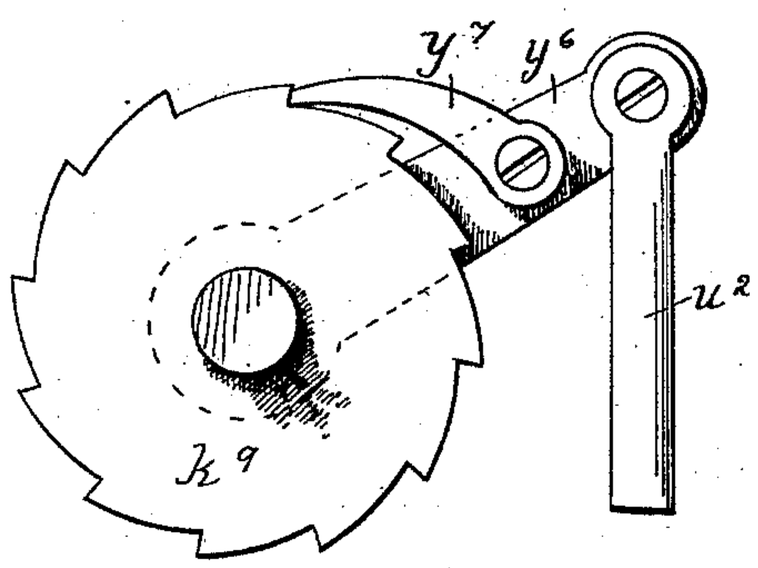
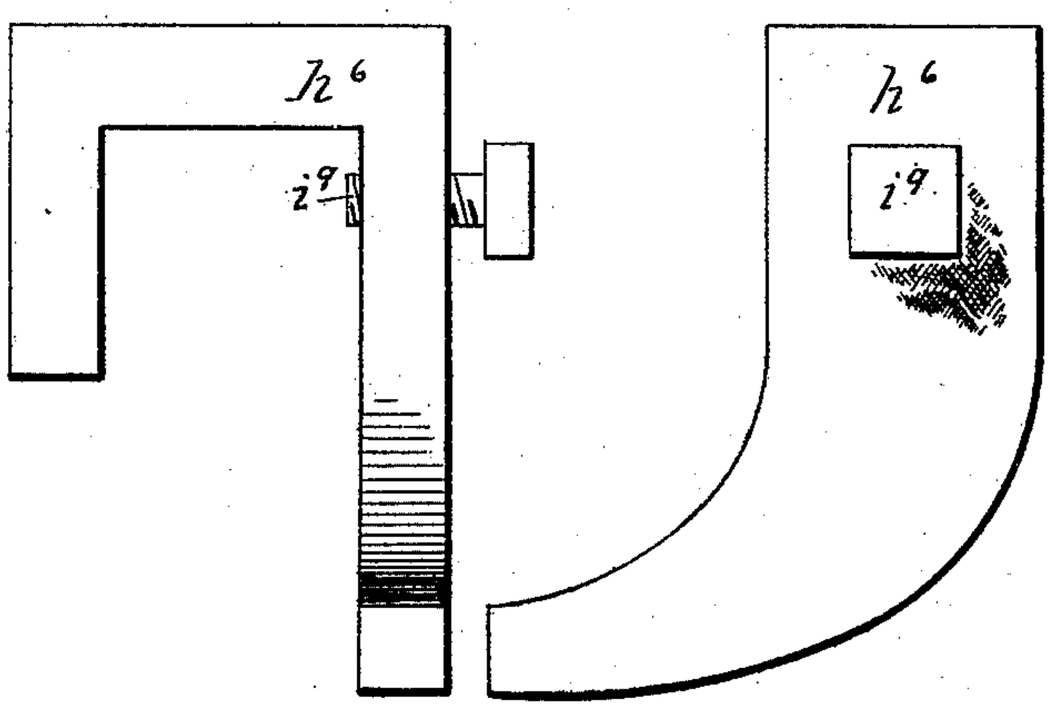


Fig. 16

Fig. 17



WITNESSES:
George L. Barnes.
Charles R Spiegel

INVENTOR
Joseph H. Greenleaf
BY
Julius Dwiss.
ATTORNEY

UNITED STATES PATENT OFFICE.

