No. 611,602. Patented Oct. 4, 1898.

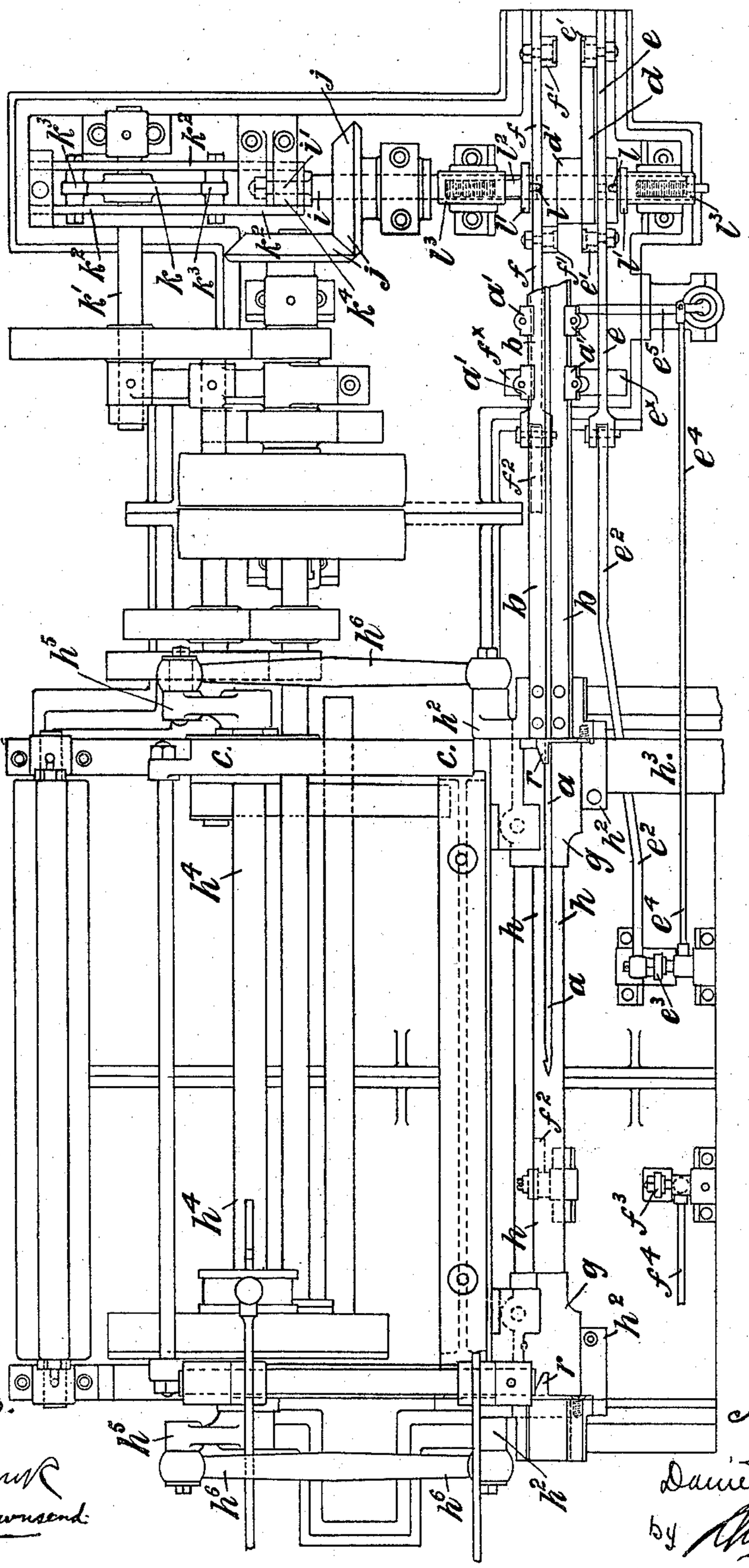
D. S. BIRRELL.

