(No Model.) 2 Sheets—Sheet 1.

W. WEAVER.

SHUTTLE ACTUATING MECHANISM FOR LOOMS.

No. 541,581. Patented June 25, 1895.

Fig. 1.

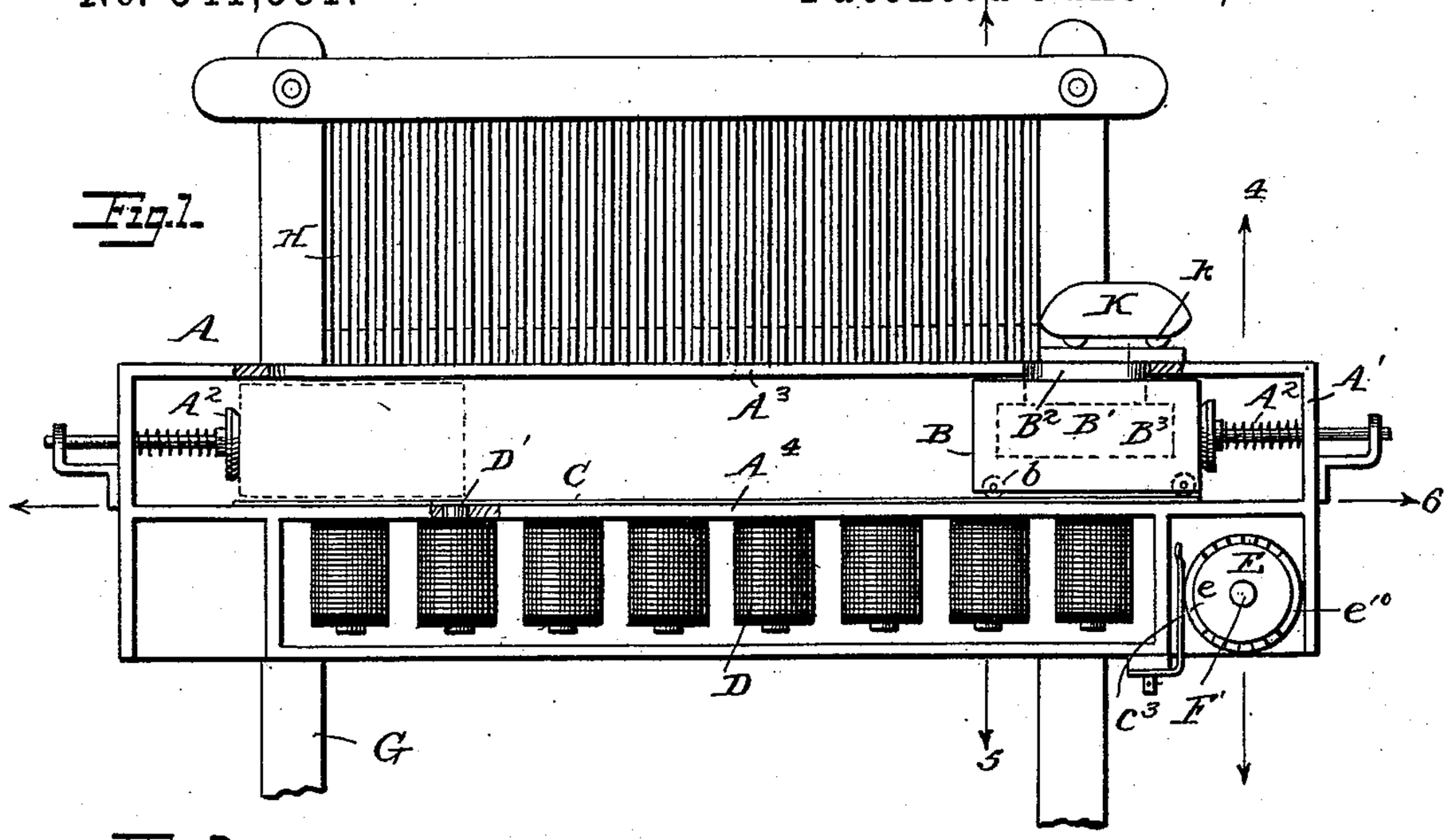


Fig. 2.