JOSEPH H. GREENLEAF, OF NEW HAVEN, CONNECTICUT.

LOOM FOR WEAVING WITH SHORT WEFTS.

SPECIFICATION forming part of Letters Patent No. 421,270, dated February 11, 1890.

Application filed June 7, 1886. Serial No. 204,403. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. GREENLEAF, of the town of New Haven and State of Connecticut, have invented new and useful Improvements in Looms for Weaving with Short Wefts, of which the following is a specification.

The object of my invention is to provide a loom for weaving cane-seating and similar fabrics.

The invention consists in the means provided for inserting the filling or woof between the warp or longitudinal strands of the fabric, in the novel mechanism for regulating the tension of the warp-strands, and in the novel construction of parts, as hereinafter more fully described and shown.

In the accompanying drawings, Figure 1 is a side elevation of my improved loom. Fig. 2 is a front view of the same with a portion of the front of the frame-work removed to show the mechanism. Fig. 3 is a plan view of the lay or beater. Fig. 4 is a front view of the feeder-head, and Fig. 5 is a plan view of the same. Fig. 6 is a plan view of the detent-pawl. Fig. 7 is a front view of the pawl-stop. Fig. 8 is a side elevation of a portion of the harness-motion, and Fig. 9 is a front view of the same. Fig. 10 shows the shears for cutting off the filling-strands. Fig. 11 is a view of the warp tension-roll. Fig. 12 shows a tension lever or brake and a section of the tension-roll on the line x, Fig. 11. Fig. 13 shows the mechanism for inserting the filling or woof between the warp, and Fig. 14 shows the weighted relief-roll. Fig. 15 shows the pawl and ratchet for operating the harness-motion, and Figs. 16 and 17 are views of the stationary stop h^6 and clamping-screw.

Referring to the drawings, A designates the frame-work of the loom, which is provided with suitable bearings for supporting the shafts a' a^2 a^3. The upper shaft a' is the driving-shaft, and imparts reciprocating motion to the lay or beater by means of ordinary cranks c and suitable connecting-rods or pitmen c'. The shaft a^3 forms the journal or axis of the beater, and by a cam movement, hereinafter described, imparts the motion to the mechanism for inserting the woof or filling. A toothed gear-wheel a^{11} is mounted on one end of the driving-shaft and intermeshes with a toothed gear-wheel a^{12}, of twice the number of teeth of the first, on the end of the intermediate shaft a^2, so that the second shaft turns through a half-revolution while the first shaft makes a complete revolution, and the third or lower shaft is geared to the intermediate shaft by a gear a^{13}, of half the number of teeth as that upon the intermediate shaft, so that the third shaft has the same speed as the first shaft and makes a complete revolution to each vibration of the beater or half-turn of the crank-shaft a'.

To the upper part or head of the beater is attached an ordinary reed b', through which the warp-strands pass in the usual manner. A horizontal guide b^2, having a dovetailed groove lengthwise therein, is formed on one end of the beater-head in line with the reed. A sliding head or block c^3 is fitted in the guiding-groove and supports a horizontal rod or arm d, which carries spring-nippers d' at its end. The block is connected by a rod d^2 to a vertical rock-arm or vibrating lever d^3, which is pivoted to the lower part of the beater. The rock-arm is connected by a rod d^4 to a shorter rock-arm d^5, which is also pivoted to the lower part of the beater. The rock-arm d^5 has a central pin or projection, which is received in a groove in a cylindrical cam f, carried on the shaft a^3. The cam actuates the rock-arms and reciprocates the nipper-rod d lengthwise of the beater-head, with the nippers d' just in front of the reed. As the rock-arms are pivoted to the frame of the beater, and the beater is journaled on the shaft which carries the cam f, all these parts vibrate with the beater, and the reciprocation of the nipper-rod can therefore take place while the beater is in motion. The cam is so timed that the nippers commence to enter between the warp-strands soon after the beater starts backward, (after having beaten up the filling.) The nipper seizes a filling-strand at the extremity of its throw and draws it between the warp-strands as it recedes back to the position shown in Fig. 2.