LOOM FOR WEAVING WIRE.

(Application filed Dec. 8, 1897.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



Witnesses.
John F. Townsend.

Inventor
Daniel Stewart Birrell
by Rheinwaldt
Attys

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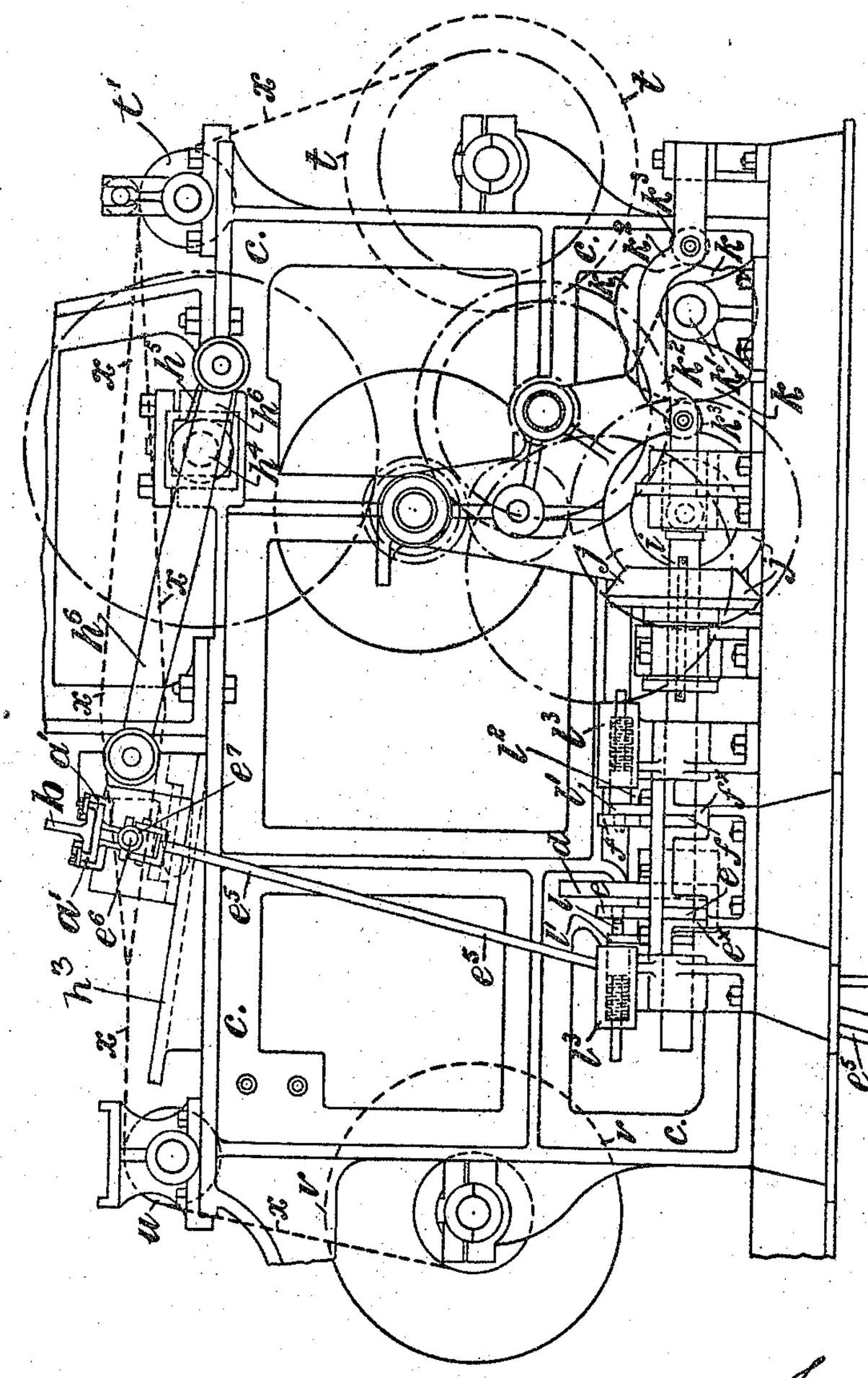
Fig. 2.



