

E. GATES.

ELECTRICALLY OPERATED JACQUARD MECHANISM FOR LOOMS.

No. 565,447.

Patented Aug. 11, 1896.

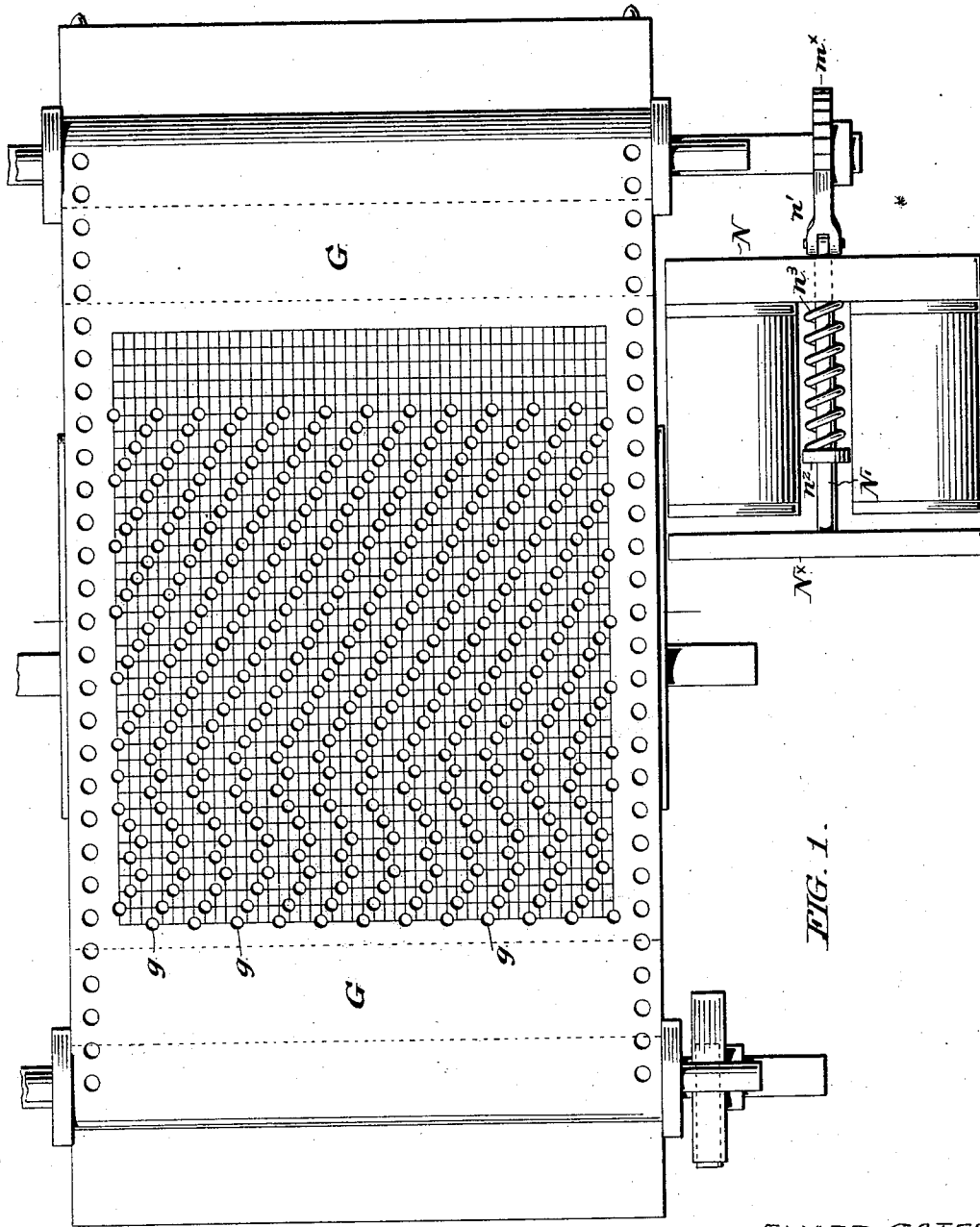


FIG. 1.