In order to weave different widths of fabric, the vibrating lever or rock-arm d^3 is provided with a series of holes g, by means of which connecting-rod d^4 may be attached to the rock-arm at different distances from the center. By this means the throw of the nipper

may be varied in length. The holes *g* are placed in an arc concentric with the upper end of the rock-arm d^5 when the nipper is at the extremity of its throw nearest to the feeders. The position of the connecting-rod, therefore, does not affect the throw of the nipper at that end, but changes the length of its throw at the opposite end only.

On the opposite end of the beater-head b^2 are attached the woof-feeding devices. (Shown in detail in Figs. 3, 4, 5, 6, and 7.)

e represents a rectangular ledge or shelf secured to the beater. A vibrating sector *e'* is pivoted upon the upper side of the shelf and carries a radial series of feeders *h* at its circumference. Each feeder consists of a trough-like part or guide *h'*, in which a tongue h^2 is pivoted, as shown. The tongue is held down at the end nearest to the reed by the looped spring h^3, having its end passed under the pivot or journal of the tongue and over the sides of the trough. The filling-strands are fed into the feeders under the tongues h^2, which act as tension-clamps or brakes thereon.

A ratchet *k* is secured on the under side of the rock-sector and is engaged by a pawl *k'*, carried on the end of a vibrating arm k^2, which is pivoted to the lower side of the shelf and bent over at the end, as shown in Figs. 4 and 5. An arm k^3 is formed integral with the pawl and extends forward from the pawl-pivot. As the beater approaches the end of its throw in its forward vibration, the end of the arm engages with a stationary stop *l* on the frame of the loom and is carried backward until the beater reverses. This motion of the pawl carries the rock-sector backward, the pawl being engaged with the ratchet by means of a spring r^9 acting upon the pawl and arm. The position of the stationary stop *l* upon the frame is so adjusted that the ratchet is carried back one tooth at each vibration of the beater, and the ratchet-teeth correspond in number and distance apart to the feeders upon the rock-sector. The feeders are so adjusted on the rock-sector that they are successively stopped in alignment with the nipper.

A detent-pawl *m* is pivoted upon the shelf *e* immediately under the operating-pawl *k'* when the latter is at rest, and serves to hold the rock-sector stationary after it has been moved backward by the operating-pawl.

Journaled upon the same pivot with the detent-pawl is a pointed movable arm *m'*, which is provided with a shoulder m^2, against which the pawl *m* abuts, as shown in Fig. 6, being there held by a spring m^3, secured to the arm *m'*. The movable arm *m'* is of the same length as the arm of the operating-pawl *k'*, and its point is even with the end of the arm k^3 when the latter comes in contact with the stationary stop *l*, both pawls then being in engagement with the same ratchet-tooth. The point of the arm *m'* enters a notch *p* in the stationary stop and slides along the side of the notch nearest the end of the stop, thus being held from vibrating while the detent-pawl rises over the next tooth. As the ratchet is carried backward by the operating-pawl *k'*, the spring m^3, secured to the movable arm, forces the pawl *m* behind the next tooth, the arm meanwhile being prevented from moving by engagement with the side of the notch in the stationary stop *l*. By means of this joint operation of the two pawls the ratchet is moved backward one tooth at each vibration of the beater until the pawls rest in the last notch *n* in the ratchet. The notch is made shallow, or of less depth than the other notches, and when the pawls are therein their arms consequently occupy a different position in relation to the stationary stop than when the pawls are in the deeper notches, being thrown toward the end of the stop. The end of the stop is beveled or inclined, as shown in Figs. 5 and 6, so that in the forward movement of the lay or beater the ends of the pawl-arms will strike the inclined surfaces when the pawls are in the last ratchet-notch and slide up the incline, as shown by the dotted lines in the same figures. This motion of the pawl-arms throws both pawls out of the notch and allows the ratchet and rock-sector to return to their extreme forward position. The sector is returned to this position by the action of a spring n^3, secured to a pin n^4 in the shelf *e*. The pin also acts as a stop to limit the forward movement of the sector.

