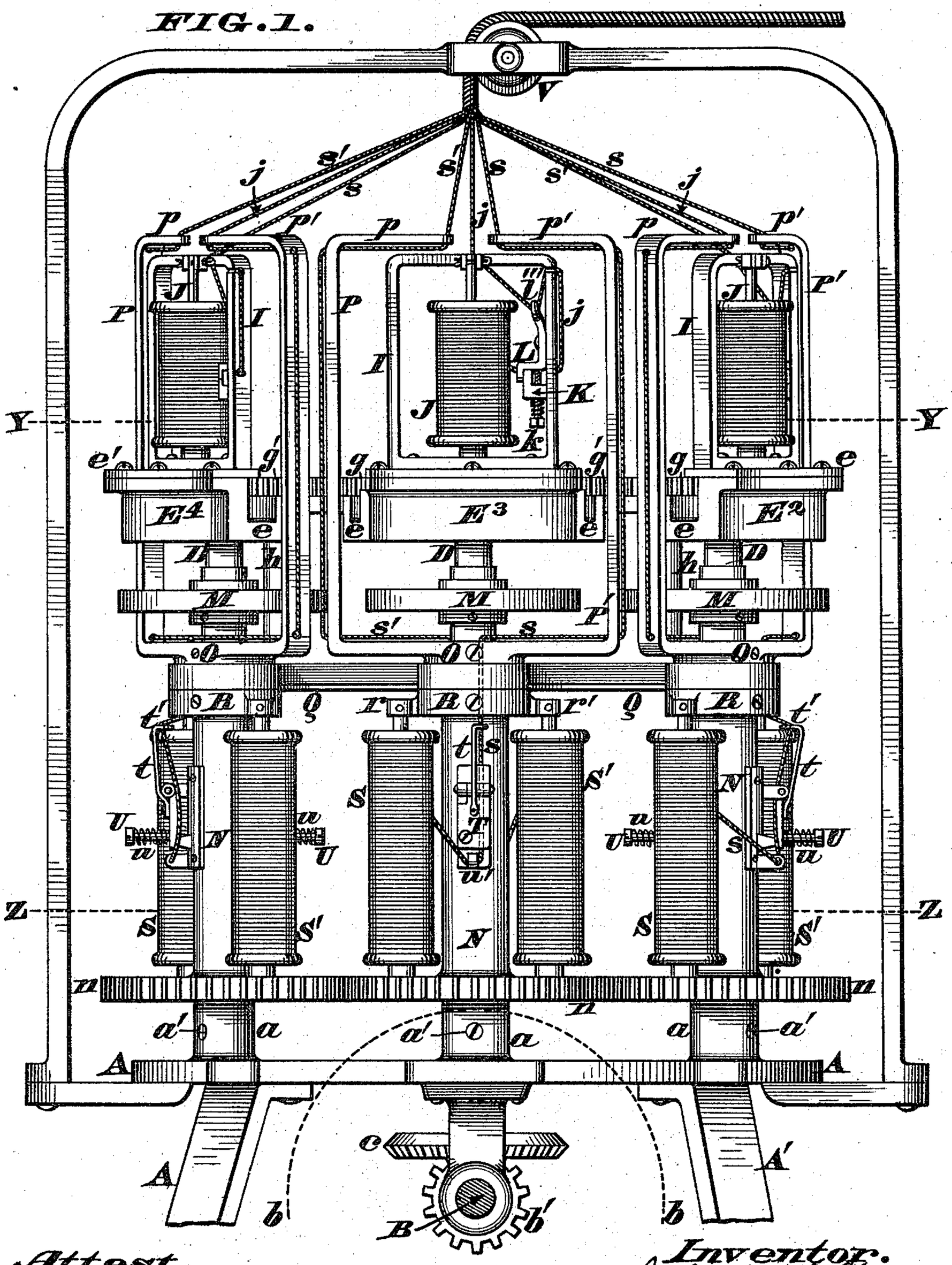
(No Model.) 4 Sheets—Sheet 1.