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J. Norman Dixon

ELMER GATES
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W. C. Smith
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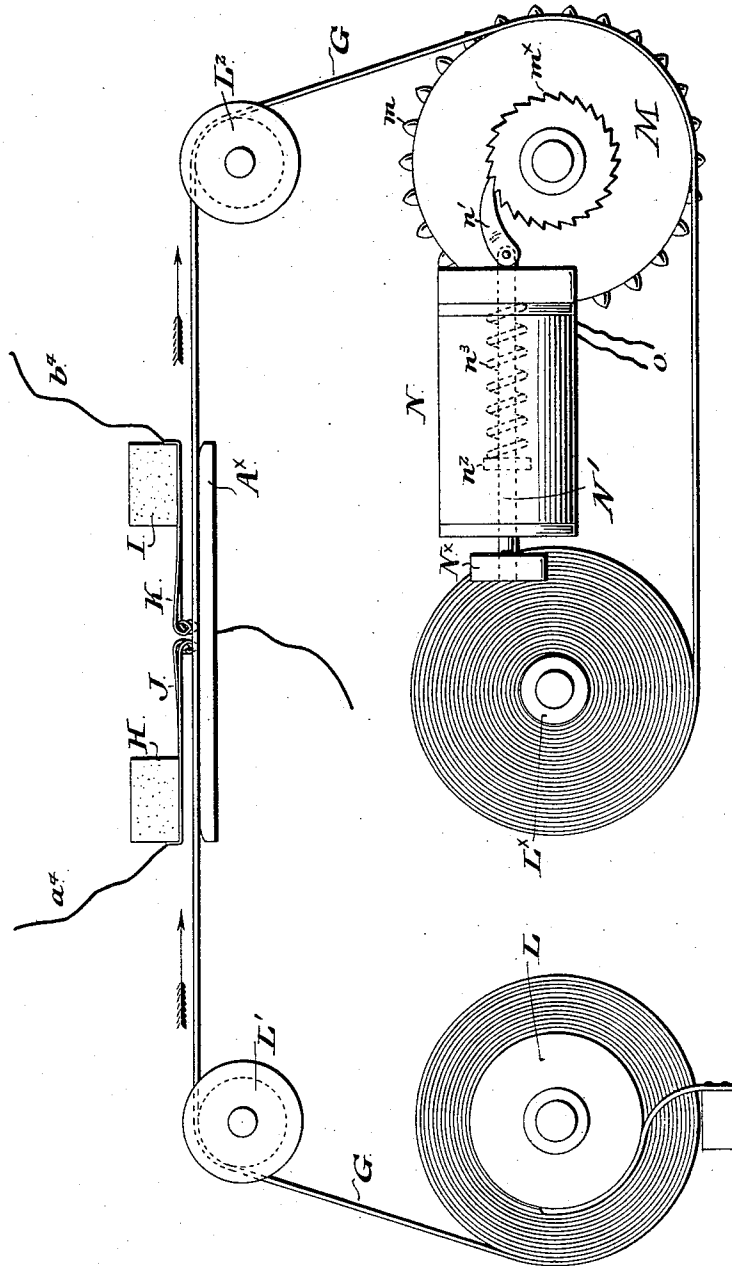
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FIG. 2.



