(No Model.) 4 Sheets—Sheet 1.

# D. DRAWBAUGH.

## BRAIDING MACHINE.

No. 412,369. Patented Oct. 8, 1889.

Fig. 1

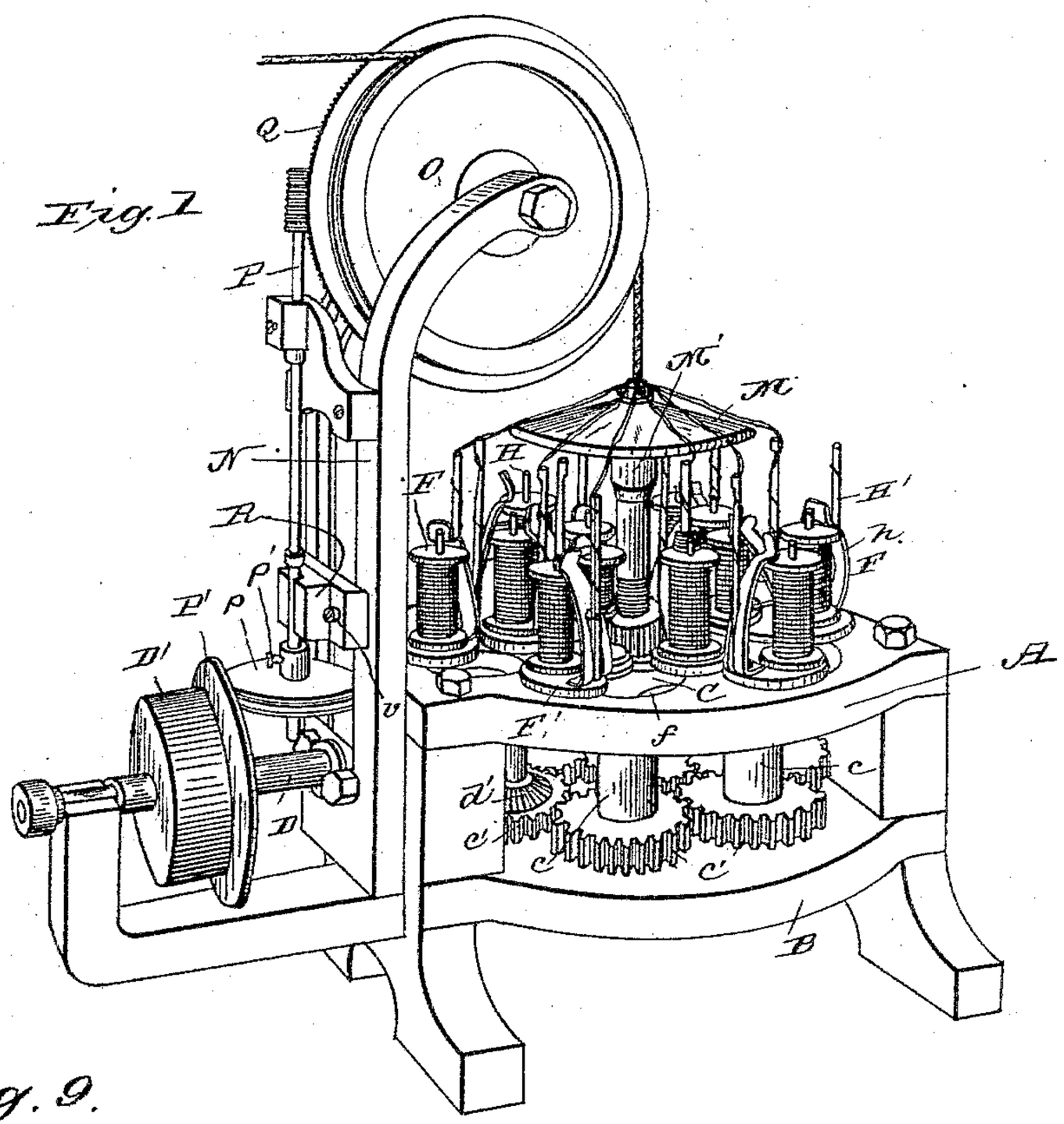



Fig. 9.

