No. 757,121. PATENTED APR. 12, 1904.

F. JOHNSON.

LOOM FOR WEAVING WIRE FABRICS.

APPLICATION FILED JULY 17, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 2.

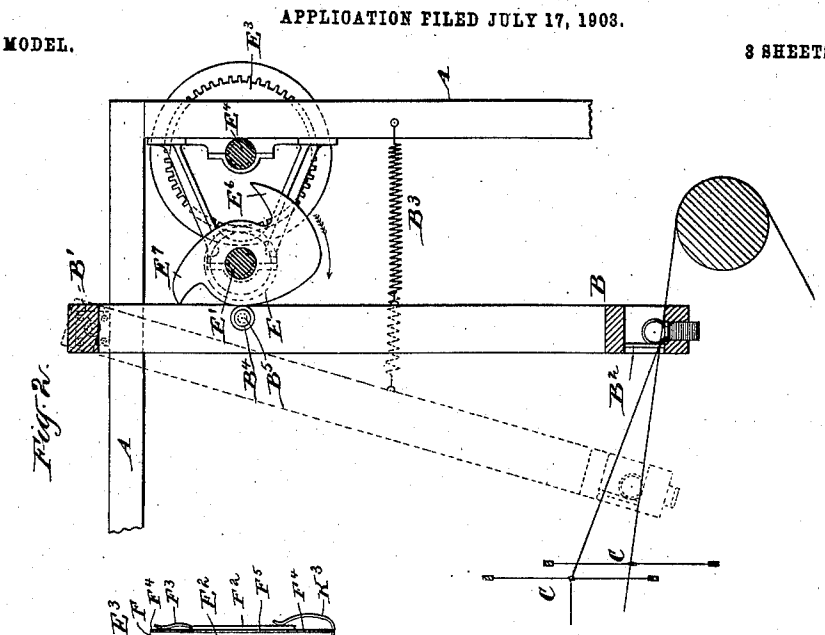
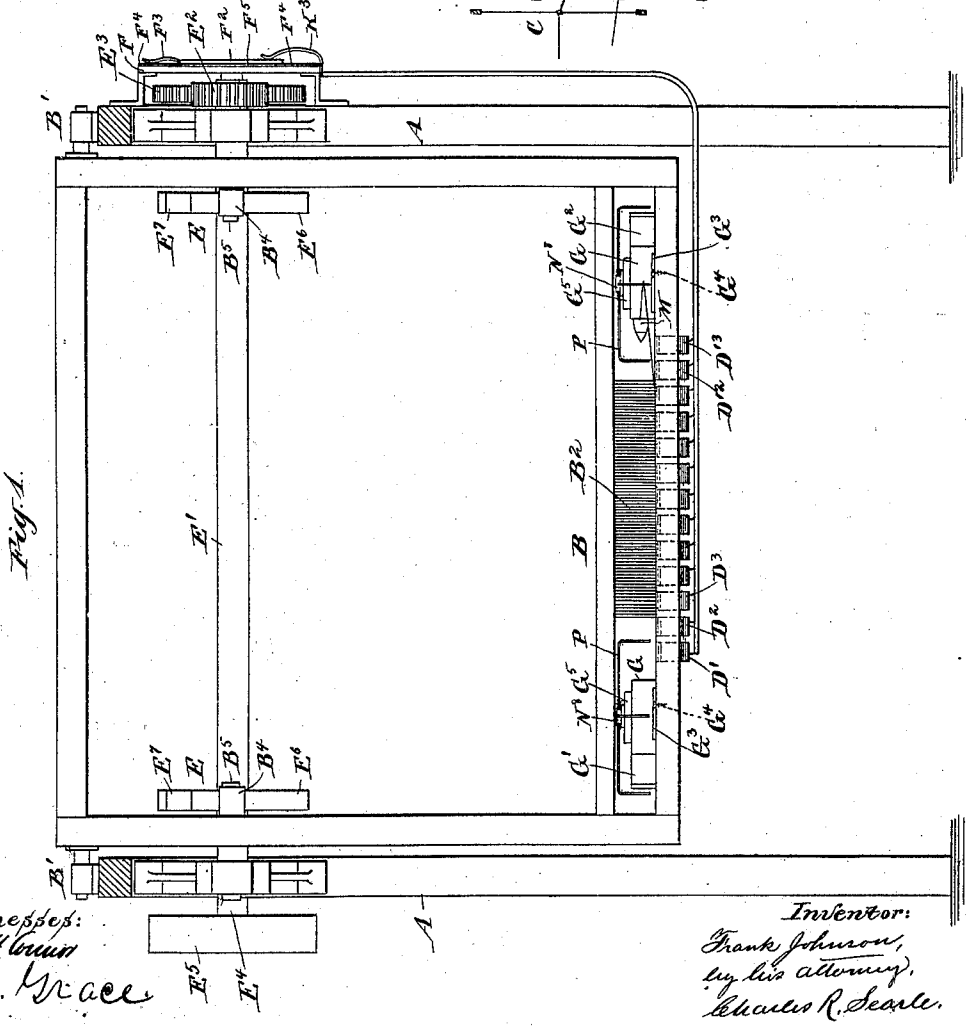