WITNESSES:

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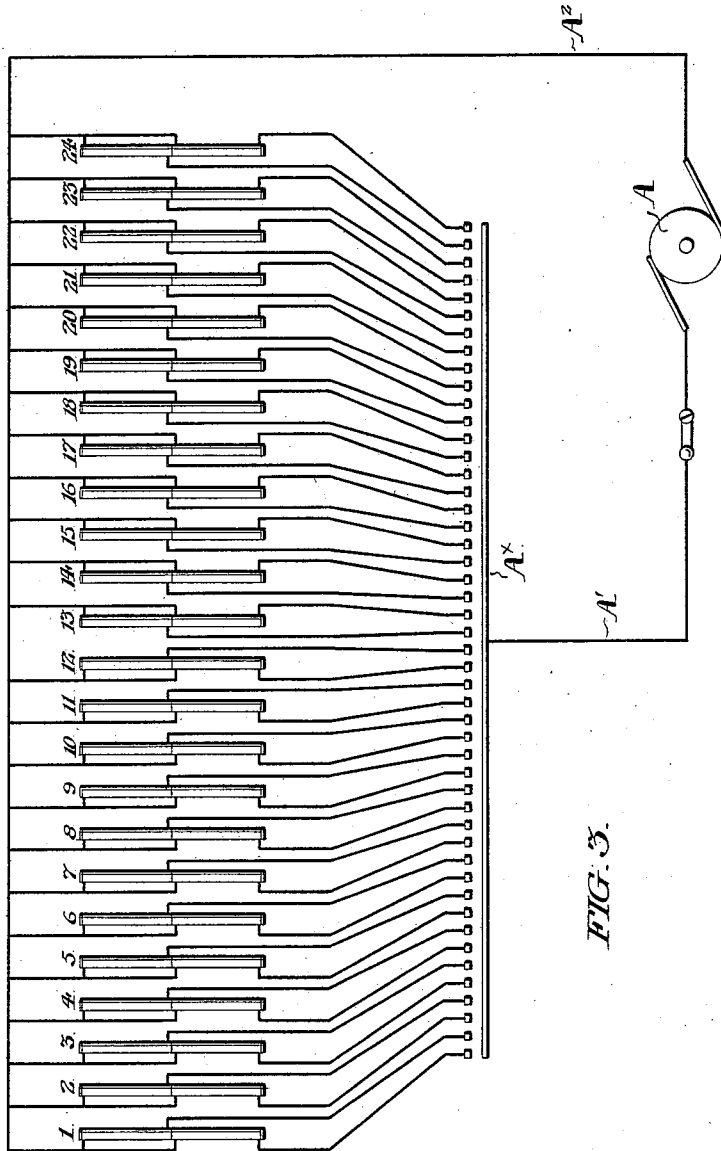


FIG. 3.

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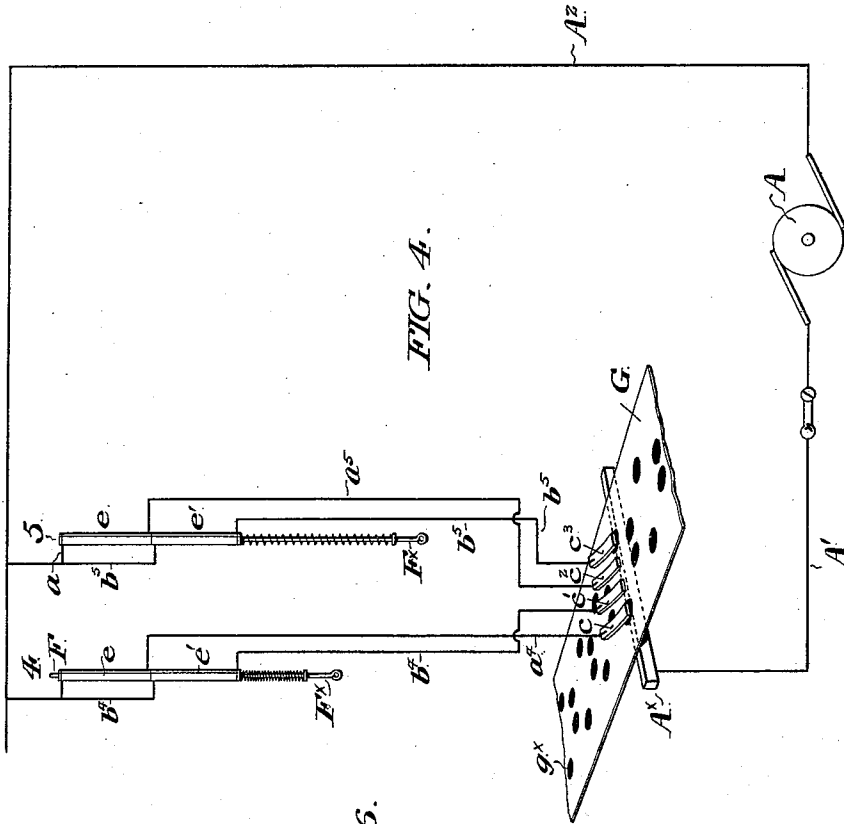