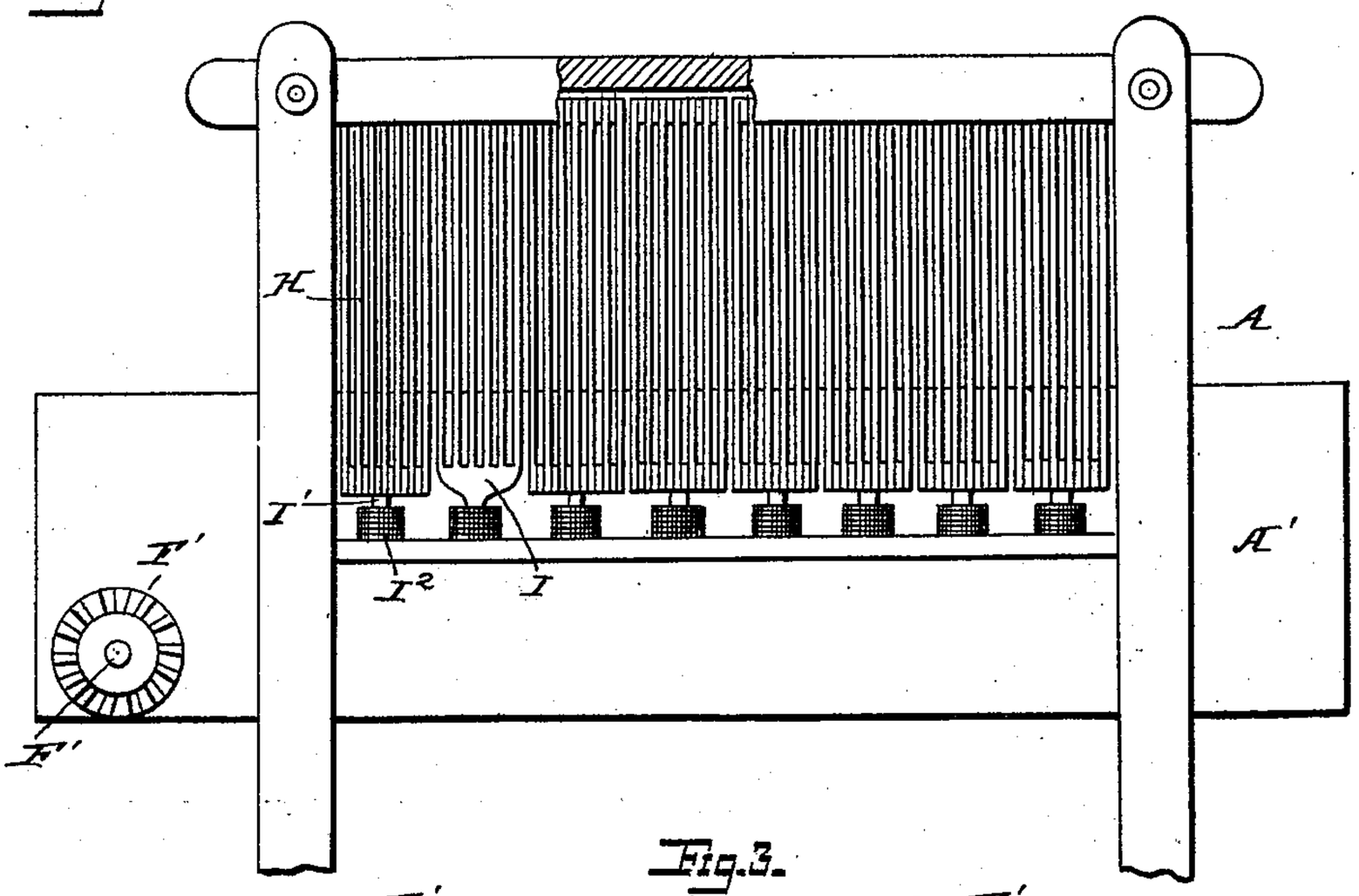
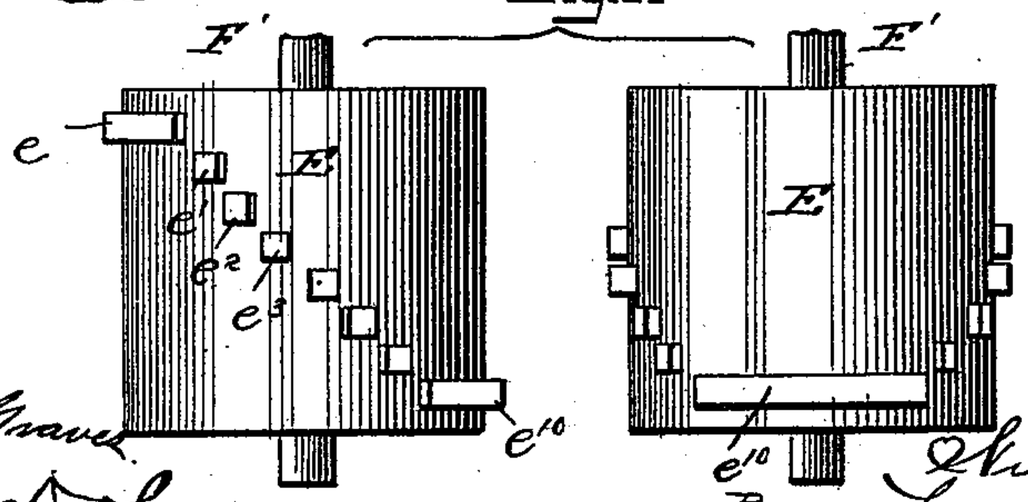