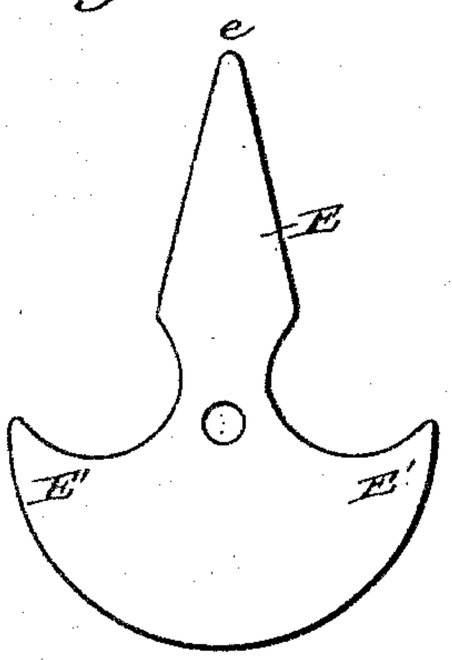
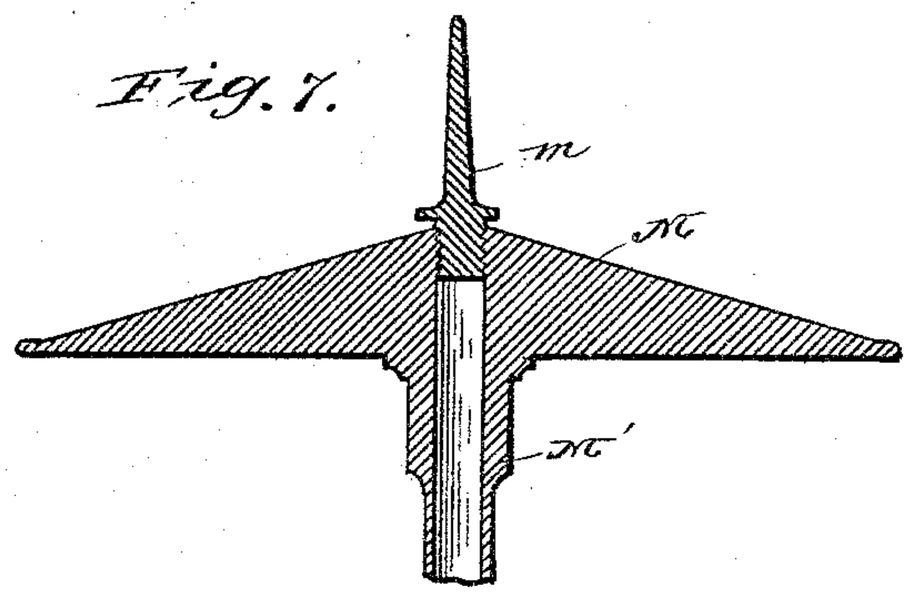



Fig. 7.

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## BRAIDING MACHINE.

No. 412,369. Patented Oct. 8, 1889.