Fig. 1.



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M. E. Grace

Inventor:
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by his attorney,
Charles R. Searle.

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NO MODEL. 3 SHEETS—SHEET 2.

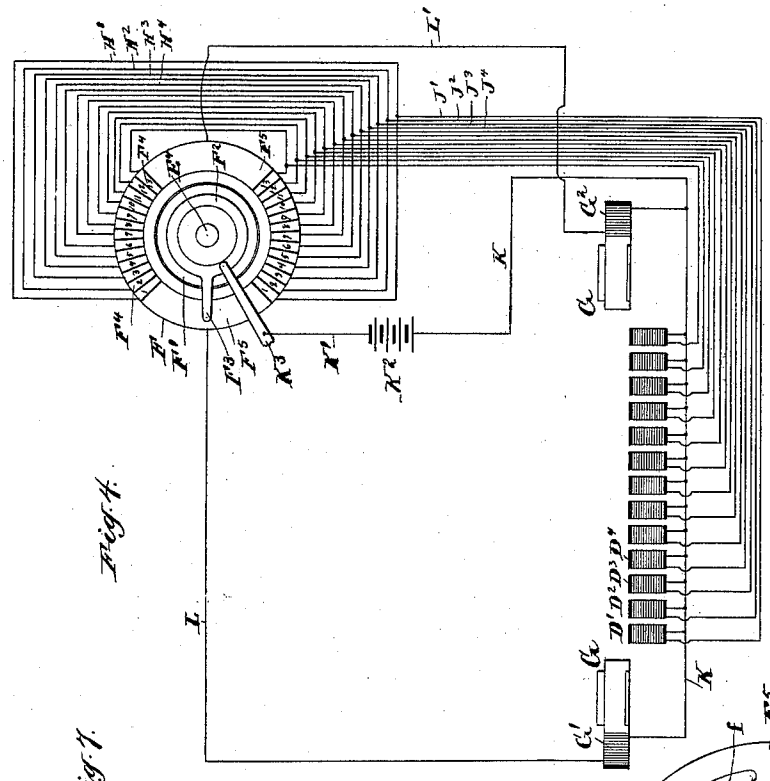

Fig. 4.

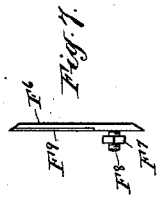

Fig. 7.

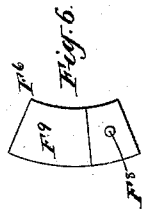

Fig. 6.

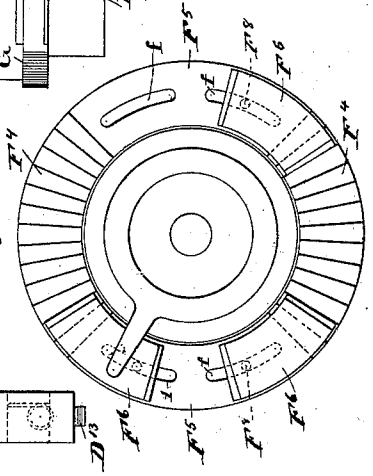

Fig. 5.