A spring *n'* is secured on the vibrating arm k^2 and bears against an abutment on the under side of the shelf *e*, to return the arm forward after the beater reverses its forward motion. By these means the rock-sector is successively ratcheted backward and instantly returned when the pawls reach the last notch *n*.

The nipper *d'* in its reciprocation passes by each end of the reed *b* and travels nearly up to the woof-feeders *h*. The nipper-rod *d*, Fig. 13, is perforated throughout its length to receive a pointed rod d^5, which is adapted to open the nippers, as its pointed end is wedged between the prongs thereof. At the opposite end of the rod d^5 is a vertical arm d^6, pivoted to the slide and formed integral with the horizontal arm d^7, which has a rear lateral projection e^4 at its end. An inclined plane e^5 is pivoted on the beater-head above the groove in the head b^2 in such position that the lateral projection on the horizontal arm slides upon the inclined plane as the nipper approaches the feeders at the end of its stroke. This movement swings the vertical arm d^6 toward the nipper and thrusts the point of the rod d^5 between the nipper-prongs, thus opening them to seize the woof-strand. The projection on the arm passes over and falls off from the highest point of the inclined plane, and the nippers then close upon the woof-strand, the rod being withdrawn from between them by the action of a spring e^6 at its opposite end. At this point the motion of

the nipper is reversed and the filling-strand is drawn in between the warp-strands, the inclined plane swinging upward to allow the projection e^4 to pass under it. When the nipper reaches the opposite extremity of its throw, the arm d^6 is brought into engagement with an adjustable stop h^6, Fig. 3, on the beater-head b^2, thereby thrusting the rod d^5 between the nipper-prongs and releasing the woof-strand.

Successive reciprocations of the nipper are made with each revolution of the cam-shaft a^3 and corresponding vibrations of the beater. The adjustable stop is an ordinary U-shaped clamp, which is placed upon the upper edge of the beater-head, with one leg on each side thereof, and is clamped thereon by a set-screw i^9 through the leg of the stop, whereby it may be fastened anywhere along the beater-head.

Shears r are pivoted upon the beater-head adjacent to the woof-feeders. The handles or arms r' of the shears are bent, as shown in Fig. 10, and each formed with inclined slots r^2. The shaft a' is arranged through the slots in the shear-handles, and as the shears vibrate with the beater-head the arms slide to and fro upon the shaft, thereby alternately opening and closing the shears. One of the shear-arms is formed with a joint r^3, as shown in Fig. 10, the two parts being hinged together by a pin j^4 and clamped tightly together, when adjusted, by means of a set-screw j^5, which passes through a slot j^6 in one of the parts and screws into the other part, which permits the shear-blade to be turned and secured at different angles to the shear-arm, whereby the closing of the shear-blades will take place sooner or later, according as the adjustable blade is elevated or depressed relatively to its arm by means of the joint. The shears are shaped and adjusted to cut off the filling-strands after the latter have been drawn between the warp-strands as the beater approaches or arrives at the extremity of its backward throw. The shear-arms may bear upon a suitable pin or stud instead of the shaft a'; but it is convenient to utilize the shaft for this purpose.