FIG. 4.

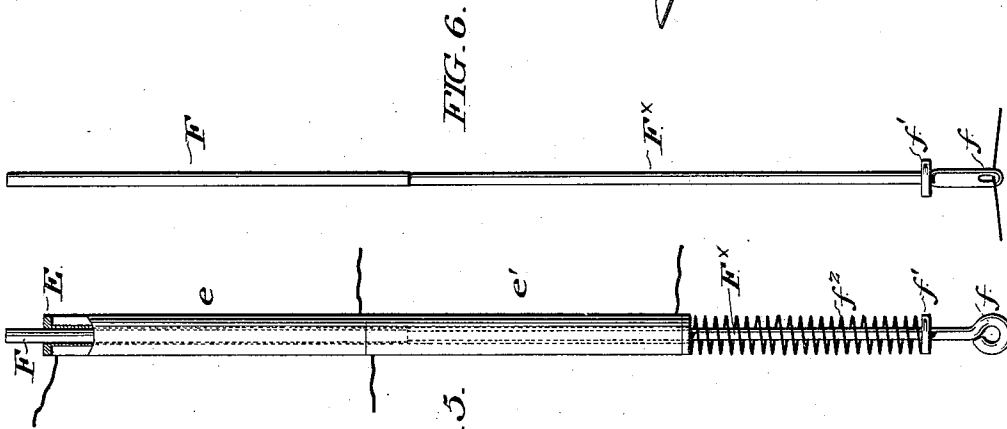


FIG. 6.

FIG. 5.

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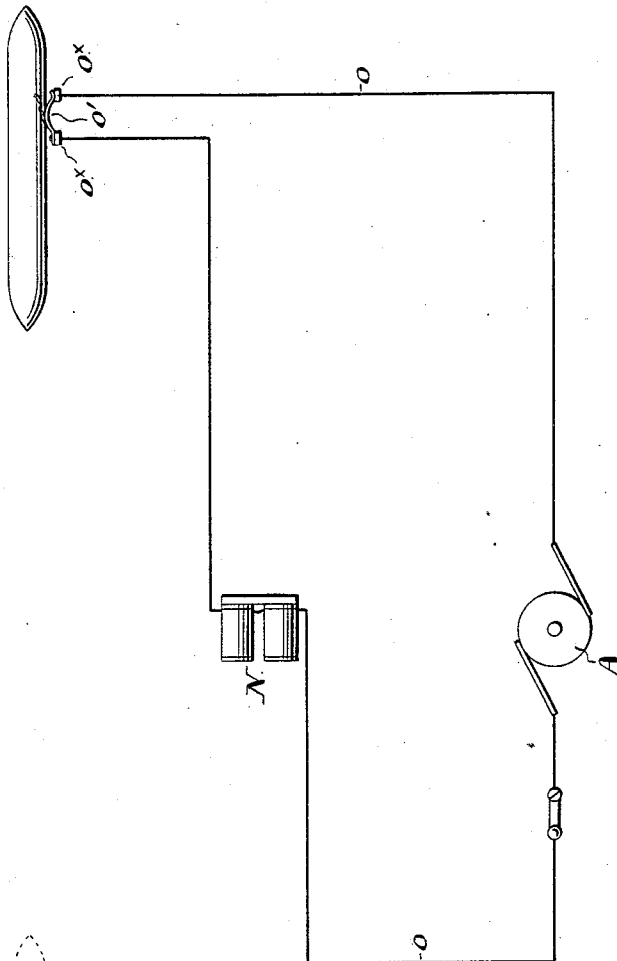


FIG. 7.