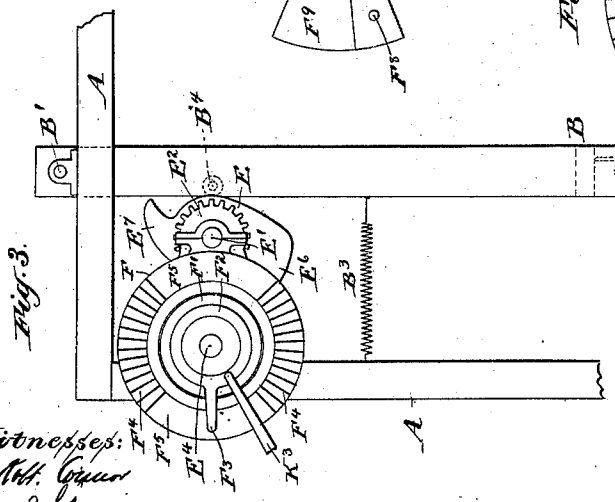

Fig. 3.

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No. 757,121. PATENTED APR. 12, 1904.

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LOOM FOR WEAVING WIRE FABRICS.

APPLICATION FILED JULY 17, 1903.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 8.

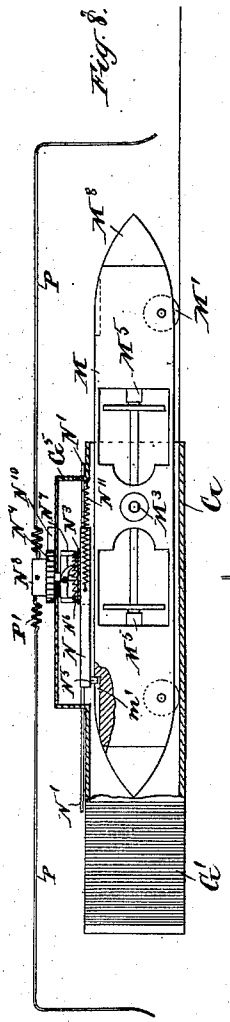


Fig. 9.

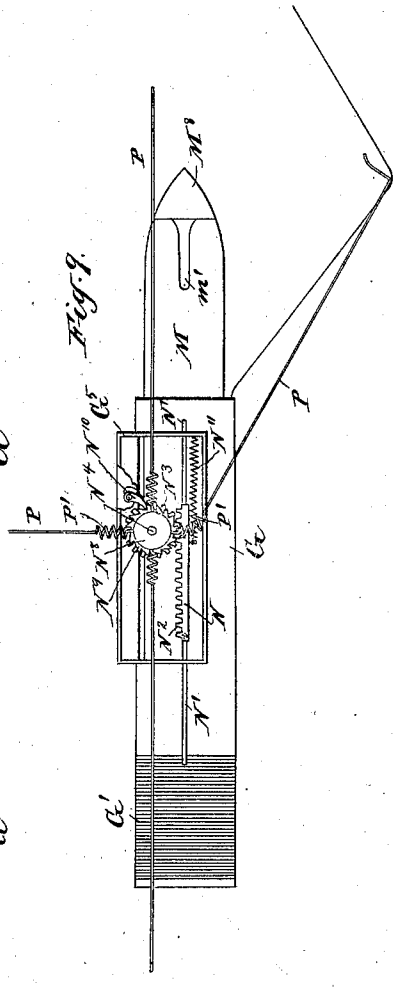


Fig. 10.

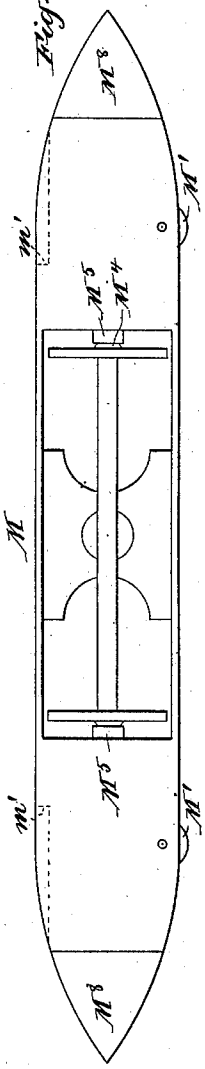
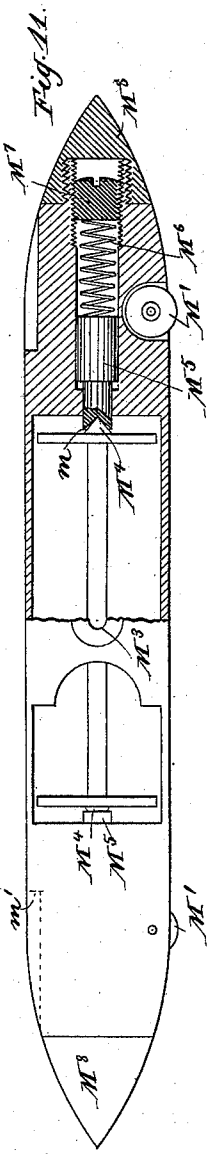


Fig. 11.