Fig. 2

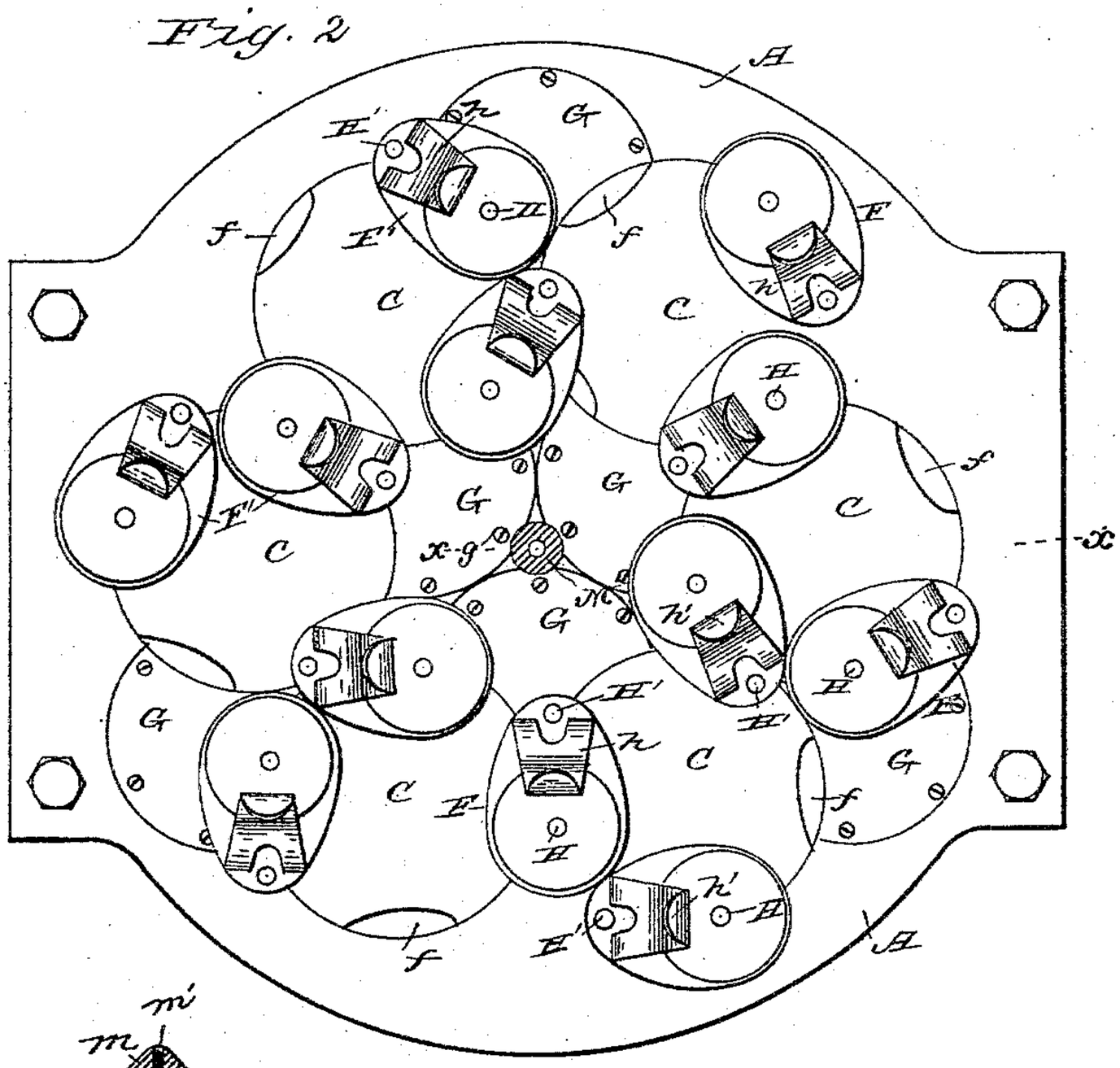
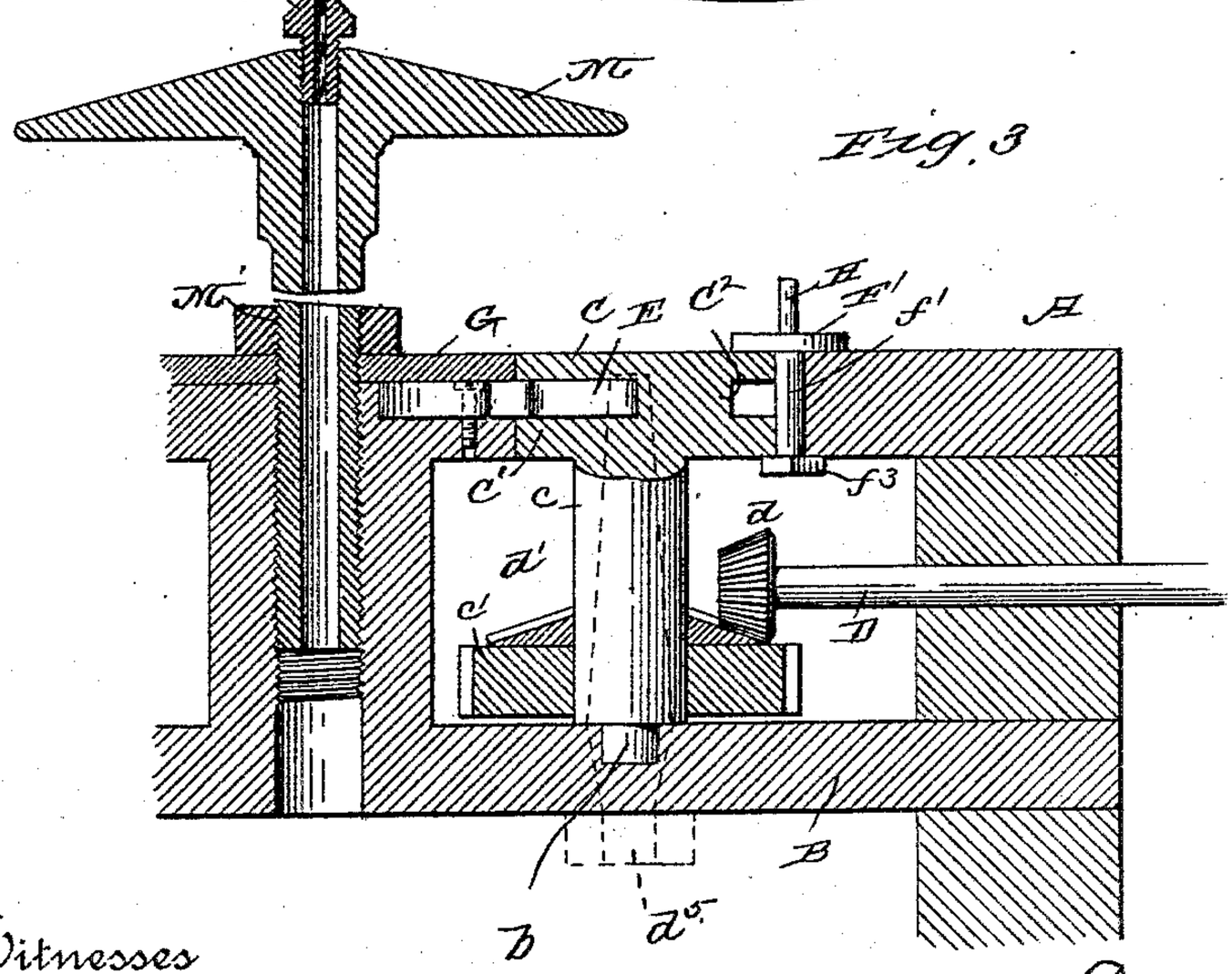



Fig. 3

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## BRAIDING MACHINE.

No. 412,369. Patented Oct. 8, 1889.

Fig. 4.