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

W. WEAVER.

SHUTTLE ACTUATING MECHANISM FOR LOOMS.

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Fig. 4.

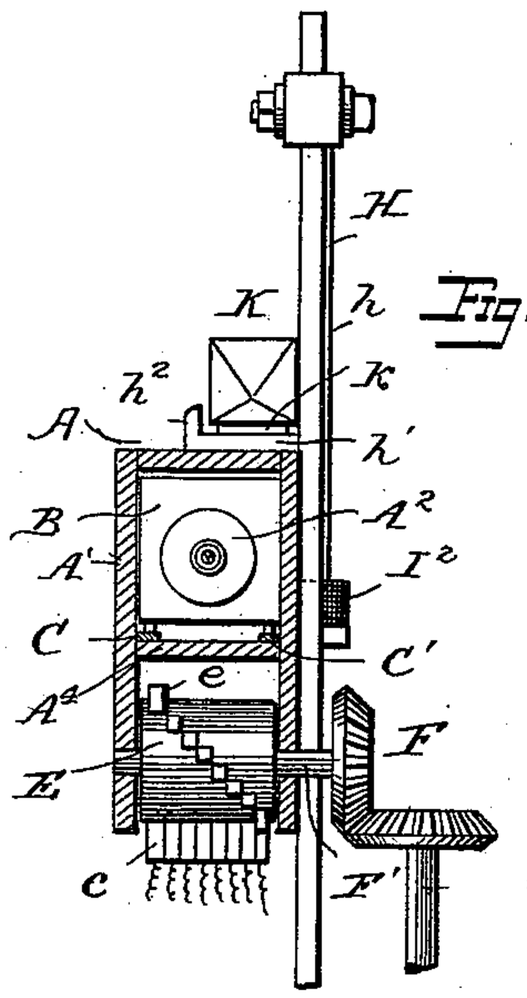


Fig. 8.

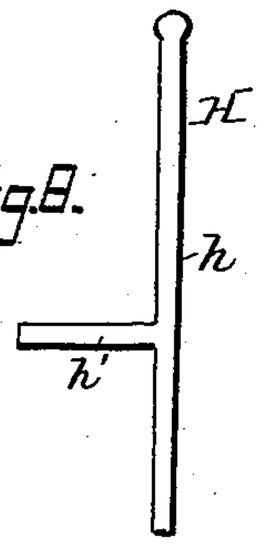


Fig. 5.

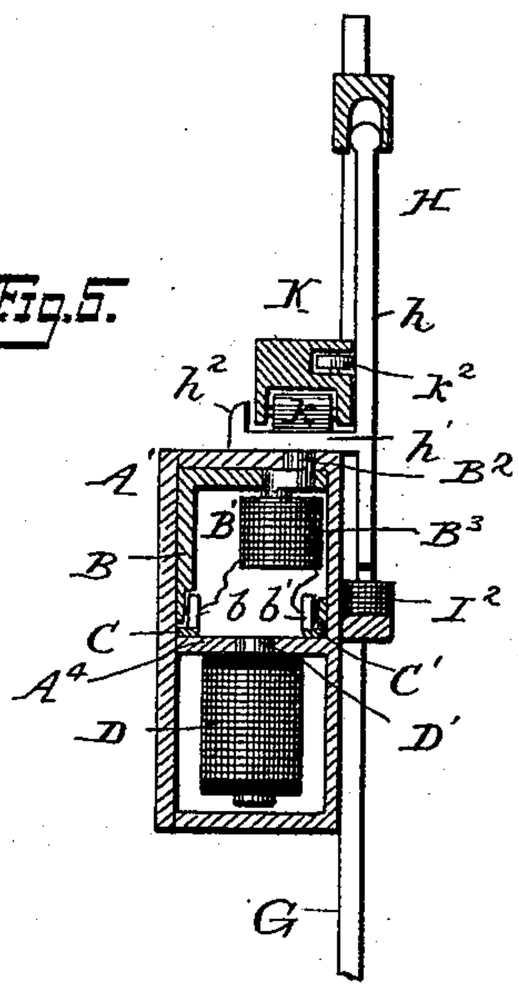


Fig. 6.