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by his attorney,
Charles R. Searle.

No. 757,121. Patented April 12, 1904.

UNITED STATES PATENT OFFICE.

FRANK JOHNSON, OF NEW YORK, N. Y.

LOOM FOR WEAVING WIRE FABRICS.

SPECIFICATION forming part of Letters Patent No. 757,121, dated April 12, 1904.

Application filed July 17, 1903. Serial No. 165,917. (No model.)

To all whom it may concern:

Be it known that I, FRANK JOHNSON, a citizen of the United States, residing in the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Looms for Weaving Wire Fabrics, of which the following is a specification.

The invention relates to looms for weaving wire-cloth, and particularly the production of that kind and quality of fabric known as "Fourdrinier" used in the manufacture of paper.

The principal object of the invention is to provide a power-loom adapted to the production of wire-cloth of the character indicated above, and includes the further object of providing means for conditioning the warp-wires after the introduction of a filling-wire to receive a succeeding filling-wire.

Another object of the invention is to provide a shuttle-throwing means which shall be positive and uniform in its action.

A further object is to provide means for automatically controlling the slack of the filling-wire at the end of each throw of the shuttle.

Another object of the invention is to provide a shuttle which shall deliver the filling-wire freely but under the desired tension.

Still another important object of the invention is to provide means for easily conditioning the shuttle mechanism to changes in the widths of fabric to be woven.

The invention consists in certain novel features, arrangements of parts, and details of construction by which the above objects are attained, to be hereinafter described.

The accompanying drawings form a part of this specification and show an approved form of the invention.

Figure 1 is a transverse section through the loom, taken just in rear of the batten or lay and showing the latter and its connections in elevation. Fig. 2 is a central vertical section, partly in elevation, showing the same parts. Fig. 3 is a side view of a portion of the lay-operating mechanism, showing in face view the commutator employed for controlling the electromagnets which move the shuttle. Fig. 4 is a diagram showing the connections from the commutator and battery to the magnets. Fig. 5 is a face view of the commutator alone, showing the means for varying the throw of the shuttle. Figs. 6 and 7 are respectively face and edge views of the shields or movable segments by which the variation is produced. Fig. 8 is a vertical section showing the tension device for controlling the slack of the filling-wire, and Fig. 9 is a corresponding plan view with certain parts removed to show the mechanism beneath. The remaining figures are on a larger scale and show the construction of the shuttle. Fig. 10 is a rear elevation or side view. Fig. 11 is a partial front view and vertical longitudinal section, and Fig. 12 is a view of the under face of one end of the shuttle.

Similar letters of reference indicate the same parts in all the figures.

A is the fixed frame of the loom, and B is the batten or lay swinging on the centers B′ B′, supported in the upper portion of the frame. The lay is equipped with a reed B^2, through which the warp-wires pass, as usual, and serves its usual function of beating the filling-wires into the fabric by the oscillations of the lay, assisted by one or more springs B^3, stretched between the uprights of the lay and any convenient points on the frame. The spring shown is marked B^3.

The shed is controlled by heddles C, operated by any ordinary or approved means. (Not shown.) The shuttle M is traversed through the shed by a series of electromagnets $D' D^2 D^3$, successively magnetized and demagnetized by means to be described.

The lay is oscillated by the action of two two-armed cams E E, mounted on a shaft E′, extending transversely of the loom and acting on rollers B^4 B^4, mounted on studs B^5 B^5, set on the inner faces of the uprights of the lay.

E^2 is a pinion at one end of the shaft E′, meshing into a spur gear-wheel E^3, carried on the main shaft E^4 of the loom and equipped with a driving-pulley E^5 and with connections (not shown) to the let-off and take-up mechanisms (not represented) and to the harness-

operating means. All these portions and any others not shown may be understood to be of the usual or any desired types.