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UNITED STATES PATENT OFFICE.

ELMER GATES, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRICALLY-OPERATED JACQUARD MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 565,447, dated August 11, 1896.

Application filed August 5, 1895. Serial No. 558,302. (No model.)

To all whom it may concern:

Be it known, that I, ELMER GATES, a citizen of the United States, residing in the City and County of Philadelphia in the State of Pennsylvania, have invented certain new and useful Improvements in Electrically Operated Jacquard Mechanism for Looms, of which the following is a specification.

Generally stated it is the object of my invention to substitute for the cumbrous, heavy, and expensive, mechanism now employed in the construction and operation of looms electrically actuated appliances for performing the functions of the parts replaced.

In an application for Letters Patent executed and filed contemporaneously with this, being Serial No. 558,301 I have shown, described and claimed electrically actuated mechanism of a character invented by me and designed to replace the heddles and heddle harness ordinarily heretofore employed in looms, the mechanism as described in said application being especially designed to effect the regular ordinary shedding of the warp threads.

My invention aims to provide electrically actuated mechanism by which operative parts of a loom, not always driven in an invariable order or sequence, may be driven or operated in any desired sequence, and aims specifically to provide in connection with electrically actuated warp thread shedding appliances of the generic type referred to in my said application, devices by which the several warp threads are in the shedding operation divided irregularly, that is to say, in groups, the individual threads of which vary in predetermined sequences, so as to produce selected patterns in the fabric manufactured, operating to this end to the same effect as the well-known Jacquard mechanism.

In the accompanying drawings I show, and herein I describe, a good form of a convenient embodiment of my invention, the particular subject-matter claimed as novel being hereinafter definitely specified.

In the drawings,

Figure 1 is a view in top plan of a pattern sheet and its operative mechanism.

Figure 2 is a view in side elevation of the pattern sheet, its winding and unwinding rolls and guide rolls, the mechanism by which its

travel is occasioned, and the terminals of the warp thread manipulating circuits.

Figure 3 is a diagrammatic view of the series of sets of solenoids and the system of wiring employed in connection therewith.

Figure 4 is a view of a portion of a pattern sheet and of two of the sets of solenoids and their actuating circuits.

Figures 5 and 6 are views in detail of cores and their lingo extensions.

Figure 7 is a diagrammatic view of the electro magnet which occasions the travel of the pattern sheet and of the circuit wires employed in connection therewith.

Similar letters of reference indicate corresponding parts.

In carrying my invention into practice in the method which I now deem best adapted for the purpose, I provide a series, designated 1, 2, 3, 4, 5, &c., of sets of coils or solenoids, preferably, corresponding by sets in number with the number of warp threads to be operated upon, and in connection with each set of coils a core adapted to be moved by the magnetic action of said coils, and equip each core with what I term a lingo extension provided with an eye adapted to carry or engage with one of the warp threads, and I further provide automatic means of a novel character for throwing the individual coils of the sets into and out of circuit to effect any desired grouping of the threads in their shedding.

Referring now to Figures 4 and 5, *e, e'*, are a pair of independent coils or solenoids mounted conveniently and preferably upon the respective extremities of a hollow spool, *E*, and independently connected with a source of energy so as to be adapted to be thrown alternately into and out of circuit.