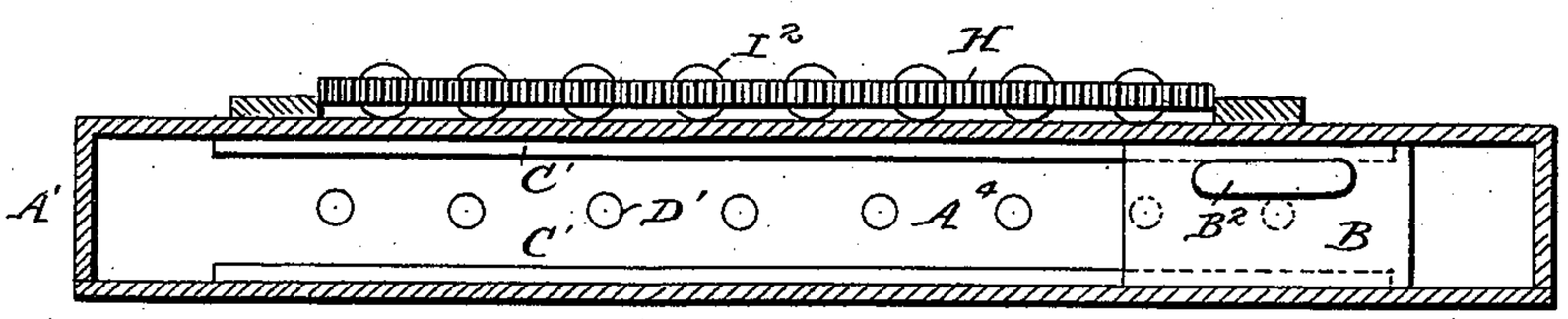
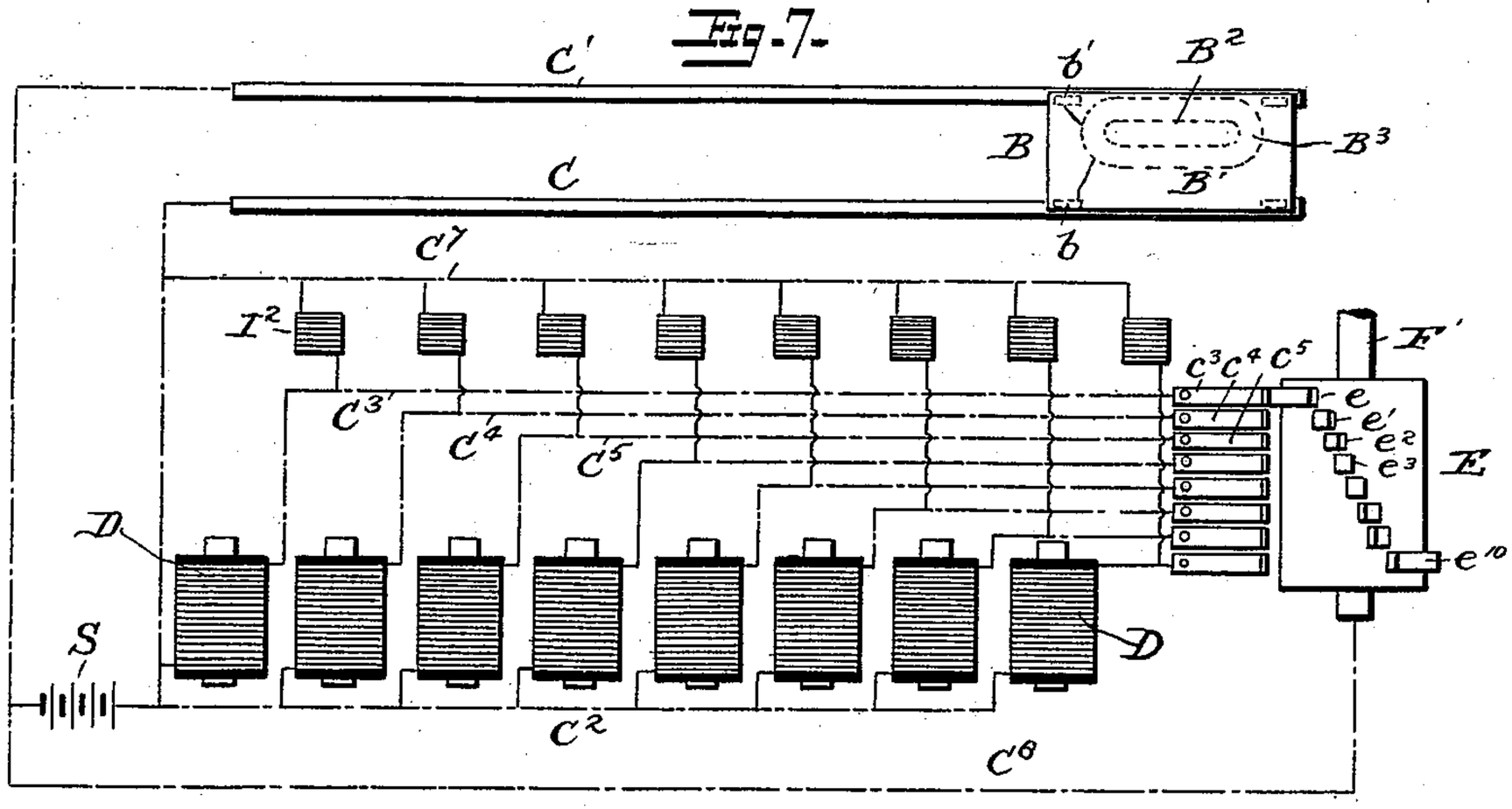


