

(No Model.)

L. W. LOMBARD.  
LOOM.

No. 510,431.

Patented Dec. 12, 1893.

Fig. 1.

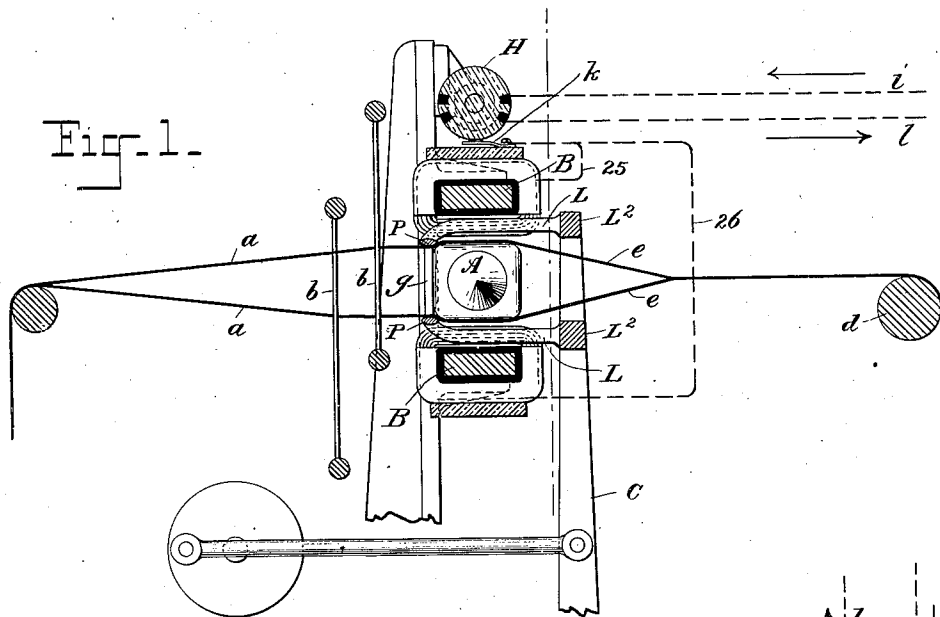


Fig. 2.

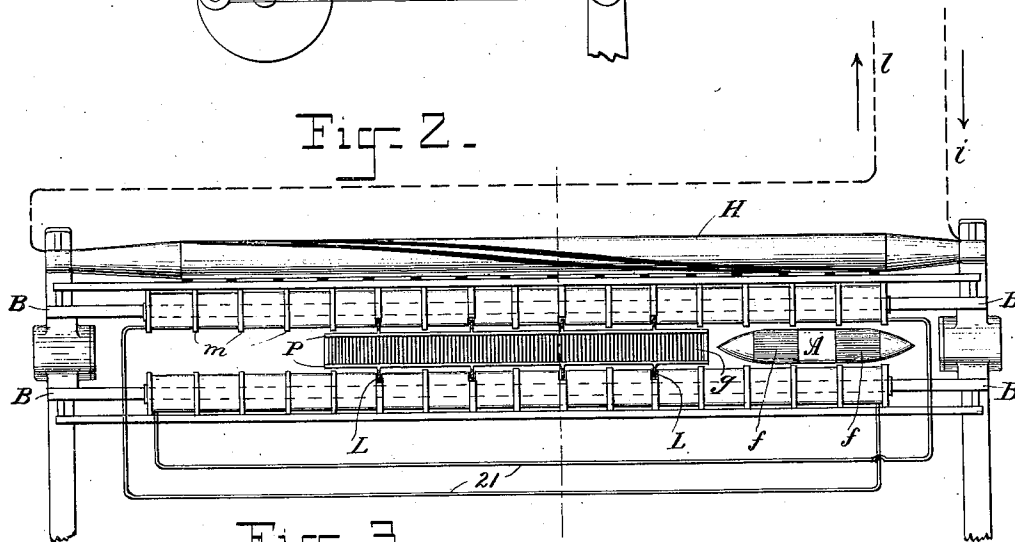
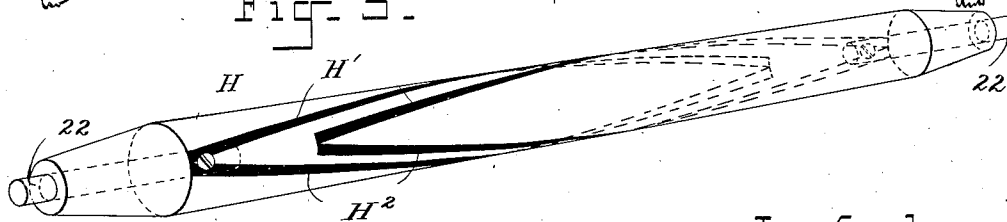