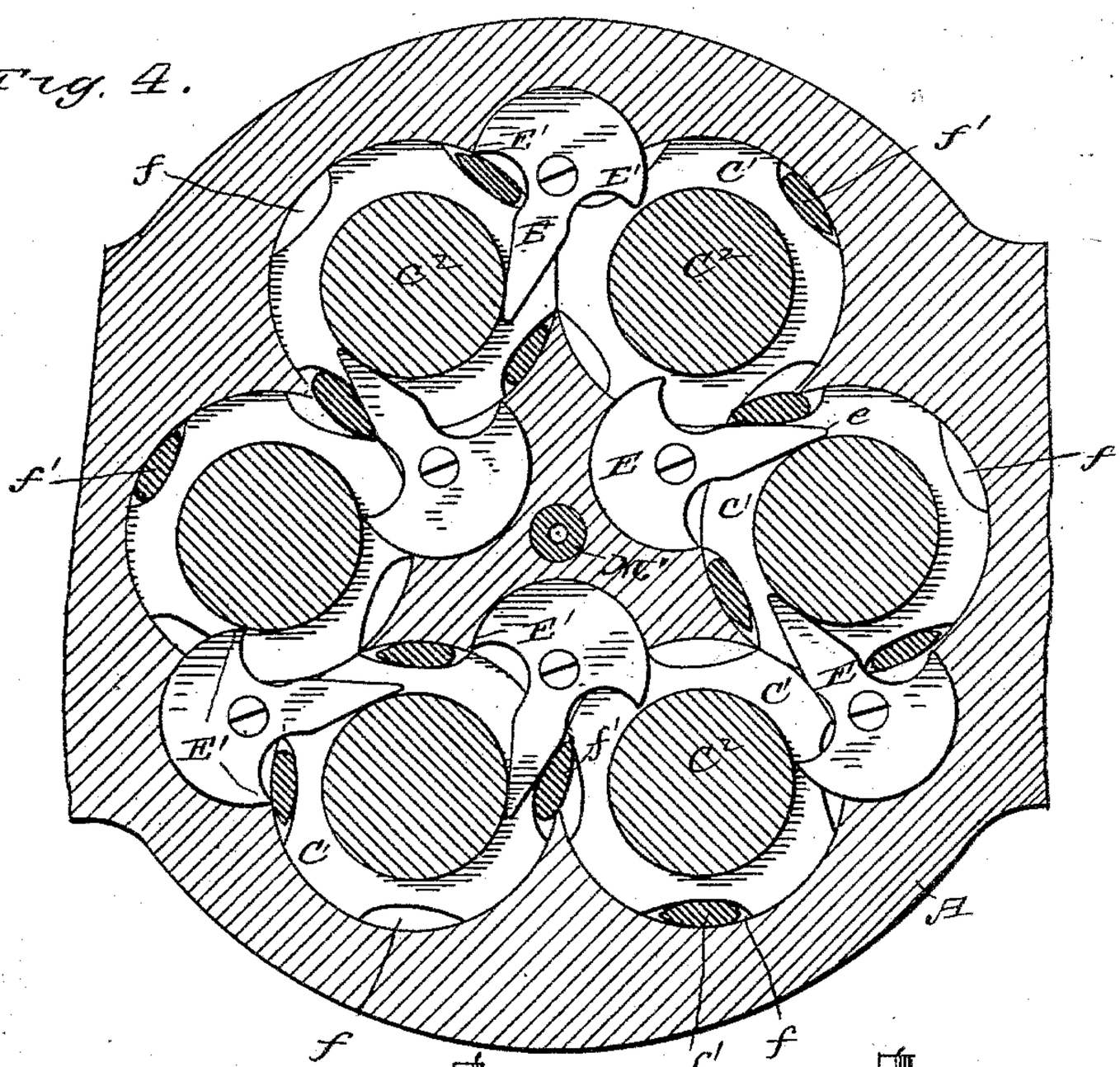



Fig. 5

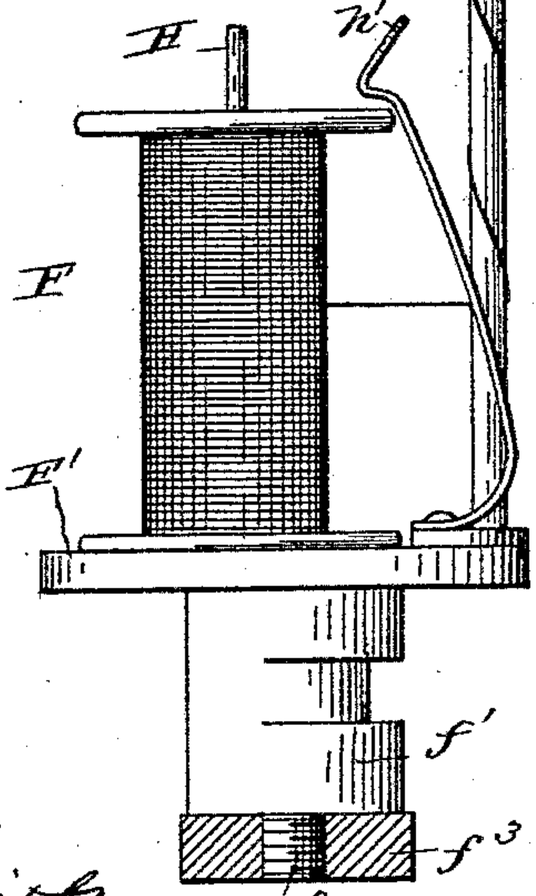
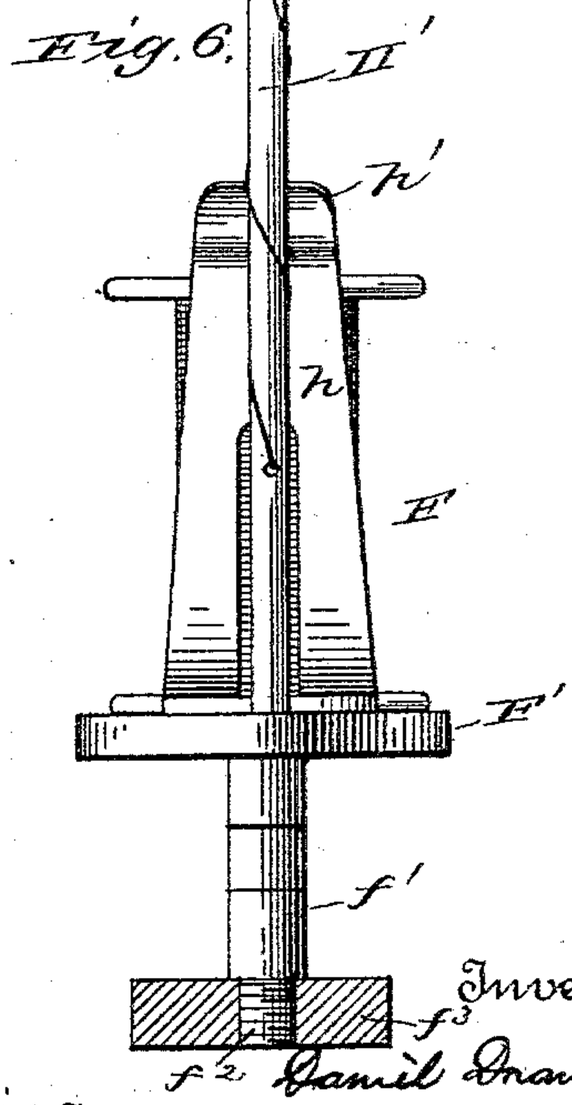



Fig. 6.

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(No Model.) 4 Sheets—Sheet 4.

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## BRAIDING MACHINE.

No. 412,369. Patented Oct. 8, 1889.

Fig. 8.