F is a core of suitable magnetizable material mounted free for reciprocation within the bore of the spool, and provided with an extension, which I term the core or lingo extension, *F^x*, of brass, or other suitable non-magnetizable material, extending a convenient distance beyond the extremity of the spool, *E*, and provided with an eye, *f*, adapted to engage with one of the warp threads.

The lower portion of the extension, *F^x*, is provided with a collar, *f'*, or other device adapted to engage one end of a spiral spring, *f²*, surrounding said extension and engaged

as to its other end with the adjacent end of the spool, E, which spring serves to maintain the core normally in a position of balance midway between the respective centers of the two solenoids.

As will be readily understood by those familiar with electric science, when one of the coils or solenoids of a set is thrown into circuit or energized while the other remains out of circuit, the magnetic influence of the first-named coil will act upon the core and occasion its longitudinal movement to a position in which its center coincides with the center of the energized solenoid, while when the coil first named is cut out and the other thrown into circuit the last named coil will act upon the core and occasion its longitudinal movement in the opposite direction to a position in which its center coincides with the center of the second named core.

Referring now to the diagrammatic illustration of a possible system of connection and wiring of the parts embodying my invention contained in said Figure 4, A indicates a dynamo and A' and A² the two divisions of the main conductors leading therefrom.

In said diagrammatic illustration of Figure 4 but two of the sets of coils, arbitrarily assumed to be "4" and "5" of the whole series shown in Figure 3 and employed in a complete loom, are illustrated.

A^x is a terminal, being a straight bar, assumed to be horizontal, in circuit with the main conductor A'. A branch, a⁴, of the main conductor, A², constitutes, or is in circuit with, the coil or solenoid, e, of the set "4" and extends to a point in the vicinity of and just above the terminal, A^x, where it is equipped with a terminal, in the nature of a brush, c, which tends to rest upon said terminal, A^x.

A branch, b⁴, of the main conductor, A², constitutes or is in circuit with the coil or solenoid, e', of the set "4", and extends to a point in the vicinity of and just above the terminal, A^x, where it is equipped with a terminal, in the nature of a brush, c', which tends to rest upon said terminal, A^x.

A branch, a⁵, of the conductor, A², constitutes or is in circuit with the coil or solenoid e of the set "5" and extends to a point in the vicinity of and just above the terminal, A^x, where it is equipped with a terminal in the nature of a brush, c², which tends to rest upon said terminal, A^x.

A branch, b⁵, of the conductor, A², constitutes or is in circuit with the coil or solenoid, e', of the set "5", and extends to a point in the vicinity of and just above the terminal, A^x, where it is equipped with a terminal, c³, in the nature of a brush, which tends to rest upon the terminal, A^x.

The branch conductors, a⁴, b⁴, a⁵, b⁵, are hereinafter referred to as solenoid branch conductors.

As will now be understood from a study of the diagram of Figure 4 in connection with

the description just given, when the brush, c, is in contact with the terminal, A^x, the circuit of the solenoid branch conductor, a⁴, will be closed and the core associated with the set of solenoids "4" will, the brush, c', being assumed out of contact with said terminal, A^x, be drawn to a position in which its center coincides with the center of the solenoid, e, or vice versa, and it will be understood that the carrying of said core to or maintaining it in a given position with respect to its set of solenoids is only a matter of placing one of the solenoid branch conductors, a⁴, b⁴, in, and the other out, of circuit with the terminal, A^x, and, this being true, not only of the sets of solenoids designated "4" and "5" shown in Figure 6, but of all the sets employed in a full-sized loom, if said solenoid branch conductors are placed in and held out of contact with the terminal, A^x, in a predetermined sequence a correspondent shedding of the warp threads will be effected and consequently a correspondent pattern produced in the resultant fabric.

G, Figures 1, 2, and 4, is a sheet or film of any suitable non-conducting material, such as paper, interposed between the terminal, A^x, and the terminals of the solenoid branch conductors, and adapted to normally maintain the terminals of the solenoid branch conductors out of circuit with said terminal, A^x.