Fig. 3.



Witnesses.

John F. Nelson  
Charles H. Thompson

Inventor.  
Levi W. Lombard

# UNITED STATES PATENT OFFICE.

LEVI W. LOMBARD, OF LYNN, MASSACHUSETTS, ASSIGNOR TO B. F. SPINNEY  
AND J. N. SMITH, OF SAME PLACE.

## LOOM.

SPECIFICATION forming part of Letters Patent No. 510,431, dated December 12, 1893.

Application filed March 21, 1893. Serial No. 467,009. (No model.)

*To all whom it may concern:*

Be it known that I, LEVI W. LOMBARD, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Loom, of which the following is a specification.

My invention relates to looms in which a shuttle is caused to reciprocate in the shed by means of magnetism.

The invention consists in the combination of a shuttle constituting an armature, a reciprocating batten or lay, and a fixed actuating electro-magnet or magnets mounted on a fixed support independently of the batten or lay and combined with means for changing or varying the electrical activity in its coils so as to actuate the shuttle.

My invention consists further in the combination in a loom, of a shuttle constituting an armature, a reciprocating batten or lay, a series of magnet coils mounted on a fixed part of the frame of the machine independently of the batten or lay, and means for causing a progressive shifting of the electrical activity in said coils to cause the traverse of magnetism along the shuttle path.

In carrying out my invention the electro-magnetic coils may be disposed with relation to the shuttle race in any desired manner and the shuttle may be made to constitute an armature by applying to it a piece of soft iron or in any other way constructing it or providing it with suitable material so that it will operate as an armature in an electric or magnetic field. One or more sets of electro-magnets may be employed but I prefer generally to employ two sets of electro-magnets or electro-magnetic coils or sections of coils disposed on opposite sides of the shuttle race or path. The coils may be wound in a plane transverse to the shuttle race or path, or may have their axis transverse to such shuttle race or path.

In the accompanying drawings:—Figure 1, is a vertical cross section through a part of the loom embodying my invention. Fig. 2, is a front elevation showing the relation of the magnets to the shuttle. Fig. 3, is a perspective view of a form of commutator that may be employed for carrying out my invention.

A, is the shuttle; a, the warp threads; e,

the shed; b, the heddles; d, the cloth beam; g, the reed dents mounted upon the swinging batten or lay C, in any proper or desired manner. The electric coils are mounted at opposite sides of the shuttle race upon cross bars B, of iron which are supported at their ends upon a fixed part of the frame of the machine independently of the swinging batten or lay. The bars and coils are placed at a distance sufficiently far apart not to interfere with the movement of the reed dents between them. The reed dents may be supported upon the cross bars P, as shown, which are sustained by projecting arms L, projecting from cross bars L<sup>2</sup>, and extending through spaces in the magnet coils. The cross bars L<sup>2</sup> are carried by the rocker arms of the swinging batten or lay.

The shuttle may be provided with an armature at both ends, as indicated at f. It moves in the race formed between the two sets of coils, as indicated. The guide for the shuttle may be formed by the ribs or plates m which separate the coils of the magnet and project toward the shuttle race. The cross bars supporting the coils are preferably of iron.

The wires leading to a source of electric supply for energizing the coils, are indicated by the letters i, l.