Witnesses.
Otto Munn
John F. Townsend

Inventor
Daniel Stewart Birrell
by Pennie & Edmonds
Attys

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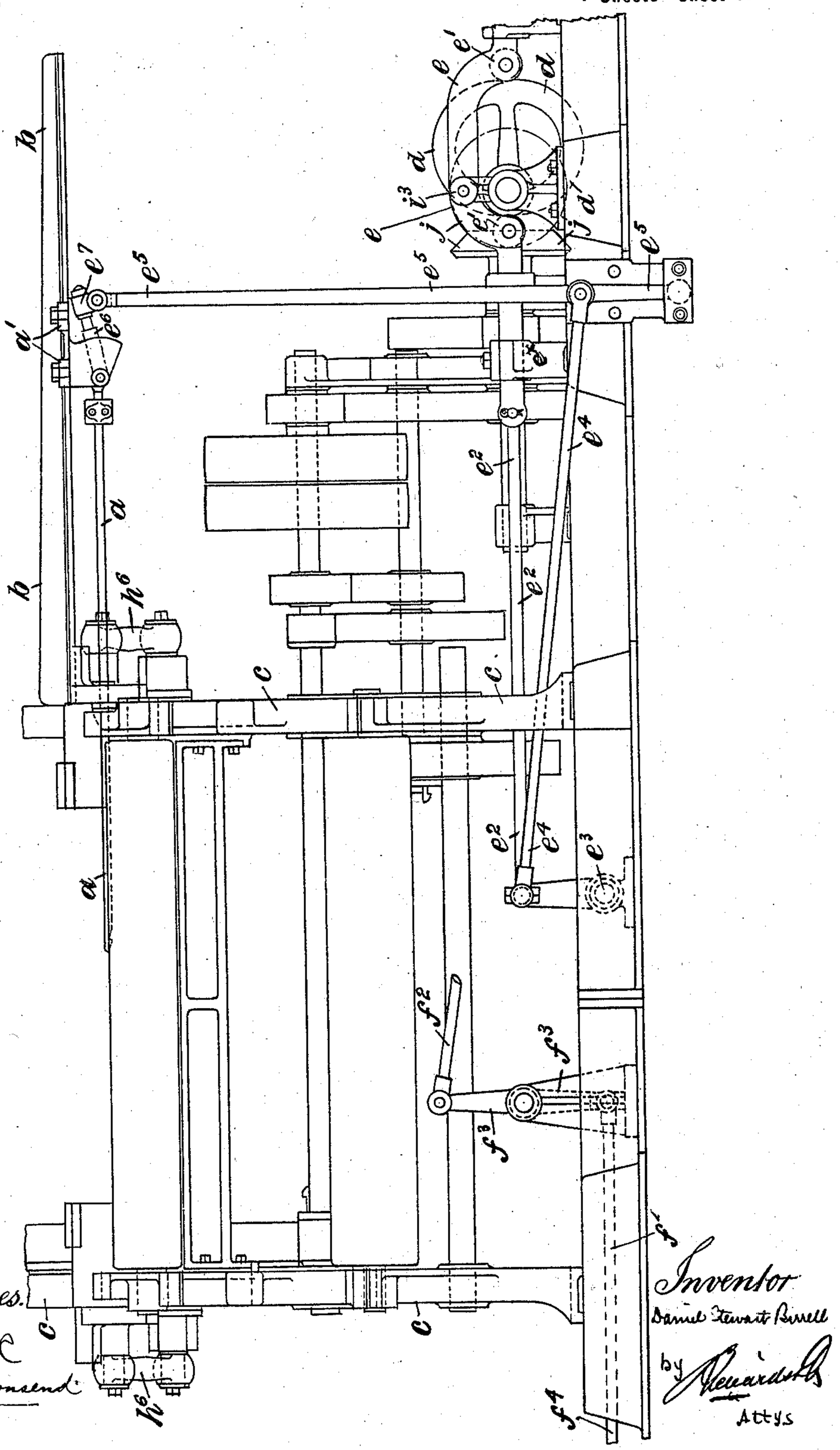
(Application filed Dec. 8, 1897.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

Fig. 5.