J. W. HILTON.

BRAIDING MACHINE.

No. 573,411. Patented Dec. 15, 1896.

FIG. 1.



Attest.
Ida Heitz
Arthur Moore

Inventor.
John W. Hilton
By James N. Layman
Atty.

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BRAIDING MACHINE.

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FIG. 2.

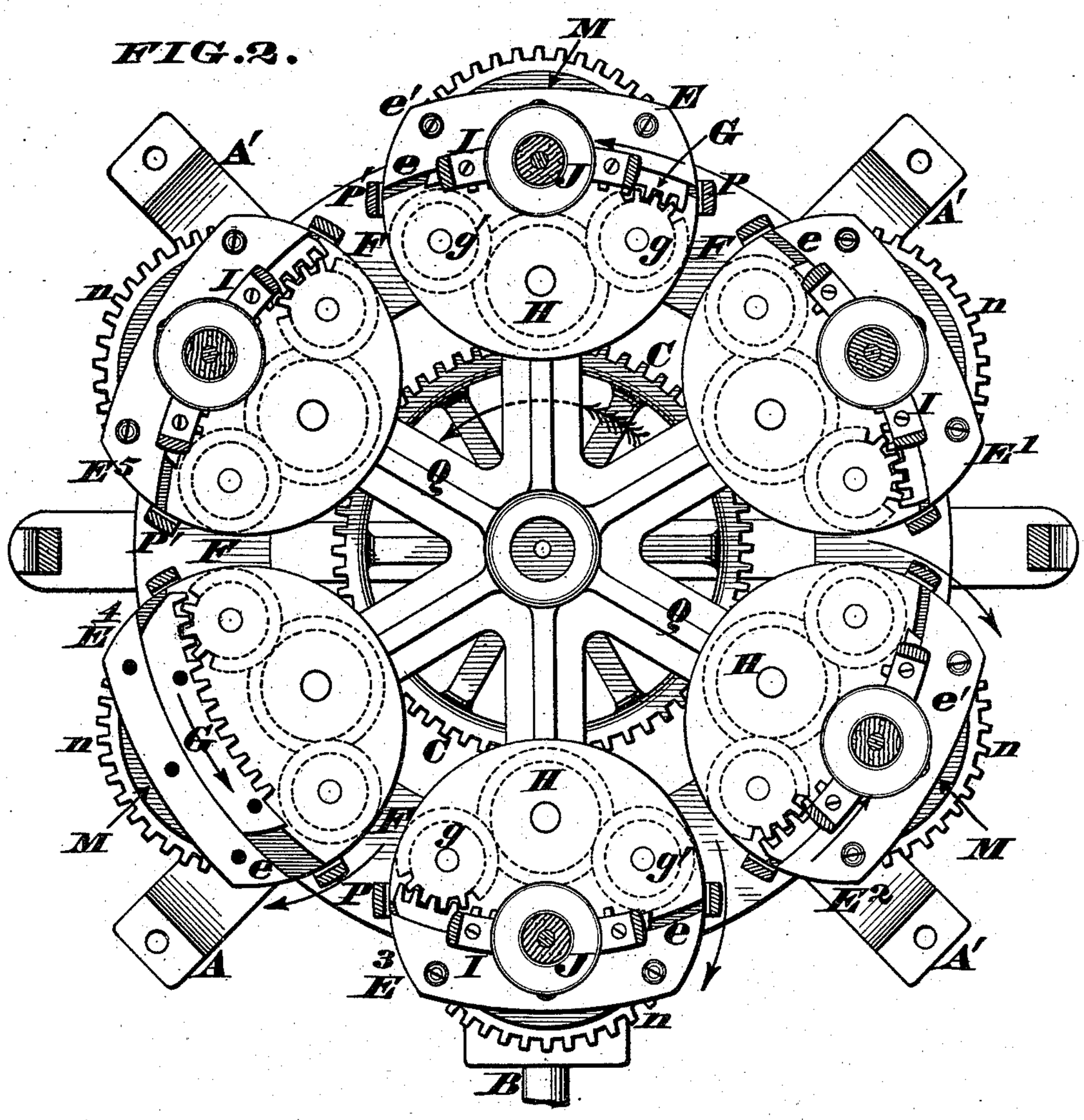
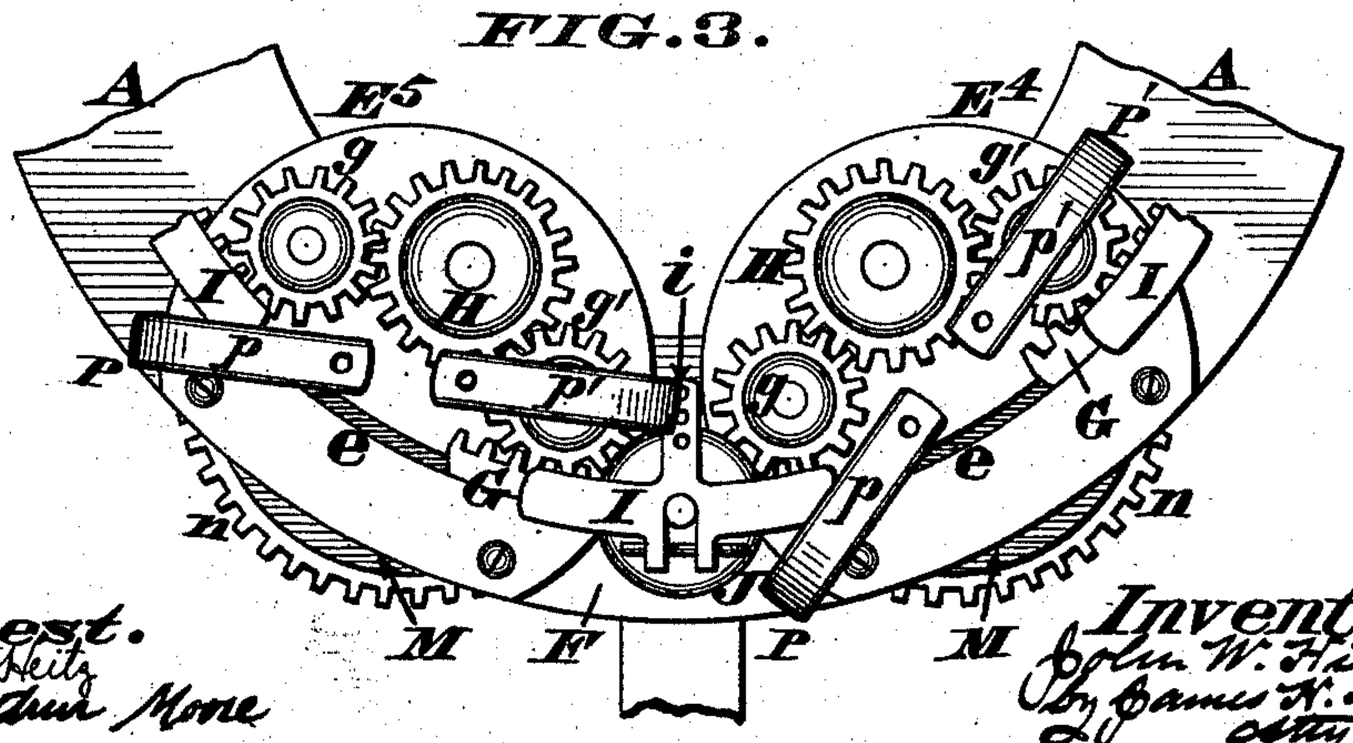


FIG. 3.



Attest.
Ida Heitz
Richard Moore

Inventor.
John W. Hilton
By James N. Baymon,
Atty.