The pinion and gear-wheel are so proportioned that one revolution of the latter induces four beats of the lay—two for each traverse of the shuttle along the race. The arms of each cam differ in radial length. The long arm E^6 has also an extended curved working face covering an arc of about ninety degrees and serving to swing the lay back to the full opening of the shed and hold it there while the shuttle makes its traverse and then release it to swing to the weaving-line and beat the filling or weft wire into the cloth. The shorter arm E^7 swings the lay through a slightly shorter arc, while the shuttle is at rest at one or the other end of its race and immediately releases the lay to allow it to swing forward a second time and perform the important function of causing the warp-wires disarranged by the first beat to assume favorable positions for the reception of the next succeeding weft-wire as practiced in hand-weaving.

The action of the electromagnets D' D^2 D^3 and their controlling means is best illustrated in the diagram Fig. 4. F is a circular plate of insulating material secured to the frame of the loom and having its center open to receive a circular disk F′, carried by the main shaft E^4. The disk revolves within the annular plate and carries a metal ring F^2 on its face, having an arm F^3 bridging the space between the disk and plate and lying with gentle pressure in electrical contact with one or the other of a series of circularly-arranged sectors F^4 F^5, with which the face of the plate is equipped and serving as a commutator for the series of magnets D' D^2. There are two series of the smaller sectors F^4, each series containing as many sectors as there are magnets, each series filling about one quadrant, the spaces between the ends of the series being filled by two oppositely-located larger sectors F^5, connected electrically to magnets on two receptacles G G, one at each end of the lay, and adapted to receive and hold the shuttle during its periods of rest between picks. The sectors F^4 are marked for convenience "1," "2," "3," &c., and the similarly-numbered pairs are connected by wires H' H^2 H^3, &c. From the latter are wires J' J^2 J^3, connecting to one of the coil-terminals in the magnets D' D^2. The other terminals are connected through a wire K to one pole of a battery K^2. The wire K′ from the opposite pole connects through a spring contact-piece K^3 with the ring F^2. The larger sectors F^5 are connected by the wires L L′ to the terminals of the receptacle-magnets G' G^2, the other terminals being attached to the battery-wire K. Thus arranged, the movement of the arm F^2 from the sector F^5 to the first of the series F^4 releases the shuttle from the receptacle in which it has been resting and draws it to the first magnet of the series. This is in turn demagnetized and the second magnet energized, and so on until the traverse is complete and the shuttle reaches and is held in the opposite receptacle G by the arm reaching the second sector F^5 and energizing its magnet G^2. The shuttle then rests while the two above-described beats of the lay are made and the latter again swung backward to the newly-formed shed, and the arm F^2, acting with the second series F^4, arranged in reverse order as to numbers, causes the return of the shuttle to the first receptacle, where it again rests while the weft is beaten in, and so on indefinitely. As above described the shuttle makes its longest traverse, as in weaving the widest fabric permitted by the loom. In order to allow the weaving of narrower goods without an unnecessary excess of filling-wire to be taken up as slack in the next pick, I mount the receptacles on the lay with provisions for moving them toward the center line of the loom, as indicated by the flanges G^3 and screws G^4. When the receptacles are thus moved, it is necessary to cut out one or more of the sectors at each end of each series F^4 by correspondingly extending the larger sectors F^5. A convenient means for accomplishing this result is shown in Figs. 5, 6, and 7, in which each sector F^5 is provided with a pair of shields F^6 of the same curvature, secured by nuts F^7, applied on the rear face of the plate F to pins F^8, extending through curved slots *f* in the plate and forming, in effect, extensions of the larger sectors circumferentially. The main portion of the back face of each shield is covered with insulation F^9; but the portion adjacent to the pin is left bare to insure electrical contact with the sector F^5, to which it is secured.

By moving the shields circumferentially the insulated ends may be lapped upon one or more of the sectors F^4, completely covering them and correspondingly lengthening the sectors F^5 and inducing proportionately longer periods of rest of the shuttle in the receptacles. The edges of the shields are beveled to permit the arm F^2 to ride easily over them.

The shuttle M is pointed at each end, as usual, to facilitate its passage through the shed and is provided on the under face at each end with a roller M′, of soft iron, serving as armatures for the magnets and lessening the friction. The shuttle is open on the rear face to permit the easy introduction of the full bobbin and the removal of the empty spool and is provided on the other or front face with a bridge having an eye M^3, through which the filling-wire is delivered.