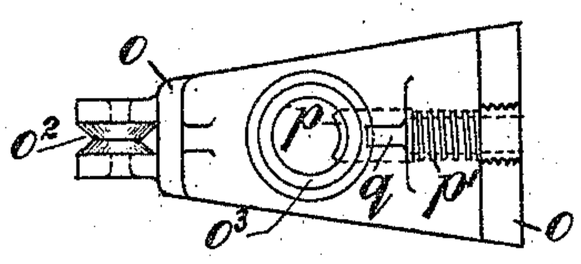
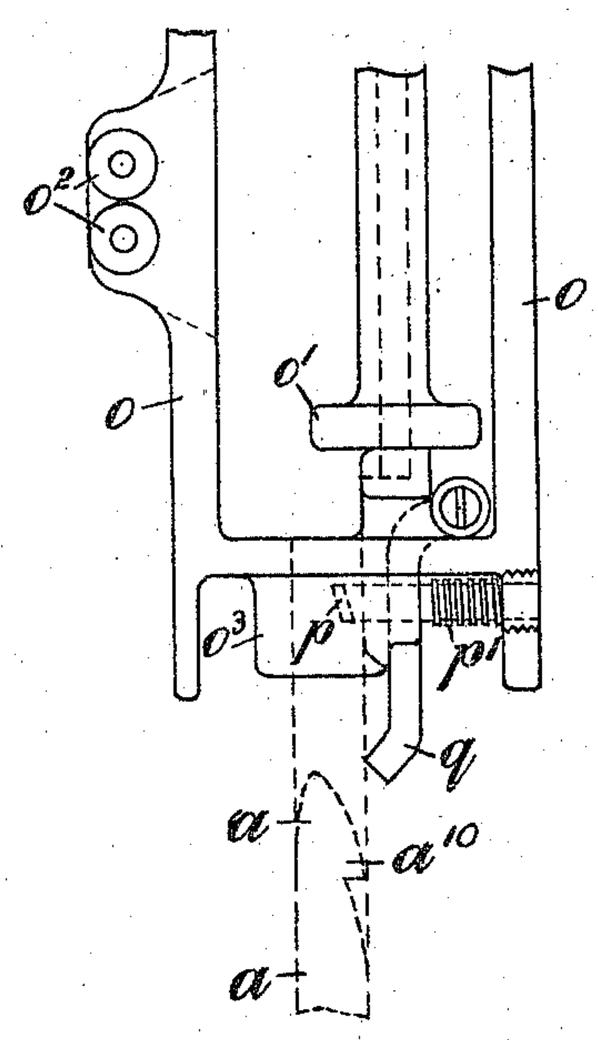


Fig. 4.



Witnesses.
John F. Townsend

Inventor
Daniel Stewart Birrell
by Benjamin R
Attys

UNITED STATES PATENT OFFICE.

DANIEL S. BIRRELL, OF WARRINGTON, ENGLAND.

LOOM FOR WEAVING WIRE.

SPECIFICATION forming part of Letters Patent No. 611,602, dated October 4, 1898.

Application filed December 8, 1897. Serial No. 661,179. (No model.) Patented in England April 18, 1896, No. 8,172.

To all whom it may concern:

Be it known that I, DANIEL STEWART BIRRELL, engineer, a subject of the Queen of Great Britain and Ireland, residing at Warrington, in the county of Lancaster, England, have invented certain new and useful Improvements in Looms for Weaving Wire, of which the following is a specification.