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J. W. HILTON.

BRAIDING MACHINE.

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FIG. 4.

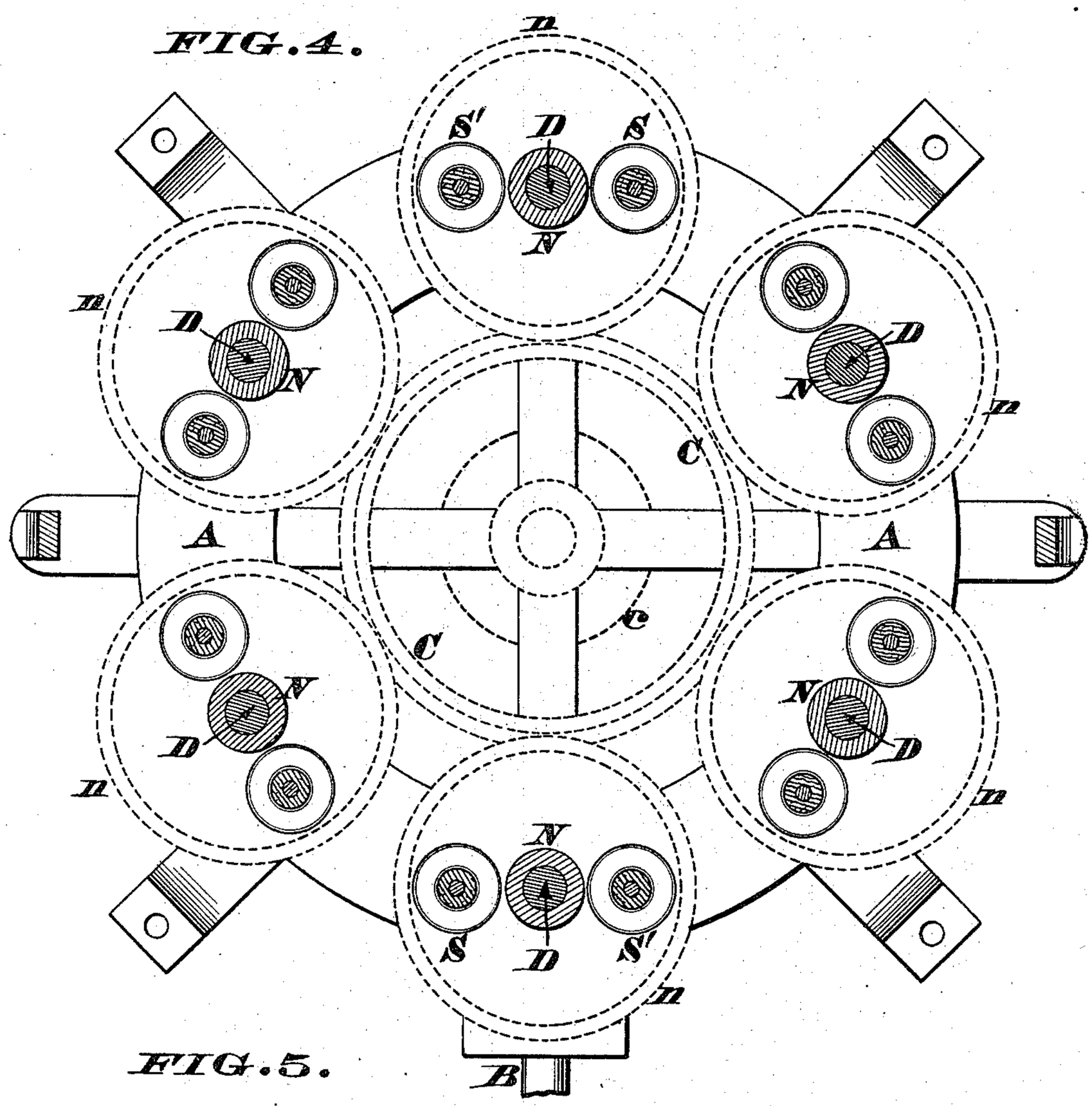


FIG. 5.