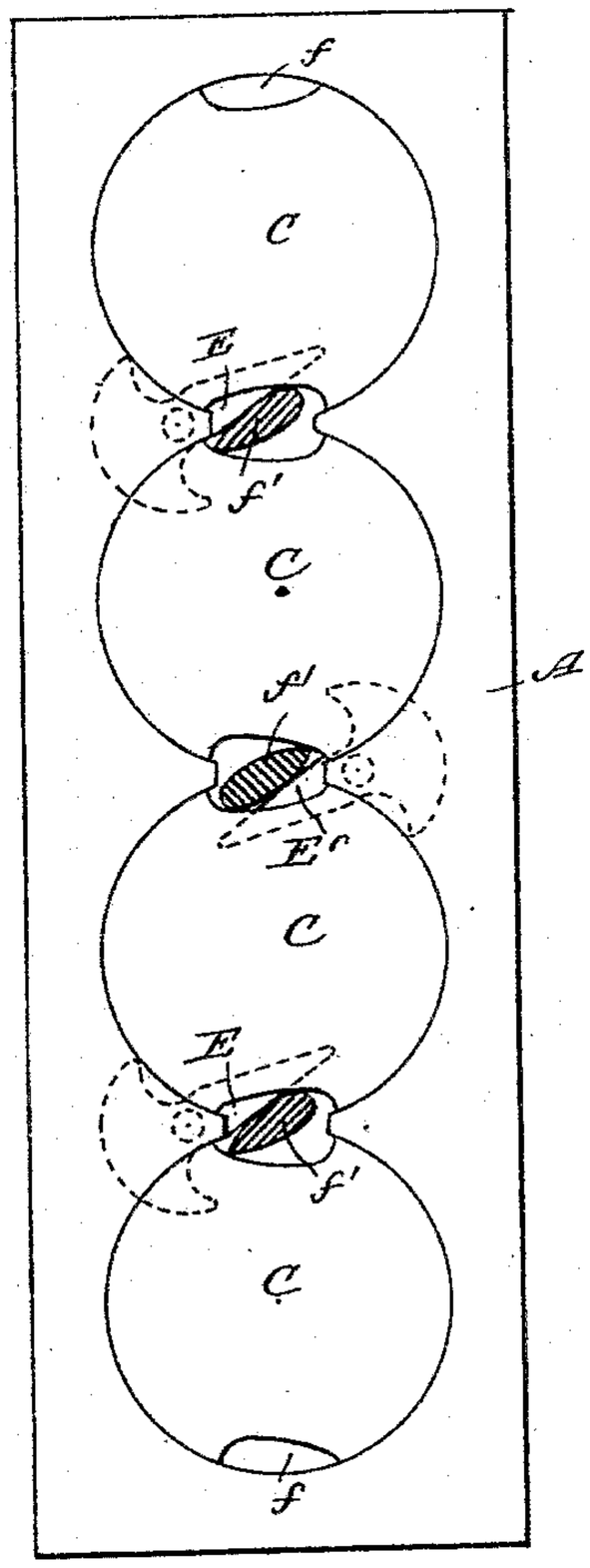
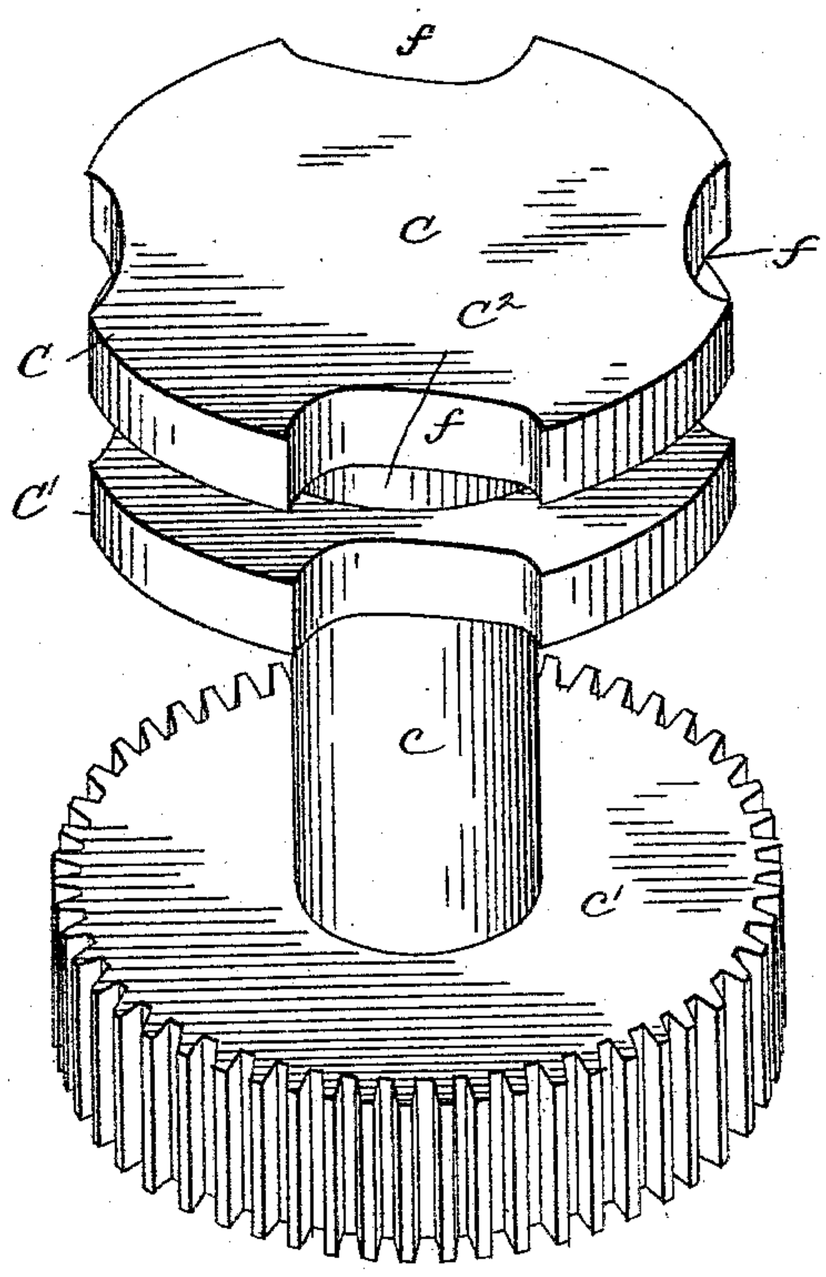



Fig. 10.

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# UNITED STATES PATENT OFFICE.

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## BRAIDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 412,369, dated October 8, 1889.

Application filed April 27, 1889. Serial No. 308,782. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL DRAWBAUGH, of Eberly's Mills, in the county of Cumberland and State of Pennsylvania, have invented certain new and useful Improvements in Braiding-Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

This invention relates to certain improvements in braiding-machines for forming braid, either flat or tubular, from a series of threads properly braided, either with or without a central core, such as a wire or the like, the objects of the invention being to provide a compact and easily-operated machine which can be run at an exceedingly high rate of speed, and which can be readily adjusted to form braid of greater or less diameter, with particular adaptations for applying braided coverings to wire or other material, as before intimated, which covering shall be compact and the threads tightly and smoothly braided.

The invention therefore consists in certain novel details of construction and combinations and arrangements of parts, as will be hereinafter described, and pointed out particularly in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a perspective view of a braiding-machine constructed in accordance with my invention. Fig. 2 is a top plan view of the top plate, spool-carriers, and rotating carrying-disks. Fig. 3 is a vertical sectional view on the line *x x*, Fig. 2. Fig. 4 is a horizontal sectional view just above the pawls. Fig. 5 is a side elevation of one of the spool-carriers. Fig. 6 is an end elevation of the same. Fig. 7 is a sectional view of a mandrel especially designed for the formation of tubular braid or cord. Fig. 8 is a top plan view of a modification for forming flat braid. Fig. 9 is a view of one of the pawls for changing the direction of movement of the spool-carriers. Fig. 10 is a perspective view of one of the carrying-disks and gear-wheels removed.