This invention has been patented in England under date of April 18, 1896, No. 8,172.

This invention has reference more particularly to looms for weaving wire fabrics composed of warps and wefts, and relates more especially to that type of such looms in which the shuttle connecting the weft is moved from side to side mechanically—that is to say, by means other than hand; and it has more particularly for its object to provide improvements in such machines by which by a single mechanical means the different operations connected with the movement of the shuttle can be effectively performed and a high rate of movement and number of picks and a large production or manufacture of material is produced in a given time.

The invention will now be described with reference to the accompanying drawings, in which—

Figure 1 is a plan of loom according to this invention. Fig. 2 is an end elevation, and Fig. 3 is a front elevation. Figs. 4 and 5 show a shuttle to be used in connection with the loom.

Referring to the drawings, a is one of the shuttle-actuating rods, which is carried in a slipper a', adapted to slide to and fro upon a slide b, fixed upon a bracket on the main frame c of the loom. At the other side of the machine a similar shuttle-actuating rod, slipper, and slide will be provided; but both of these mechanisms are worked by the single actuating mechanism shown and hereinafter described. These shuttle-actuating rods are driven by a cam d, the rod a shown being operated by this cam, through the slide-bar e, carrying the rollers e' (which are acted upon by the cam) and supported in guides $e^{\times}$, rod e^2, a rocking lever and shaft e^3, connecting-rod e^4, and a lever e^5, fulcrumed at its lower end in a ball-socket joint and connected at its upper end to the slipper a' by a link e^6, the connection of e^5 to the slipper being by a universal coupling e^7. These parts constitute the mechanism for actuating the shuttle-operating rod a on one side of the loom. The mechanism for operating the rod at the other side for moving the shuttle in the opposite direction consists of a similar mechanism—namely, a slide-bar f, carrying rollers f' and suitably supported in guides $f^{\times}$, a rod f^2, (shown in dotted lines in Fig. 1,) a motion-reversing lever and shaft f^3, and a connecting-rod f^4, which will actuate a lever exactly similar to e^5, and so, through another similar slipper and slide, the shuttle-rod at that side of the frame.

The shuttle is supported at each side of the loom when it reaches the end of its throw or stroke upon a table or bed g, fixed upon the frames c, and the slay h, which carries the reed and by which the beating up of the weft is effected, extends across the machine and is carried on slippers h^2, which slide to and fro on the inclined slides h^3, motion being given to the slippers h^2 from the shaft h^4, (having one revolution for each picking movement and driven from a suitable part of the machine,) cranks h^5 on shaft h^4, and connecting-rods h^6, connected to the slippers h^2.

The cycle of movements of the picking-motion parts are, first, a forward motion of the rod across the shed and a backward motion of it, this being effected by one complete revolution of the cam d. Then there is a pause of the rods a for about an equal period of time, in which the beating-up motion or action is effected. The third is the outward and return movement of the shuttle-rod at the other side of the loom similar to the former, and following it is another pause equal to the former, during which the beating-up action takes place as before. This completes the cycle of actions as regards the shuttle's performances, both the two actions of the shuttle-picking-motion rods a at both sides of the loom and the pauses being produced or effected by the one cam d and mechanism described, the cam d itself in the cycle performing four complete revolutions. The mechanism by which these effects and actions of the cam d are enabled to be performed is as follows:

The cam d is fixed upon and revolved with and by the shaft i, and the shaft i is rotated

by the bevel-wheels j, (which are driven by the driving-gearing of the loom,) wheel j on shaft l having a spline connection therewith. The shaft i has also longitudinal movement, and this is effected by the cam k, which is fixed on the shaft k' and driven by the driving-gear of the loom. The longitudinal movement is imparted to the shaft i by the cam k through slide-bars k^2, carrying rollers k^3 (operated upon by the cam) and suitably guided at each end, the bars k^2 being connected to shaft i through a collar k^4 thereon, which fits over the neck i' of the shaft i.