In carrying out my invention, I may employ one or more electro-magnets or sets of electro-magnets of any form fixed with relation to the shuttle and provided with a commutator whereby the shuttle may be actuated backward and forward. I prefer to use a set of coils or magnets extending along the shuttle race and to cause a progressive shifting of the magnetic polarity by a commutator or otherwise for the purpose of actuating the shuttle. I preferably connect the coils of a set in closed or continuous circuit and connection is made with the junction points of the series in succession to cause a shifting of magnetic poles. The junction points may be connected to a series of contact springs or connection may be made with the coil windings themselves. In the present case contact springs K are used for the purpose and are connected with the junctions of the upper set by wires 25, and with the junctions of the lower set by wires 26. The two

sets of coils are connected together by wires 21, 21.

As two armature pieces *ff* are used provision is made for connecting to the set of  
5 contacts *k k*, at two points so as to develop poles at two points opposite the pieces *ff* respectively. *H* is the revolving cylinder of a commutator whereby this connection may be  
10 effected progressively along the series of contacts *k*. The cylinder which is of insulating material and is operated by any suitable mechanism carries two pairs of special con-  
15 tacts *H'*, *H*<sup>2</sup>. One pair is in connection with the metal spindle 22, at one end and the other with the metal spindle 22 at the opposite end  
20 and said spindles are respectively in connection through their bearings with the positive and negative supply wires *i l* respectively. The connection of the spirals and spindles  
25 may be made by screws as indicated. As the two spirals of each pair are reversed the continuous rotation of the cylinder will cause a progressive shifting of the connection to  
30 contacts *k* backward and forward along the series and a consequent shifting of magnetic polarity for operating on a soft iron piece *f*. The two pairs of spirals are removed from  
35 one another along the axes of rotation a distance corresponding to the distance of the contacts *k* with which connection is to be simultaneously made in order that two mag-  
40 netic poles may be produced opposite the two pieces *ff* respectively. The circuit from *i* to *l* is through the spiral of one pair *H'* *H*<sup>2</sup> to a spring *k* and thence through intervening coils to the spring *k*, on which a spiral of the other pair *H'* *H*<sup>2</sup> bears. The spirals should be ar-  
45 ranged not to break connection in passing from one contact *k* to the next. The shuttle may be received at the end of its throw upon a suitable stop or the magnetism of the actuating magnets may be used to hold it. A dwell in the shift or reversal of the travel of magnetism may be made to exist to allow  
time for the operation of the lay. Such dwell is provided in the commutator shown by the prolongation of contact produced where the two pairs of spirals come together at each end.

While I have described one form of com- mutator and one arrangement of coils that 50 may be employed for reciprocating the mag- netic field, I do not wish to be understood as limiting myself thereto, my invention consist- ing rather in the combinations hereinafter expressed than in the particular way of re- 55 ciprocating the magnetic fields of the fixed or stationary magnets or sets of sectional coils. Nor do I wish to be understood as lim- iting myself to any particular arrangement of magnets, since other forms of stationary 60 magnet stationary with relation to the traverse of the shuttle might be used and the shuttle actuated by the changes of magnetic action of such magnet produced by a commutator or otherwise so as not to necessitate a travel 65 or traverse of the magnet itself substantially co-extensive with the travel of the shuttle.

What I claim as my invention is—

1. In a loom, the combination of the actu- ating magnet coils mounted on a fixed sup- 70 port parallel to the shuttle race, a shuttle constituting an armature, and the reeds sup- ported from the swinging lay by arms pass- ing through spaces in the series of magnet coils.

2. The combination in a loom, of a shuttle constituting an armature, a reciprocating bat- 75 ten or lay, and a fixed actuating electro-mag- net or magnets mounted on the frame of the machine independently of the batten or lay. 80

3. The combination in a loom, of a shuttle constituting an armature, a reciprocating bat- 85 ten or lay, a series of magnet coils mount- ed on a fixed part of the frame of the ma- chine independently of the batten or lay, and means for causing a progressive shifting of the electrical activity in said coils to cause the traverse of magnetism along the shuttle path.

Signed at Lynn, in the county of Essex and 90 State of Massachusetts, this 18th day of March, A. D. 1893.

LEVI W. LOMBARD.

Witnesses:

CHARLES H. STEPHENSON,  
JOHN F. NELSON.