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

In the preferred form of machine illustrated in the drawings, Fig. 1, it will be seen that a top or bed plate A and a bottom plate B are employed to support and guide the carrying-disks C, the shafts *c*, on which said disks are mounted, and the gear-wheels *c'*, located one on each shaft, with adjacent ones intermeshing, whereby the simultaneous movement of all the carrying-disks is insured. Such motion may be given the disks through the medium of the drive-shaft D, carrying the beveled gear *d*, meshing with a similar gear *d'* on one of the shafts *c*, said shaft D being driven from any suitable source of power, preferably by means of a belt running on pulley D'.

Each of the carrying-disks (see Fig. 10) consists, preferably, of one piece, with the central part $C^2$ cut away to a less diameter, for a purpose to be presently explained. The upper and lower surfaces of the disks lie flush with the upper and under surfaces of the bed-plate, and the shafts *c*, on which they are mounted, are stepped into the plate B at *b*, to afford the necessary bearing at the bottom, or else are hollow, as shown in dotted lines, Fig. 3, and mounted on a stud $d^5$, secured to the bottom plate, as also shown in dotted lines in said figure.

In the periphery of each disk C are formed irregularly-shaped oblong notches *f*, preferably four in each disk, for the reception of the similarly-shaped bottom extensions *f'* of the spool-carriers F, the plate F', resting on the top of the plate C and carrying-disks, serving as a base on which the spool rests. The lower end of the extension *f'* is provided with a screw-threaded stud $f^2$ for the reception of the relatively-large nut $f^3$, which is put in position after the spool-carrier is in place and takes its bearing against the under surface of the plate A and carrying-disks, thus effectually retaining the spool-carrier in position without the necessity of providing widely-separated bearings to support the same.

In order to transfer the spool-carriers from one disk to the other, pivoted latches or pawls

E are provided, as follows: The bed-plate A is recessed at points between the carrying-disks, on alternate sides of the same, the bottom of the recesses being made flush with the top surface of the disk-plate C′, and in these recesses are pivoted the latches E, before referred to, they being of such thickness as to enter between the disk-plates C C′. The shape of the latches is shown clearly in Fig. 9. The point *e*, when turned in one direction and resting against the central or recessed part $C^2$, passes behind the downward extension of the spool-carrier carried by the disk against which the pawl rests, and as the disk is rotated deflects the carrier into the notch in the next disk. The extension of said carrier then engaging one of the wings E′ on the latch turns the latter into position to direct the next spool-carrier, passing the same into the notch in the disk which the first-mentioned carrier has just left, and so on throughout the entire series of disks, thus keeping two series of carriers, passing in opposite directions and crossing the path of each other, constantly in motion, just as in the ordinary braiders now in common use. The rear end of the latch, it will be seen, is in the form of the segment of a circle with the pivotal point of the pawl as a center, and the recess is similarly shaped, thus affording a long bearing for the latch and also permitting said recess to be easily formed by boring.

A removable plate G may be secured over each pawl by screws *g*, as shown, leaving the face of the plate A perfectly smooth and level throughout.

Difficulty has been heretofore experienced by reason of the latches rebounding when thrown to one position or the other by the carriers, causing the next carrier to pass in the wrong direction or stopping the machine entirely; but by constructing the projections engaging such latches oblong the latch is not simply thrown, as would be the case with a round projection, but is thrown and the body of the projection, engaging the wing, prevents the rebound and positively holds the latch until the other carrier has passed the point, and so on, enabling the machine to be run at a practically unlimited speed.

The disks are preferably arranged in a circle, as illustrated in Figs. 1, 2, and 4; but it is obvious that for the purpose of forming flat braid they may be arranged in a direct line, each carrier when it arrives at the end being turned clear around by the end disk and started back in the reverse direction, as illustrated in Fig. 8. Referring now particularly to Figs. 5 and 6, it will be seen that the plate F′ carries the standard H, on which the spool is mounted, and also the thread-guide H′, through the end of which the thread passes, and which is of considerable height in order to hold the threads out of danger of entanglement with the carriers. A spring *h* is also secured on the plate, and its upper end extends over the top of the spool to retain the same in place and further acts as a brake to prevent the racing of the spool, as will be readily understood. The upper end *h′* of the spring is bent outward, permitting the spool to be slipped on, the flanges engaging the end of the spring and forcing the same to one side. After passing out through the thread-guides H′ the threads pass over the top of the convex disk M, adjustably mounted in the center of the bed-plate on a screw-threaded standard M′, screwing down into the bed-plate and center support and having an aperture-way through the same for the passage of the wire or other material to be covered. At the apex of the disk M is a removable piece *m*, constituting what I term a "mandrel," through which the wire or other core passes, and which is made removable to permit of the insertion of different-sized mandrels having apertures *m′* corresponding to the size of the wire being covered, or where a tubular braid or cord is being formed to permit a mandrel, such as in Fig. 7, to be inserted, on which the braid is woven and then drawn off by the feed mechanism, which will now be described.