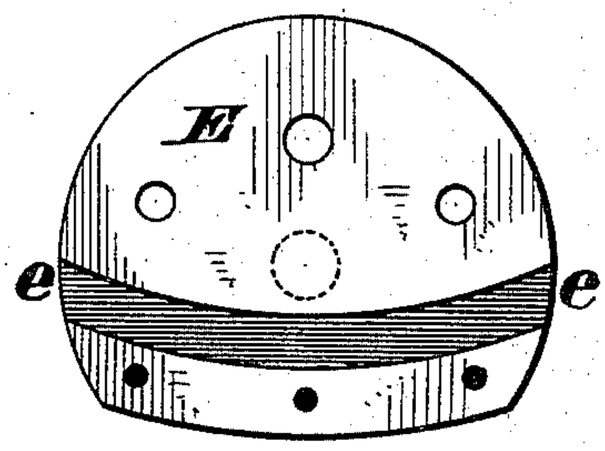
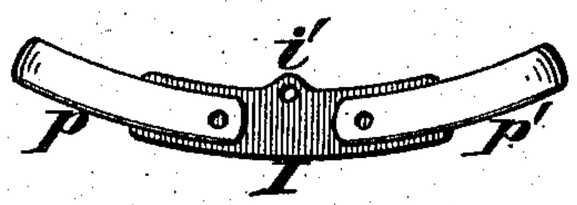


FIG. 6.



Attest.
Ida Heitz
Arthur Moore

Inventor.
John W. Hilton
by James N. Layman.
Atty.

(No Model.) 4 Sheets—Sheet 4.

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FIG. 7.