The relative rates of revolution of the cams d and k are four to one, and the number of actual movements effected by the cam k is four, while the number of separate parts and functions of the cam k is eight. In the position shown in the drawings the rotation of the cam is inoperative upon its bars k^2 and the shaft i, holding the shaft in this position while the cam d makes one complete revolution. Then the cam k presses the shaft i inward, bringing the cam d to a position intermediate the operative rollers e' and f' of the picking-motion slides e and f, respectively. Then the cam k in the next part of its revolution ceases to act upon the shaft i and retains it in this position while the cam d makes an idle revolution, during which time the beating-up motion is actuated through the cranks h^5 and connecting-rods h^6. After this the cam k imparts to the slide-bars k^2 and shaft i further movement in the same direction and brings it into the space between the rollers f' of the cam-slide bar f, and when in this position it holds the shaft i and cam d while the latter is making another complete revolution, in which revolution it operates the picking motion at the other side of the loom. After this the cam k presses the cam d out of engagement with rollers f' into a position again intermediate e' and f' and holds it in this position while it makes another idle revolution, during which time the beating up of the pick last made is effected, and after this the cam k moves the cam d again into position within the cam-rollers e', so completing the cycle of operations. Thus the cam k gives four positive lateral movements to the shaft i and cam d and also gives four pauses in respect of the longitudinal movements of the cam d. To give these four several pauses, the cam k has, as will be seen in Fig. 2, four parts, the peripheries of which are parts of a circle having at their center the axis of the shaft k'. One of these pause parts is comparatively close to the axis and that exactly opposite it is farthest from the axis, while the other two have a length of radius between these two extremes and equal to one another. For imparting the four lateral movements to the cam d the cam k has four humps or rises, two of which give the lateral movements of d in one direction and the other two the lateral movements in the opposite direction.

As regards the cam d and its action upon the slides e and f, its shape is such that when the rod a has been pushed either out or pulled in and is at the extreme end of its stroke it gives it a pause or rest by not acting upon the cam-slide roller e' or f', and at these periods of the cycle of movements the cam d is moved laterally by cam k out of contact with roller e' or f' into the intermediate position between them and also into the active positions in which it operates them. These pauses at these moments are provided to enable this shifting of the cam d into and out of its active positions to be performed smoothly and without jar. While these changings of positions are taking place—that is, when the cam d is being moved out of gear with the cam-rollers—the cam-slide e or f, as the case may be, is automatically locked, and it is held in this position as long as the cam is not engaged with it, while, on the other hand, when the cam goes into engagement with either of such cam-slides it simultaneously unlocks that slide. These lockings and unlockings are effected by two locking-pins l, each of which is fixed on a plate l', carried by a shank l^2, held or working in a sleeve l^3, the shank l^2 being normally pressed outward toward the cam-slides by a spring (shown in dotted lines) within the sleeve l^3, while, on the other hand, it is pressed in by the boss d' of the cam d when that cam is moved into engagement with one or other of the cam-slides. In action when the boss d' moves away from the plate l' of the locking device the locking-pin l enters a hole in the cam-slide and locks that slide, and, vice versa, when the cam is pressed into engagement with one of the cam-slides its boss d' comes in contact with a locking-pin plate l' and presses its pin l from out of the hole in the slide and so unlocks the slide.

The shuttle illustrated in Figs. 4 and 5 (half only of which is shown in Fig. 4) consists of a frame o, having a spool o' within it containing the weft-wire, which is paid out from the shuttle-spool over rollers o^2. At each end of the shuttle there is a neck o^3, into which the rods a pass when making engagement with the shuttle. Projecting into the interior of each of the necks o^3 there is a catch p, having an inclined end which is normally pressed up into the neck by a spring p', and this catch engages with a notch a^{10} in the rod-nose when it enters the neck o^3. The action is that as the coned nose of rod a enters the neck o^3 the catch p is pressed back by it and when the notch a' comes opposite p it is pressed by the spring p' into the notch and so engages the rod a, and this being effected the shuttle is drawn across through the shed in the return action of the rod a.