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM WEAVER, OF NORWALK, CONNECTICUT, ASSIGNOR TO THE WEAVER JACQUARD AND ELECTRIC SHUTTLE COMPANY, OF SAME PLACE.

SHUTTLE-ACTUATING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 541,581, dated June 25, 1895.

Application filed May 29, 1894. Serial No. 512,877. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WEAVER, a citizen of the United States, residing at Norwalk, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Shuttle-Actuating Mechanism for Looms, of which the following is a specification.

My invention relates to a shuttle mechanism for looms, and more particularly to a shuttle mechanism in which the shuttle is moved through the influence of electro-magnets to cause it to reciprocate, and consists in the features of construction and arrangement of parts operating in connection with the shuttle, as well as in the features of construction and arrangement of the reeds, which are adapted to co-operate with the shuttle, in substantially the manner and for the purposes more particularly hereinafter pointed out.

Referring to the accompanying drawings, in which I have illustrated one embodiment of my invention, Figure 1 is a front view of so much of a loom as is necessary to illustrate and explain my invention. Fig. 2 is a rear view of the same. Fig. 3 is an enlarged detail view of the circuit-controllers. Fig. 4 is an end view, partly in section, on the line 4 4, Fig. 1. Fig. 5 is a sectional view on the line 5 5, Fig. 1. Fig. 6 is a longitudinal section on the line 6 6, Fig. 1. Fig. 7 is a diagram view showing one arrangement of electrical circuits and connections for carrying out my invention. Fig. 8 is a detail view showing a side elevation of one of the reeds having a lateral extension, but without the projection.

It is not deemed necessary to set forth the usual and common construction of looms, and the means adopted for throwing the shuttle, but it is well understood that in many instances, it is impracticable, to throw the shuttle in the ordinary way, and many devices have been suggested by which the shuttle can be moved between the threads forming the shed, without injury to the threads, or distortion or displacement thereof, and it is one of the main objects of my present invention to move the shuttle through the agency of electro-magnets, so that there need not be any positive or mechanical connection with the shuttle, and so that it may be moved positively and regularly through any required distance and under any desired circumstances, and in order that the shuttle may not come in contact with the threads, my invention further consists in a new reed for guiding and controlling the threads, as well as for operating in connection with the shuttle to accomplish the purposes and objects desired.

While the various features of my invention may be carried out and embodied in various forms and details of construction, without departing from the principle thereof, I will now proceed to describe the specific construction and arrangement illustrated in the accompanying drawings.

The race-way of the loom is represented at A, and in this instance it forms a part of an inclosure or frame A′, in which is mounted what I will term a shuttle-carrier or mover B. The frame or inclosure may be provided with buffers A^2, at each end, which may be of any usual construction, adapted to take up the momentum of the shuttle-carrier or mover, and the buffers may be mounted or supported on the frame of the loom in any desired way.

