

(No Model.)

2 Sheets—Sheet 1.

E. WINCKLER & J. J. HEILMANN.

SHUTTLE OPERATING MECHANISM FOR CIRCULAR LOOMS.

No. 365,216.

Patented June 21, 1887.

Fig. 2.

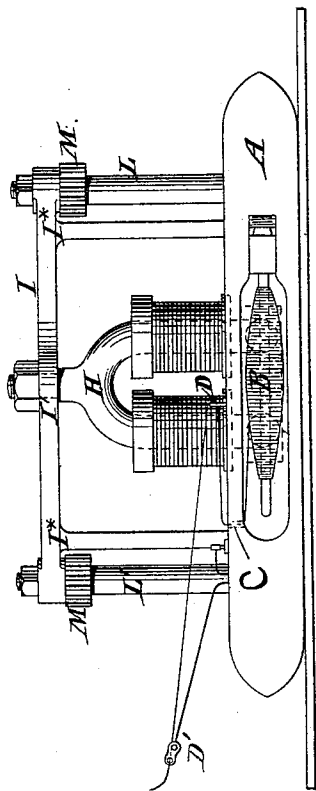


Fig. 1.

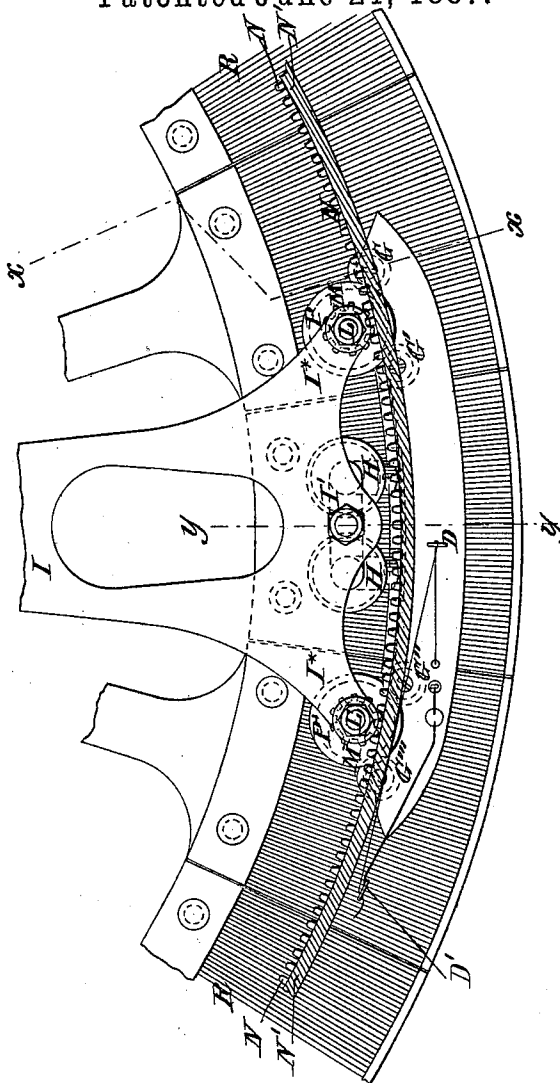
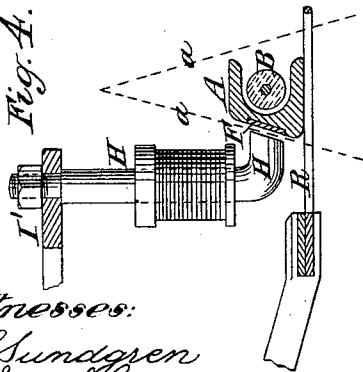
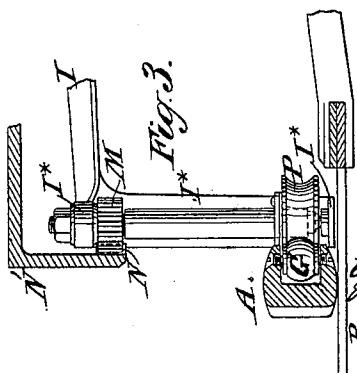


Fig. 4.



Witnesses:
O. Sundgren
Comptroller.

Fig. 3.



Inventors:
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Attorney

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2 Sheets—Sheet 2.