To induce the desired tension on the bobbin, its pointed ends M^4 are received in conical cavities *m* on the inwardly-projecting ends of the oppositely-placed axial slides M^5, each of

which is forced inwardly to grasp the bobbin by a spring M^6, the expansive force being controlled and the tension adjusted by a screw-threaded follower M^7, having a transverse slot to receive a screw-driver or similar instrument. The screw is concealed by the smoothly-finished conical cap M^8, forming the end of the shuttle.

The device for controlling the slack of the filling-wire at the end of each pick and presenting it smoothly without kinks or sharp angles is shown in Figs. 8 and 9. On the upper face of each tubular receptacle G is a casing G^5, containing a longitudinally-extending slide N, guided by the stems N′ at each end or otherwise, and equipped with a rack N^2 on the rear face, engaging a correspondingly-toothed pinion N^3, loosely mounted on a short vertical shaft N^4. On the outward end of the slide on its under face is a pin N^5, adapted to be engaged by a notch or shoulder m' on the shuttle as the latter approaches the end of its throw, and thus cause a longitudinal movement of the slide, which in turn produces a partial rotation of the pinion N^3. The pinion has on its upper face a vertically-arranged ratchet N^6, in which a series of pawls N^7 on a sleeve N^8 engages. The sleeve extends through the casing G^5 and carries a ratchet-wheel N^9, engaged by a pawl N^{10}, mounted on the upper face of the casing. The sleeve also carries four or other number of radially-projecting arms P, bent downwardly at the ends and of sufficient length to clear the receptacle and its magnet in their movement. The arms are of stiff wire and are connected to the sleeve by short coiled portions P′, serving to give the desired flexibility. As the shuttle enters the receptacle G the pin N^5 is struck by the shoulder m' on the shuttle and carries the slide along, causing the sleeve, through the medium of the ratchet N^6 and pawls N^7, to make a quarter-turn, carrying with it the arms P. Each arm in succession acts on a weft-wire. As the weft-wire is drawn taut and held in the slightly-strained position by the shuttle one of the arms P is pressed against it; but, being taut, the arm by reason of its flexibility bends under the strain of the partial revolution and remains in that condition, bearing against the wire as long as the shuttle remains in the receptacle. As soon as the shuttle is released the weft-wire begins to slacken; but the arm P, the strain being relaxed, begins to straighten and continues to do so until the slackening ceases and the movement of the shuttle pulls the wire from the arm, allowing the latter to assume its normal position and leaving the next succeeding arm in position to act upon the next weft-wire presented at that end of the race. The movement of the shuttle allows the slide N to return under the tension of a spring N^{11}, the pinion N^3 and ratchet N^6 turning idly, while the upper ratchet-wheel N^9 and its pawl N^{10} hold the sleeve and its arms P from partaking in the return motion.

Modifications may be made in the forms and proportions of the parts within wide limits without departing from the invention or sacrificing its advantages, and parts of the invention may be used without the whole.

Other forms of commutators differently operated may be employed for controlling the electromagnets, and other means may be employed for lengthening the sectors F^5 in conditioning the loom for the manufacture of narrow goods.

I claim—

1. In a loom for weaving wire fabrics, a lay carrying a series of electromagnets, a battery, a commutator for automatically magnetizing and demagnetizing said magnets successively, an armature-shuttle traversed along said lay by the action of said magnets, and means carried by said commutator for cutting out one or more magnets at each end of said series when required.

2. In a loom for weaving wire fabrics, a lay carrying a series of electromagnets, a battery, a commutator for automatically magnetizing and demagnetizing said magnets successively, an armature-shuttle traversed along said lay by the action of said magnets, the said commutator having portions serving to induce the movements of said shuttle, and portions serving to hold said shuttle at rest at the ends of its travel, and means for conditioning said commutator to cut out one or more magnets at each end of the series and to lengthen the periods of rest.

3. In a loom for weaving wire fabrics, a lay carrying a series of electromagnets, a battery, an armature-shuttle traversed by the action of said magnets, a commutator controlling said magnets and comprising two series of contact-pieces serving to magnetize and demagnetize said magnets successively, and two contact-pieces serving to magnetize and demagnetize two receptacle-magnets adapted when energized to hold said shuttle at the ends of its throw, in combination with said receptacle-magnets, and means for adjusting the latter relatively to the center line of the loom, and shields mounted on said commutator and serving to shorten the travel of said shuttle and lengthen its periods of rest at the ends of its throw.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

FRANK JOHNSON.

Witnesses:
ROBT. CONNOR,
CHARLES R. SEARLE.