The shuttle-carrier B, may be made of any suitable material, preferably of insulating material, and is shown in the form of a rectangular block or box, having mounted in its interior an electro-magnet B′, and while the shape and size of this magnet will vary according to circumstances, I preferably make the pole-piece B^2, of an elongated shape, as best seen in Fig. 6, and project it above the carrier through a slot A^3, in the race-way, and the upper surface of the pole-piece is preferably on a level with the top of the race-way. While this magnet may be a permanent magnet, in the present instance I have shown it as an electro-magnet, having a coil B^3, surrounding the core, and connected so as to be energized from the source of electricity S, which may be a battery, mechanical generator, or other source. This shuttle-carrier is arranged to be moved back and forth in the frame in a manner hereinafter pointed out, and I have shown a means whereby the magnet may be continuously energized, regardless of its position in the frame, and for this purpose I have arranged conductors C, C′, on the frame beneath the carrier, which are con-

nected with the source of supply, and I provide contact-pieces b, b', on the carrier, which move in contact with the conductors, and in this instance I have shown these contact-pieces or connectors in the form of rollers which move readily over the conductors C, C', supporting the weight of the carrier, and avoiding friction, and at the same time conducting the electricity to the coil B^3, of the magnet, through the medium of suitable wires between the terminals of the coil and the contact-pieces. From this arrangement it will be seen that no matter what the position of the shuttle-carrier in the race-way, its magnet will be fully energized, and it can be moved back and forth with the least friction.

In order to move the shuttle-carrier, I arrange a series of magnets or solenoids and connect them to a source of electric energy and provide suitable circuit-controllers, whereby they may be energized in proper order to cause the carrier to move under the influence of magnetic attraction, and while various forms and arrangements of magnets can be used, in the present instance I have shown a series of magnets D, supported in the frame A', and having their pole-pieces D', extending through the lower plate or partition A^4 of the frame A', so as to be in as close proximity as practicable with the shuttle-carrier, and these magnets are connected with the source of electricity S, by suitable conductors, as a conductor C^2, having branches leading to one side of each coil of each magnet, while from the opposite side of each coil of each magnet there are conductors C^3, C^4, C^5, &c., each terminating in a contact-piece c^3, c^4, c^5, &c., and these contact-pieces are arranged at one end of the frame and are shown in the form of springs, and the circuits of the various magnets are controlled by a circuit-controller E. This circuit-controller may be of any desired and convenient form and size, according to the requirements of any particular case, and I have shown it in the present instance as consisting of a cylinder of conducting material having mounted on its surface a series of projections e, e', e^2, e^3, &c., they being arranged spirally around the surface, and preferably overlapping each other slightly, and are adapted to be brought in contact with the contact-pieces adjacent thereto, so as to close the circuit through the magnets in proper order and preferably to close the circuit through the next succeeding magnet, before the circuit is broken in the next preceding magnet. This circuit-controller is mounted to be driven by any suitable mechanism, connected with the loom, and I have indicated in the present instance a bevel gear F, on a shaft F', of the circuit-controller, so that the controller may be operated in unison with the other parts of the loom.

The shaft F', of the circuit-controller is connected by a conductor C^6, with one pole of the battery or other source of electricity, and it will be seen that when any one of the projections e, is in contact with the corresponding contact-piece, c^3, for instance, the circuit is closed through one of the magnets D, and when the next succeeding projection comes in contact with its corresponding contact-piece, the circuit is closed through the next succeeding magnet, before it is broken in the preceding magnet, and so on successively.

As it is desirable to allow a certain dwell or time of rest for the shuttle-carrier, after it has completed one of its movements, in order that the lay and other parts of the loom may be operated in the usual manner, I make the contacts e, and e^{10}, which are at the ends of the series of contacts in the form of a segment of a circle, so that they will remain in contact with their respective contact-pieces throughout a greater or less portion of the rotation or movement of the circuit-controller, thereby completing the circuit through the respective magnets included therein, and maintaining them in their energized condition, so that they will operate to hold the shuttle-carrier against displacement or jar in its extreme position.

Of course, it will be understood that the projections on the circuit-controller are arranged on the opposite sides, so that in the present instance the magnets D, will be energized in one series or order, to move the shuttle-carrier in one direction, and in the reverse order or series to move the shuttle-carrier in the opposite direction, allowing a sufficient dwell at the end of each movement.