Figs. 8 and 9 show the harness-motion. The levers r^4, which operate the harnesses, are arranged in a vertical series at one side of the loom, pivoted side by side upon the stud or arbor r^5, which is supported in suitable brackets on the frame. Cords r^6, Fig. 2, extend from the ends of the levers over suitable pulleys to the ordinary harnesses r^7. Parallel with the stud r^5 and under it is an arbor t, upon which is arranged a pair of sprocket-wheels t'. The arbor and sprocket-wheels have intermittent motion, which may be imparted to them by any suitable mechanism from any one of the three shafts a' a^2 a^3, or the beater, by means of suitable mutilated gears, or crank and pitman, or worm-gear, or any well-known mechanical device. I employ an ordinary pawl y^7 and ratchet k^9, mounted on the sprocket-arbor, the pawl being attached to a rock-arm y^6, operated by the reciprocating rod u^2, which is actuated by a cam u', secured on a shaft l^8, driven by a pair of beveled gears u, one of which is fastened to the shaft l^8 and the other to the shaft a^2. A detent-pawl and ratchet u^4 is also placed upon the sprocket-arbor for holding it stationary between its movements, the detent-pawl being operated by rod u^3 and cam u^{13}, actuated by the shaft l^8. This mechanism is usual and well known in looms and requires no further description. The sprocket-wheels carry a chain of arbors t^2, which are connected by suitable links a^9, as shown. A series of rolls t^3 are arranged on the arbor t^2 and adapted in their rotation to bear against the harness-levers r^4 and vibrate the levers in the direction to raise the harnesses. Each lever is formed with an offset-spur t^4, which extends down on the opposite side of the sprocket-arbor t, and is engaged by the rolls t^3 to vibrate the harness-levers in the opposite direction. As the spurs are offset from the levers, they may be engaged by a separate set of rolls, so that each roll in the chain shall operate the lever only in one direction. Consequently one set of rolls is arranged to raise the harnesses above or out of their central position and a different set is employed to actuate the harnesses from their normal position downward. Any required succession of upward or downward throws may therefore be given to the harnesses by a suitable arrangement of the rolls in the chain.

Any required number of harnesses and levers may be employed and the roll-arbors t^2 correspondingly extended at the end shown broken in Fig. 9.

It is evident that the chain may be lengthened to weave any desired pattern in the fabric.

A series of rolls t^5 are preferably arranged on the sprocket-arbor to afford a bearing for the rolls which actuate the lever, and thereby prevent their arbors from springing.

The rolls t^3 are held in place on the arbors t^2 by means of washers t^6 and suitable cotters t^7, inserted through the arbors outside of the links of the chain. It is evident that the successive movements of the chain must correspond with the movements of the beater.

The warp-strands are carried into the loom under a cylindrical roll u^5, which is secured upon the rear part of the machine. The roll has a groove u^6 for each thread, by means of which the warp-strands are kept separated. A series of brakes or tension-clamps u^7 are pivoted upon a transverse bar near the roll and adapted to bear at their rear ends in the grooves in the roll. The brakes are fitted to the curvature of the roll and are forced against it by suitable springs v, Fig. 1. An eyelet v' is secured at the end of each of the clamps to guide the warp-strands into their respective grooves. The warp-strands pass from the friction-roll upward and over a roll i, from whence they pass through the harnesses to the

reed. The roll i is pivoted upon a rocking frame i', which is journaled upon the frame of the loom. A cord and weight i^2 are attached to the lower part of the frame and hold it stationary with a suitable stop i^3 in contact with a shoulder on the loom-frame. It is evident that the strain of the beater on the warp-strands, when beating up, can never exceed the strain of the weight i^2, as the roll can yield and swing forward by raising the weight.

Constructed as above described and shown, the operation of my improved loom is as follows: The warp-strands are regularly alternated by the action of the harness and harness-motion. The nipper which travels upon the beater reciprocates between the warp-strands after each stroke of the beater, and draws the filling-strands i^4 between the warp-strands i^5, when they are successively beaten up by the beater in the usual manner of weaving.

The filling-strands are fed into the feeders by an operator or attendant. In order to supply the filling-strands without interruption, a series of successively-acting feeders are necessary, so that all the feeders except one are always idle in succession and may be fed at leisure.

The completed fabric may be reeled off from the loom as fast as woven by the usual means.

Any desired figure may be woven in the fabric by a suitable arrangement of the rolls in the harness-chain.

This loom is especially adapted for weaving fabric from cane or rattan, but can be used for weaving any kind of fabric in which the woof or filling strands are sufficiently stiff to prevent the warp from unraveling or crushing out laterally at the edges of the fabric or ends of the strands.