This sheet, which I term the pattern sheet, is caused to travel at a predetermined speed past said terminals, and is, to permit of the prearranged contact of the terminals of the solenoid branch conductors with said terminal, A^x, provided with apertures, g, as shown in Figure 1, which apertures, in the travel of the sheet, register with the terminals of the solenoid branch conductors, so that said terminals make contact through said openings with the terminal, A^x.

As an alternative arrangement, the sheet may, in lieu of said apertures, be provided with conducting spaces designated, g^x, in Figure 4, being spaces saturated with a suitable conducting solution, which render them conductive. Hereinafter the term conducting spaces refers both to the apertures, g, and the saturated regions, g^x.

The series of sets of coils or solenoids represented in the diagram of Figure 3 are supposed to represent the complete number requisite in the operation of a working loom, and are to be each provided with a core. Connections between said cores and the warp threads of the loom, are to be provided, of such form and arrangement, as may be dictated by the general arrangement of the mechanism of the loom, and as convenience of manufacture may dictate, and while the arrangement shown in Figures 4 and 5, and hereinbefore explained in detail is one well adapted for the purpose, my invention is not to be considered as restricted to said arrangement.

Thus, for example, instead of pendent brushes, c, c', c², c³, which constitute the ter-

minals of the wires, a^4 , b^4 , a^5 , b^5 , of the sets "4" and "5" of Figure 4, the arrangement shown in Figure 2 may be resorted to, in which a pair of non-conducting supports H I extend in parallelism over and transversely with respect to the direction of travel of the pattern sheet, and a series of spring wires, J, mounted upon the support, H, and a corresponding series, K, mounted upon the support, I, project as to their free extremities to a position midway between the two supports and are given such set as cause them to bear or tread upon the pattern sheet, said wires being, to minimize wear of the sheet, bent to form eyes at their free extremities, and the individual members of the series, K, of which wires are respectively connected one to each of the solenoid branch conductors of the upper solenoids of the sets shown in Figure 3, while the members of the series, J, are respectively connected one to each of the solenoid branch conductors of the lower solenoids of said sets

As a means for occasioning the predetermined travel of the pattern sheet in correspondence with the speed of operation of the loom, I resort to the following devices. The sheet is led from the feed roll, L, Figure 2, over guide rolls L^1 , L^2 , and a drum, M, to the winding roll, L^x .

The drum, M, is provided at its respective extremities with circular series of sprockets, m , which take into corresponding apertures in the respective margins of the pattern sheet, and is also provided at one end with a ratchet wheel, m^x .

N is a horse-shoe magnet mounted in the vicinity of the drum, M, and in circuit through the line wires, o , with the dynamo.

N^x is an armature provided with a pin, N^1 , extending through the transverse frame of the magnet and equipped at its protruding extremity with a pawl, n^1 , which engages with the teeth of the ratchet wheel m^x .

n^2 is a collar mounted upon said pin and n^3 is a spiral push spring surrounding said pin and bearing respectively against said collar and the adjacent framework of the magnet, and tending to carry the armature away from the magnet, being limited however in such movement by the contact of the rear end of the pawl, pivotally mounted upon the pin, N^1 , with the frame of the magnet.

The line wire, o , is intermediate of the magnet and the dynamo, carried to a point in the vicinity of the shuttle race, Figure 7, where it is parted and provided with a pair of terminals, o^x , o^x , upon one of which is mounted a spring tongue, o^1 , adapted, when it rests upon the other terminal, to close the circuit, but which spring tongue is normally open and in position to extend into the path of the shuttle, so that each time the shuttle returns to the side of the loom where said switch is situated the circuit will be momentarily closed.