Arranged adjacent to the race-way or frame are the swords G, which are arranged to support the reeds H, between which the warp threads may pass in the usual way, and in order that the shuttle may not come in contact with the warp threads in its passage through the shed, and in order that the threads may be held in proper relations on the race-way so that they will not be twisted, worn or distorted by the passage of the shuttle, I form the reeds so that they serve not only the usual purpose of separating the warp threads and beating up the weft thread, but also form a support or way on which the shuttle travels out of contact with the threads. Thus, as best seen in Fig. 5, each reed consists of a straight portion h, having a lateral extension h', which is adapted to rest upon the top of the race-way and form a channel between the adjacent reeds for the threads. Sometimes I find it advantageous to form a projection h^2, on the end of the lateral extension h', to operate as a guide for the shuttle, although this is not absolutely necessary, especially when the shuttle is guided and controlled magnetically in the manner hereinafter set forth. These reeds are made in whole or in part of magnetic material, and I provide means whereby they may be separately energized in order that they may aid in guiding, and to a certain extent, in propelling the shuttle, although it is to be understood that when they are not separately energized, they operate to a greater or less extent

in guiding the shuttle through magnetic induction.

In order that the reeds may operate in the manner set forth, I arrange them in gangs or sets, and provide means whereby each gang or set may be separately magnetized, and as indicated in Fig. 2, I connect the ends of a series of reeds together magnetically in any suitable way, as by bending their ends and extending them to form a core, as seen at I, or by connecting them to a piece of magnetic material having a core, as seen at I′, and I surround these cores with coils I^2, and these are arranged to be successively energized in a manner similar to the coils of the magnets D, and preferably in the same order, so that they will co-operate with the magnets D in propelling the shuttle-carrier, and in order to get the best effect, it is preferable to arrange these coils so that they practically intervene between two successive coils of the magnets D, so that any one of the coils will exert its greatest force at a point between the cores of two of the adjacent magnets D, and this will be readily seen by reference to the diagram, Fig. 7. These coils are connected by a conductor C^7, to the source of electric energy, and by branches leading from this conductor to one terminal of each of the coils, and the other terminals of the coils are connected in the present instance to the conductors C^3, C^4, C^5, respectively, so that these latter conductors form a portion of the circuit of the coils of each set of magnets and thereby, but a single circuit-controller is necessary to control both sets or series of magnets.

The shuttle K, may be of any desired shape, according to the bobbin or spool to be carried thereby, and is preferably provided with friction-rollers k, and it is either made of magnetic material, or has embedded in its body a mass of magnetic material, so that it will be attracted by the shuttle-carrier, and when the reeds are energized in the manner just described, by the sets or gangs of reeds, and in order to prevent friction between the side of the shuttle and the reeds, I preferably provide one or more friction rollers k^2, in the side of the shuttle adjacent the reeds.

Understanding, that so far I have described a typical construction and arrangement of parts, in order that the principles of my invention may be understood, I will now set forth its mode of operation, and it will be seen that the shuttle is supported on the lateral extensions of the reeds and moves over their upper faces, the friction rollers aiding in preventing friction, and the extensions preventing the shuttle coming in contact with the threads between the adjacent reeds.

When the lateral extension is provided with an upward extension k^2, this serves to prevent the shuttle being thrown or dislodged from its proper path, but I preferably make use of magnetic induction to hold the shuttle to its path, and while this is aided to a greater or less extent by the induction from the magnet of the shuttle-carrier, by connecting the reeds in gangs and energizing these gangs in advance as the shuttle moves through its path, the shuttle is held against the face of the reeds and prevented from dislodgment, and as before stated, the reeds also aid in propelling it. Thus assuming the shuttle-carrier B, to be in the position indicated in dotted lines, Fig. 1, and the circuit-controller to be operated, it will be seen that the elongated projection e, is in contact with the contact-piece c^3, and the circuit is closed through the first magnet D, and at the same time the circuit is closed through the first magnet I^2, of the first gang of reeds, and as the circuit-controller moves, the contact e', closes the circuit with the contact-piece c^4, energizing the next succeeding magnet D, and at the same time the next succeeding magnet I^2, and this through the magnetic attraction in these magnets, causes the shuttle-carrier to move forward in its way, and it will be understood that its magnet coils B^3, are included in the circuit of the conductors C C′, whatever its position. Thus, as the circuit-controller continues its movement, the respective magnets of the series are energized in succession, and the shuttle-carrier moves forward to the end of the frame, and this through its energized magnet operating upon the shuttle, causes the shuttle to traverse the shed moving over the lateral projections of the reeds, and the magnets I^2, on their respective gangs of reeds tend to hold it in proper position as well as to aid in its progressive movement. When it has reached the extent of its movement in one direction through the elongated contact e^{10}, the shuttle is held in position until the necessary operations are completed and then it is caused to travel back again to its original position, through a reversal of the order of energizing the magnets, and so on continuously.