I claim as new and desire to secure by Letters Patent—

1. The combination, with the lay or beater, of a nipper, a carrying-rod therefor reciprocated upon the lay or beater, a cam mounted concentrically with the axis of the lay or beater, and rock-arms and connecting-rods, whereby the said carrying-rod and nipper are actuated from the said cam, substantially as set forth.

2. The combination, with the lay or beater, of a nipper and carrying-rod guided upon the beater-head, a vibrating lever or rock-arm pivoted upon the beater and connected at its upper end with the nipper-rod, a second or driving lever or rock-arm pivoted on the beater and connected by a rod to the first, and a rotating cam journaled concentric with the axis of the beater and adapted to engage and reciprocate the driving rock-arm, one of the rock-arms being provided with means, substantially as described, for attaching its connecting-rod at different distances from the center for the purpose of varying the stroke of the nipper, as specified.

3. In combination with the slide and the nipper-jaws carried thereby, the nipper-jaw-opening rod, the spring for retracting the same, the lever carried by the slide, adapted to move the rod to open the nipper-jaws, and a cam mounted on a support independent of the slide, into and out of engagement with which a projection of the lever is brought as the slide moves in one direction, so that the lever is moved to open the nipper-jaws and then released, substantially as and for the purpose specified.

4. In combination with the slide and the spring nipper-jaws carried upon a suitable support on the slide, the reciprocable rod having its forward end adapted to engage and open the nipper-jaws, the spring for retracting such rod, the lever carried by the slide, adapted to move the rod to open the nipper-jaws and having a lug or pin, a cam up over and off of which such lever pin or lug rides as the slide and nipper reach the forward end of their travel, and a stop to be engaged by the lever at the end of the return movement of the slide and nipper, substantially as and for the purpose shown.

5. The combination, with the slide and the spring nipper-jaws carried on a suitable arm from the slide, of the reciprocable jaw-opening rod, the retracting-spring therefor, the lever for moving the rod to open the nipper-jaws, provided with a lug or pin, the swinging piece having a cam into and out of engagement with which the pin or lug on the lever passes as the slide and nipper approach the end of their forward travel, and a stop to engage and actuate the lever as the slide reaches the end of its return movement, substantially as and for the purpose set forth.

6. The combination, with a lay or beater and a reciprocating nipper carried on the beater-head for inserting the woof-strands, of a rock-sector pivoted on the beater, a series of radial woof-feeders mounted upon the rock-sector, a ratchet secured concentrically upon the sector and provided with teeth corresponding in number and position to the woof-feeders, a vibrating pawl carried upon the beater, adapted to actuate the ratchet backward, a detent-pawl carried upon the beater and adapted to hold the sector with the feeders successively in line with the nipper, and a stationary stop with which the vibrating and detent pawls engage to operate the rock-sector and effect its release at the termination of its backward throw, substantially in the manner and for the purpose described.

7. In combination, the lay or beater B, the rock-sector e', pivoted thereon, the series of woof-feeders h, carried on the sector, the ratchet k, secured on the sector, the spring-actuated arm k^2, pivoted on the beater, the operating-pawl k', carried on the spring-actuated arm k^2, the detent-pawl m, pivoted upon the beater and provided with the movable arm m' and spring m^3, the stationary stop l,

and the spring n^3, for returning the rock-sector, all combined substantially in the manner and for the purpose specified.

8. In a loom, the combination, with the lay or beater and a reciprocating nipper carried and guided on the beater-head for inserting the woof-strands, of the shears r, pivoted upon the beater and having the bent slotted handles r', arranged to slide to and fro upon the shaft a', or equivalent stationary part of the machine, in the movement of the beater, whereby the shears are operated to sever the woof-strands, substantially in the manner set forth.

9. The combination of the cylindrical roll u^5, having a separate groove u^6 for each warp-strand, with a series of spring-actuated tension-clamps u^7, arranged to bear, respectively, in the grooves u^6, and formed with the guides v', for leading the warp-strands into the groove, all arranged and combined to provide an independent tension for each warp-strand, substantially as described.

JOSEPH H. GREENLEAF.

Witnesses:
JULIUS TWISS,
DAVID K. ANDREWS.