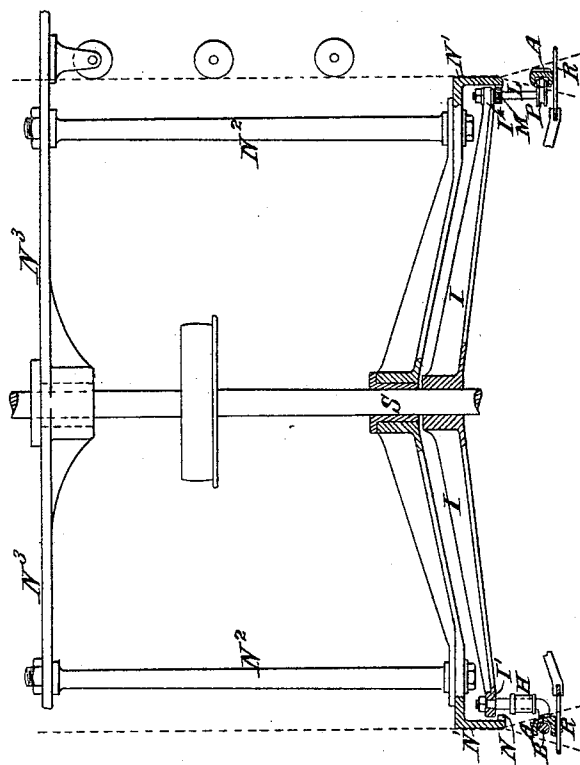
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Fig. 5.



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Ernst Hertel.

Inventor:

Edouard Winckler
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UNITED STATES PATENT OFFICE.

EDOUARD WINCKLER AND JEAN J. HEILMANN, OF MULHOUSE, GERMANY.

SHUTTLE-OPERATING MECHANISM FOR CIRCULAR LOOMS.

SPECIFICATION forming part of Letters Patent No. 365,216, dated June 21, 1887.

Application filed April 28, 1885. Serial No. 163,713. (No model.) Patented in France February 22, 1884, No. 160,493; in Belgium March 24, 1884, No. 64,610; in Italy March 31, 1884, No. 16,640; in Germany April 1, 1884, No. 31,375; in Luxemburg April 1, 1884, No. 376; in Austria-Hungary April 4, 1884, No. 42,321; in England April 8, 1884, No. 6,120, and in Spain August 8, 1884, No. 7,019.

To all whom it may concern:

Be it known that we, EDOUARD WINCKLER and JEAN JACQUES HEILMANN, subjects of the Emperor of Germany, both residing at Mulhouse, in the German Empire, have invented a new and useful Improvement in Shuttle-Operating Mechanisms for Circular Looms, of which the following is a specification.

The driving of the shuttles in circular looms has heretofore presented such great difficulties as to have prevented the practical use of such looms to any very considerable extent.

The object of this invention is to overcome these difficulties and to effect the movement of the shuttles of such looms in a perfectly-regular manner, and that while permitting the shuttles to revolve in both directions, which is a condition very important for good weaving.

Our invention consists in the novel means, hereinafter described and claimed, whereby, while the shuttle is driven in its circular path by the pressure against it in a circular direction of a rotary driving device, it is held by magnetic attraction against the effects of centrifugal force.

In the accompanying drawings, Figure 1 exhibits a plan of the shuttle, the principal parts of its operating mechanism, and part of the reed, and a horizontal section of the breast-beam of a circular loom, illustrating our invention. Fig. 2 exhibits a side elevation of the shuttle and parts of its driving mechanism and an edge view of part of the reed. Fig. 3 is a transverse vertical section in the line *xx* of Fig. 1. Fig. 4 is a transverse vertical section in the line *yy* of Fig. 1. Fig. 5 is a view, partly in vertical section, of the framing of a circular loom, the reed, and the shuttle-operating mechanism.

Similar letters of reference indicate corresponding parts in the several figures.

The shuttle *A* presents in plan a curved form concentric with the circumference of the loom, and has in the middle a cavity for the reception of the filling-bobbin *B*. The thread in unwinding from this bobbin passes through a small hole, *C*, and, passing or not through a tension-regulating device, is directed by means

of metallic guides *D D'*, provided on the exterior of the shuttle, into the upper part of the shed formed by the crossing of the warp-threads *aa*. This shuttle carries on the side corresponding with the interior of the loom a soft-iron plate, *F*, which constitutes an armature, and opposite to which are placed the poles of the electro magnet *H*. It is also furnished on the same side with small rollers *G G' G'' G'''*, arranged in pairs at its two extremities and turning freely on their axes.

The loom to which this system of shuttle-driving mechanism is applied is to be furnished with four shuttles following each other in their movement; but it may be understood that any number of shuttles might be employed.