Immediately above the former or mandrel is journaled in bearings in the standards N a drum O, around which the braid is coiled as it is formed, preferably, however, only making a couple of turns around said drum and then passing off to the reel, on which it is finally wound. Now, as it is desirable that the rate of feed be in exact proportion to the number of threads and thickness of the braid, I provide a mechanism for rotating said drum at a variable rate, consisting of a worm-shaft P, gearing with the worm-teeth Q on the drum O and driven by the wheel *p* on the lower end of the shaft, engaging the wheel or disk P′ on the drive-shaft. The wheel *p* is adjustable on the shaft by means of the set-screw *p′*. Thus when a more rapid feed is desired it is set away from the drive-shaft, and vice versa. The engagement between the wheel *p* and disk P′ is preferably frictional, a rubber friction-surface being provided on the wheel *p*; but it is obvious that the well-known equivalent of friction-gearing may be employed without departing from the spirit of my invention.

The lower bearing R for the worm-shaft is preferably adjustable toward and away from the disk P′ by means of set-screw *v*, in order that the wheel *p* may be held against said disk with a greater or less pressure, as the motion of the feed or wear requires.

From the above description it will be seen that a braider constructed in accordance with my invention will occupy but little room and may be run at a speed heretofore found impracticable, as there are no delicate parts to be destroyed, and the path for each spool-carrier is defined by the latches before said carrier reaches the same without danger of mishap by reason of the rebound of the latches or

other accidental misplacement of the same, and, further, that the crrriers are supported rigidly in place, being always compelled to move forward without danger of turning on their own axes—a material advantage in forming some braids, particularly if flat thread should be employed and it is desired to braid the same flatwise. By adjusting the central disk over which the threads pass to a a greater or less height the compactness of the thread around the core may be varied, as will be understood by those skilled in the art. Finally, it will be seen that with the construction of bed-plate described all the perforations through the same, as those for the carrying-disks, and the recesses, as those for the latches, may be bored out, no special tools being required to make the same, and at the same time a rigid and solid guide for the carriers is formed.

Having thus described my invention, what I claim as new is—

1. In a braiding-machine, the combination, with the bed-plate and series of rotating disks working therein, having their upper faces flush with the faces of the bed-plate and the notches in their edges, of the series of spool-carriers having the extended bases resting on said bed-plate and disks and having the downward projection entering said notches, and the latches for guiding said carriers from one disk to the other, substantially as described.

2. In a braiding-machine, the combination, with the bed-plate, the series of rotating disks therein, having their upper and lower faces flush with the faces of the bed-plate, with notches in the edges of such disks, and the pivoted latches within the bed-plate, of the spool-carriers having the extended bases resting on said bed-plate, with the downward projections entering the notches and engaging the latches, and the nuts on the lower ends of said projections working against the lower face of the bed-plate and disks, substantially as described.

3. In a braiding-machine, the combination, with the bed-plate having the series of arc-shaped recesses and the series of circular apertures in the same, and the series of rotary disks in said apertures, and the spool-carriers moved by said disks, of the series of latches pivoted in said recesses, having the arc-shaped rear ends, substantially as and for the purpose set forth.

4. In a braiding-machine, the combination, with the bed-plate A, plate B, and series of rotary disks in plate A, with the upper and lower surfaces flush with surfaces of said plate, of the shafts on which said disks are mounted, journaled in plate B and having the intermeshing gear-wheels thereon, and the spool-carriers moved by said disks, and the latches E within the plate A, substantially as described.

5. In a braiding-machine, the combination, with the spool-carriers and means for moving them, substantially as described, of the enlarged vertically-adjustable central disk over which the braid is formed, as set forth.

6. In a braiding-machine, the combination, with the spool-carriers and means for moving them, substantially as described, of the vertically-adjustable central disk and the removable former at the center over which the braid is formed, substantially as described.

7. In a braiding-machine, the combination, with the spool-carriers and means for moving them, substantially as described, of the vertically-adjustable central disk and removable former at the center having an aperture through the same for the passage of a core, as and for the purpose set forth.

8. In a braiding-machine, the combination, with the drum over which the braid passes, having the gear-teeth thereon, of the gear engaging said teeth, the shaft in which said gear is mounted, the wheel adjustably mounted on said shaft, and the disk on the drive-shaft with which said wheel engages, substantially as described.

9. In a braiding-machine, the combination, with the drum over which the braid passes, having the gear-teeth thereon, of the worm-gear engaging said teeth, the worm-shaft, the wheel adjustably mounted on said shaft, the disk on the drive-shaft with which said wheel engages, and the adjustable bearing for the worm-shaft for pressing said wheel and disk together, substantially as described.

10. In a braiding-machine, the combination, with the carrying mechanism, of a spool-carrier having the extended plate with the downward projection and nut, the spool-spindle, thread-guide, and spring, with the outwardly-turned upper end at the top, substantially as described.

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