The releasing of the rods a from the shuttle is effected by a trigger q and a stationary releasing projection r on the end of the bracket carrying the slide b. The action between these parts is that when the rod a is

approaching the inner end of its stroke, pulling with it the shuttle, the inclined nose of the trigger *q* comes in contact with the inclined face of the projection *r* and presses the trigger away from the rod *a*, drawing with it the catch *p* and taking it out of engagement with the rod-nose. After this the rod *a* continues moving backward until it is clear of the shuttle. When the shuttle has been so released, it rests upon its bed *g* until the picking-rod from the other side engages with and carries it back again through the shed.

The warp-wires *x* are carried upon a suitable warp reel or roller *t* and pass over a roller *t'* at the back of the loom, and the woven fabric is passed over a front roller *u* and wound on a taking-off roller *v* in the usual way.

What is claimed in respect of the herein-described invention is—

1. In a wire-weaving loom, for weaving wire fabric of warp and woof, a rod at either side of the loom, adapted to pass through the shed; a shuttle adapted to be passed through the shed by said rods, alternately; a continuously-revolving cam for operating said two rods; intermediate operating-levers between said cam and the rods; and means for moving said cam into and out of engagement with the two rod-actuating mechanisms alternately, whereby one of said mechanisms is entirely at rest, when the other is in action; substantially as set forth.

2. In a wire-weaving loom for weaving wire fabrics of warp and woof, a rod at either side for moving the shuttle across the shed; a lever for operating each of said shuttle-rods; two sets of reciprocating slides connected with said shuttle-rod levers, by which such levers are operated; and a continuously-revolving cam, means for moving said cam alternately into and out of engagement with said slides, and also out of engagement with either of them, and thereby to perform alternate active and idle revolutions, and so operate the rod, and also provide periods of rest for same; substantially as described.

3. In a wire-weaving loom, for weaving wire fabric of warp and woof, a slay and operating mechanism therefor, a shuttle adapted to be moved across the shed from either side, a rod at either side for moving said shuttle; a cam having a continuous rotative, and intermittent bodily lateral movement; a rod or lever mechanism between the cam and the shuttle-rods connected with each of said rods, and adapted to be operated alternately by said cam; and means for moving said cam bodily into and out of engagement alternately with each of the shuttle-rod-actuating mechanisms, and also out of engagement with both, whereby an idle revolution between each bodily actuation is effected, and pauses of the picking motion effected, while the beating-up motion is actuated; substantially as described.

4. In a wire-weaving loom, for weaving wire fabric of warp and woof, a shuttle, shuttle-rods at either side for operating said shuttle, a cam mechanism for operating said rods, comprising a continuously-rotating cam; two devices on either side of said cam, adapted to be alternately operated by said cam; and a separate cam with operating connections for giving said first-named cam bodily lateral movement, and moving it into and out of engagement with said two devices, alternately; substantially as and for the purposes described.

5. In a wire-weaving loom, the combination of shuttle and shuttle-rods, the cam *d*, cam-slides *e* and *f*, shaft *i* carrying said cam, the cam *k* disposed and revolving in a plane at right angles to the plane of the cam *d*, connections for driving both said cams from a moving part of the loom, and means for connecting the shaft *i* with cam *d* whereby said shaft is reciprocated, said cams having different relative rates of movement; substantially as described.

6. In a wire-weaving loom, the combination of the cam *d;* two sets of cam-actuated devices, operated alternately by said cam, to and fro; and a locking device operating in connection with each of said cam-actuated parts, and adapted to be disengaged from said parts, by the cam, by the lateral movement thereof, alternately, and means for imparting to cam *d* its lateral movement; substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

DANIEL S. BIRRELL.

Witnesses:
SAMUEL TAYLOR,
GEORGE SMITH.