When the circuit is thus closed, as will be understood, the magnet will be energized and attract the armature, N^x , with the result that the movement of the armature will, through the pin and pawl, be transmitted to the ratchet wheel, m^x , and occasion the movement of the said ratchet wheel one tooth, with the further result that the corresponding rotation of the drum M, will draw the pattern sheet along and carry a new set of conducting spaces into registry with the terminals of the solenoid wires. It will, of course, be understood that any desired form of connection between the cores and the heddle eyes or equivalent devices which engage the warp threads may be resorted to, and said connection may either be direct, as shown in Figure 4, or otherwise.

Having thus described my invention, I claim:—

1. In a loom, in combination, a series of warp thread eyes, a series of electrically actuated devices connected with said eyes, a dynamo or source of electric energy having a main conductor, one division of which is provided with branches in circuit with said electrically-actuated devices, and the other of which is provided with a common terminal, terminals in circuit with said branches adapted to make contact with the common terminal, a sheet of non-conducting material, provided with conducting spaces, interposed between said terminals and the common terminal, and electrically actuated means controlled by a moving part of the loom for occasioning the travel of said sheet,—substantially as set forth.

2. In a loom, in combination, a pattern sheet embodying conducting spaces or openings, a roll in contact with said sheet, electrically actuated mechanism adapted to occasion the rotation of said roll, a conducting wire leading to said mechanism and equipped with a switch adapted to be thrown by a moving part of the loom, substantially as set forth.

3. In a loom, in combination, a sheet adapted to be moved longitudinally, rolls upon which said sheet travels, a drum adapted to positively engage with said sheet, a magnet provided with an armature, mechanism connective of said armature and drum, a dynamo, wires leading from said dynamo to said magnet, a switch mounted on said wire and arranged in the path of so as to be operated by a moving member of the loom,—substantially as set forth.

4. In a loom, in combination, a sheet adapted to be moved longitudinally, rolls upon which said sheet travels, a drum adapted to positively engage said sheet, a magnet provided with an armature, a dynamo, wires leading from said dynamo to said magnet, a switch mounted on said wire and arranged in the path of so as to be operated by a moving member of the loom, a tooth wheel mounted on said drum, a pin connected to said armature, a pawl connected to said pin and engaging

said toothed wheel, and a spring which tends to carry the armature away from the toothed wheel,—substantially as set forth.

5 In a loom, in combination, a sheet adapted to be moved longitudinally, rolls upon which said sheet travels, a drum adapted to positively engage with said sheet, a magnet provided with an armature, mechanism connective of said armature and drum, a dynamo, 10 wires leading from said dynamo to said magnet, a normally open switch mounted on said wire and arranged in the path of so as to be encountered by the shuttle,—substantially as set forth.

15 6. In a loom, in combination, a dynamo, two main conductors leading from said dynamo, a series of sets of solenoids, each set consisting of two, a series of branches leading from one of the main conductors, two of which 20 branches lead to and are so connected with each set of solenoids as to place the individual solenoids of each set in multiple circuit, terminals mounted upon each of said branches, which terminals are located in proximity to and adapted to make contact with 25 the other of the main conductors, a sheet of non-conducting material, provided with conducting spaces, interposed between said terminals and said second branch, cores adapted

to be reciprocated by said solenoids, and heddle eyes connected with said cores,—substantially as set forth. 30

7. In a loom, in combination, a dynamo, two main conductors leading from said dynamo, a series of sets of solenoids, each set consisting of two, a series of branches leading from 35 one of the main conductors, two of which lead to and are so connected with each set of solenoids as to place the individual solenoids of each set in multiple circuit, terminals mounted upon each of said branches, which terminals are located in proximity to and adapted 40 to make contact with the other branch of the main conductor, a sheet of non-conducting material provided with conducting spaces interposed between said terminals and said second branch, cores adapted to be reciprocated by said solenoids, heddle eyes connected with 45 said cores, and electrically actuated mechanism for occasioning the movement of the sheet,—substantially as set forth. 50

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 9th day of July, A. D. 1895.

ELMER GATES.

In the presence of—

F. NORMAN DIXON,
A. E. PAIGE.