This shuttle is driven by an arm, *I*, fast on the central main shaft, *S*, of the loom. This arm terminates in three branches, *I' I'' I'''*, of which the central branch, *I'*, has the electro-magnet *H* firmly secured to it, and the two outer branches are each made to contain the upper and lower bearings of two upright shafts, *L L'*. Each of these shafts is furnished at its upper end with a pinion, *M*, which gears with a stationary circular rack, *N*, provided on the interior of the fixed breast-beam *N'* of the loom, which is rigidly attached by hangers or inverted posts *N''* to the upper part, *N'''*, of the circular framing of the loom. On the lower part of these shafts are rollers *P P'*, one on each. The shafts *L L'* are at such distance apart that while the roller *P* of one shaft enters some distance between the two rollers *G G'* at one end of the shuttle, the roller *P'* of the other shaft may enter correspondingly between the two rollers *G'' G'''* at the other end of the shuttle, as shown in Fig. 1.

The electro-magnet *H* serves to draw the shuttle toward the center of the loom, and to hold its rollers *G G' G'' G'''* in such engagement with the rollers *P P'* that the latter will drive the shuttle in either direction. In this driving operation the magnet has nothing to do but to hold the shuttle to the driving-rollers *P P'*, and to overcome the effect of centrifugal force, the driving being effected by the pressure of the rollers in the circular direction

of their movement around the axis of the loom. The magnet is so arranged, as shown in Fig. 4, that it is never in contact with the plate F of the shuttle, but that room is left between its poles and the shuttle for the free admission between them of the warp *a a*.

The rack N and pinions M are for the purpose of imparting to the rollers P P' a rotary motion on their axis for the purpose of facilitating the passing of the warp between and by the shuttle and the driver without rubbing friction. The rotary motion of the rollers produced by the running of the pinions around the rack is communicated by friction to the rollers in the shuttle, so that all the rollers roll across the threads of the warp. The pitch-lines of the rack and pinions and the circumference of the rollers P P' are preferably so proportioned that the velocity of the rotation of the surfaces of the said rollers about their axes is somewhat greater than the velocity at which the parts of the said rollers in contact with the shuttle-rollers revolve with the arm I, and in this way the movement of the rollers on their own axis will assist them to pass by the warp threads, which will thus be prevented from impeding the movement of the shuttle.

We prefer to make the driving-rollers P P', as shown in Fig. 3, with axial profiles of concave form, except small portions at top and bottom, which are cylindrical, and to make the axial profiles of the shuttle-rollers G G' G'' G''' of corresponding form—that is to say, the counterparts of the profiles of P P'—their upper and lower parts being cylindrical and the intervening part convex. By these forms the rollers are made to insure the retention of the shuttle in a horizontal plane, and they may be made to hold it clear of the reed R, and so reduce its friction.

It is by the position of the driving-rollers P P' relatively to each other and to their respective shuttle-rollers G G' and G'' G''' in the direction of the arcs of their movements that the armature F is kept in proper relation with the magnet in that direction, and it is by the form of the axial profiles of the several rollers that the said armature is kept at proper

height relative to the magnet in case the shuttle does not run on the reed. In case the shuttle should run on the reed, the latter would support the shuttle at the proper height. In either case it is the relative distances of the driving-rollers and of the poles of the magnet from the center of the loom that control the proximity of the armature and shuttle to and their distance from the poles of the magnet.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination of a rotary driver for pushing the shuttle in a circular path and an electro-magnet for holding the shuttle against the said driver and counteracting centrifugal force developed in the movement of the shuttle, substantially as herein described.

2. The combination, with the rotary shuttle-driving arm and the shuttle, of driving-rollers on the said arm, rollers on the shuttle constituting bearings for said driving-rollers, a magnet attached to said arm, and an armature in the shuttle, said driving-rollers and the poles of the magnet being at such relative distances from the axis of the loom that the said driving-rollers hold the shuttle and its armature at a short distance out of contact with the poles of the magnet, substantially as and for the purpose herein described.

3. The combination of the rotary shuttle-driver, provided with driving-rollers P P', and means, substantially as herein described, of giving rotary motion to said driving-rollers in said shuttle-driver, and a shuttle provided with bearing-rollers G G' G'' G''', the said driving-rollers and bearing-rollers having corresponding portions which are cylindrical, and corresponding portions of the axial profiles of which are respectively concave and convex, substantially as and for the purpose herein set forth.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

EDOUARD WINCKLER.
J. J. HEILMANN.

Witnesses:

DIEMER HEILMANN,
RUBEN HEILMANN.