It will thus be seen that the shuttle is moved positively under the influence of magnetic induction and guided so that it moves accurately and in a proper course, and at the same time it is out of contact with the threads of warp, and can do them no injury, and that there is practically no limit to the length through which the shuttle-carrier and shuttle may be moved at a uniform and positive speed.

It will be understood that the reeds may be used in connection with shuttles moved otherwise than by magnetic induction, and that they will perform their functions to a greater or less extent in this connection, but they are specially adapted to co-operate with a shuttle moved substantially as shown herein, and they enable the device to be used in the manufacture of the most delicate fabrics, regardless of their width.

It is also understood that the shuttle-carrier may be mechanically propelled, instead of electrically, and still many of the advantages of my invention be attained.

What I claim is—

1. The combination with a shuttle-carrier

having an electro-magnet, of electrical connections for energizing the magnet in all positions of the carrier, electro-magnetic devices for moving the shuttle-carrier, and a magnetic shuttle moved by the shuttle-carrier, substantially as described.

2. The combination with a shuttle-carrier having an electro-magnet, of electrical connections for energizing the electro-magnet of the shuttle-carrier in all positions of the carrier, electro-magnetic devices for moving the carrier, and a magnetic shuttle moved by the carrier, substantially as described.

3. The combination with a shuttle-carrier having an electro-magnet, of electric conductors connected with a source of electrical supply and on which the shuttle-carrier moves, and connections between the conductors and the magnet for energizing the same at all positions of its movement, substantially as described.

4. The combination with a race-way having a slot, of a shuttle-carrier having a magnet the pole of which projects into the slot in the race-way, and means for moving the carrier, substantially as described.

5. The combination with a frame or race-way, of a shuttle-carrier having a magnet, a series of electro-magnets arranged along the race-way, electrical connections for the magnets, and a circuit-controller for energizing the magnets in regular order to propel the shuttle-carrier, substantially as described.

6. The combination with the frame or race-way of a loom, of a carrier having a magnet, a series of electro-magnets arranged along the race-way, electrical connections for the magnets, a circuit-controller operating in unison with the moving parts of the loom and constructed and arranged to close the circuits of the various magnets in regular succession to propel the carrier, substantially as described.

7. The combination with the frame or race-way of a loom, of a shuttle-carrier having a magnet, a series of electro-magnets arranged along the race-way and electrical connections therefor, and a circuit-controller provided with contact-pieces for closing the circuits of the respective magnets, the contact-pieces for closing the circuits of some of the magnets being elongated to produce a dwell, substantially as described.

8. A reed for looms having a lateral extension integral therewith adapted to rest upon the top of the race-way and to form a channel between the adjacent reeds for the threads, substantially as described.

9. The combination with a race-way, of a reed having a lateral extension integral therewith extending over the race-way, substantially as described.

10. The combination with the race-way, of a reed having a lateral extension integral therewith extending over the race-way, a shuttle moving over the extension, and means for moving the shuttle, substantially as described.

11. The combination with the race-way, of a series of reeds having lateral projections extending over the race-way, a magnetic shuttle mounted on and moving over the lateral projections, a shuttle-carrier, a magnet mounted on the shuttle-carrier, and means for moving the shuttle-carrier, substantially as described.

12. In a loom, a series of metallic reeds having their ends magnetically connected in gangs and provided with coils, substantially as described.

13. In a loom, a series of reeds having their ends magnetically connected in gangs, coils connected to each gang, electric connections with the coils, and means for controlling the circuits through the coils, substantially as described.

14. The combination with the frame or race-way, of a series of reeds having lateral extensions, means for magnetizing the reeds, a shuttle having magnetic material, and means for moving the shuttle, substantially as described.

15. The combination with the frame, of a series of reeds having lateral extensions, means for magnetizing the reeds, a shuttle having magnetic material moving over the reeds, a shuttle-carrier having a magnet, electro-magnetic devices for moving the shuttle-carrier, and a circuit-controller controlling the circuits of the magnets and of the reeds, substantially as described.

16. The combination with the frame or race-way, of the reeds and means for rendering the reeds magnetic, a magnetic shuttle, a shuttle-carrier having a magnet, and means for moving the shuttle-carrier, substantially as described.

17. The combination with the frame or race-way, of reeds having lateral extensions, magnets connected with the reeds, a magnetic shuttle, a shuttle-carrier having a magnet, electric connections for energizing the magnet in all positions of the carrier, a series of magnets for moving the shuttle-carrier, and a circuit-controller controlling the circuits of the magnets and of the reeds, substantially as described.

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

WM. WEAVER.

Witnesses:
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C. S. DRURY.