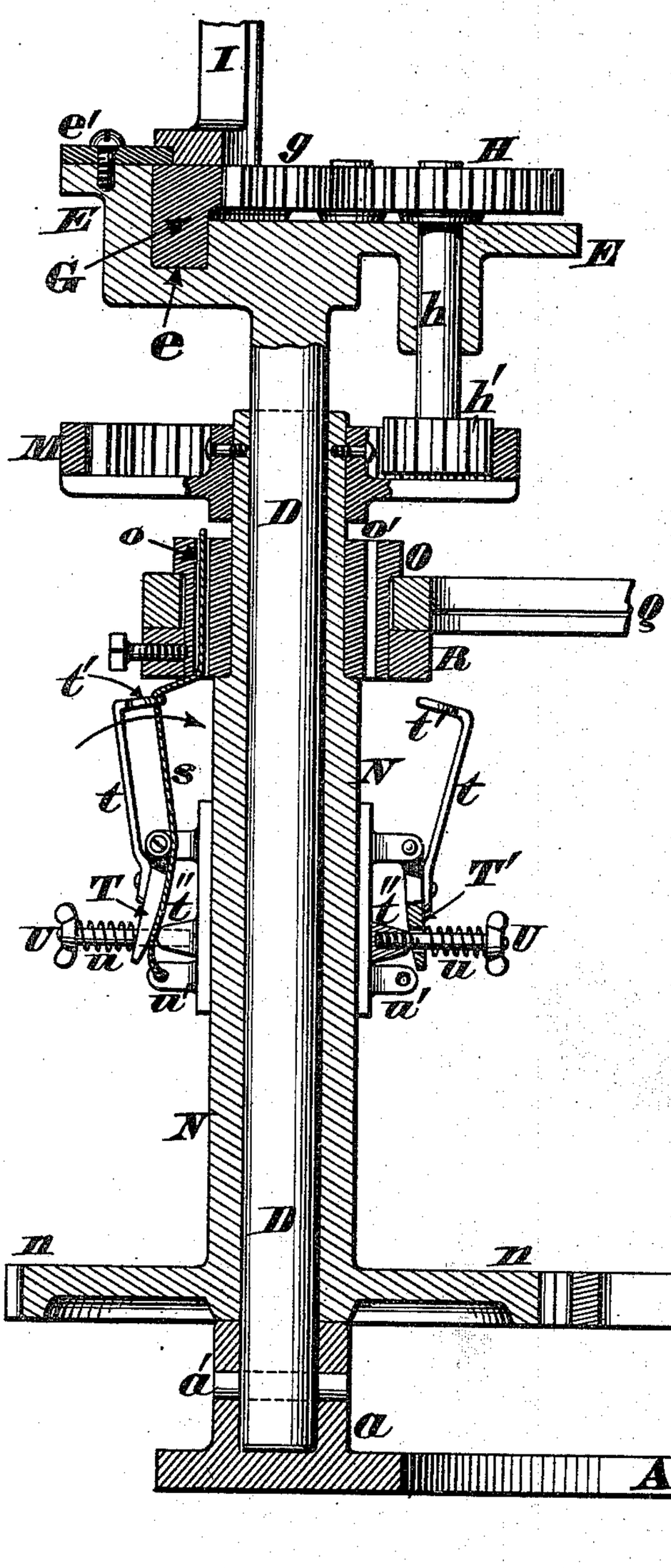
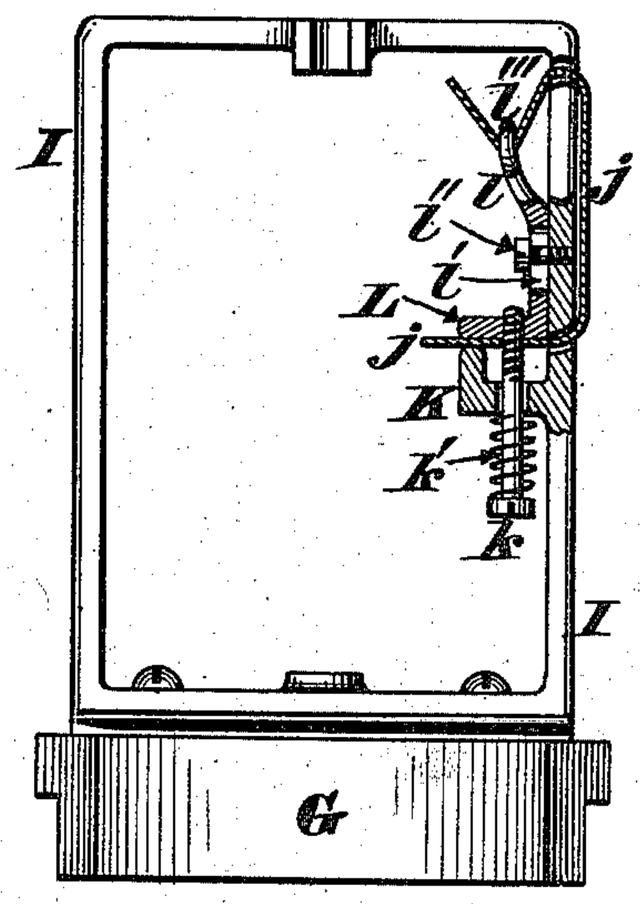


FIG. 8.



Attest.
Ida Steitz
Arthur Moore

Inventor.
John W. Hilton.
by James N. Layman.
Atty.

UNITED STATES PATENT OFFICE.

JOHN W. HILTON, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF TO CHARLES R. MULLEN, OF SAME PLACE.

BRAIDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 573,411, dated December 15, 1896.

Application filed May 14, 1896. Serial No. 591,472. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. HILTON, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, 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 invention, reference being had to the annexed drawings, which form a part of this specification.

My invention comprises certain improvements in the construction of those braiding-machines or circular looms which have an upper and lower set of bobbins, whose threads are twisted together at a common uniting-point to form a cord, the details of said improvements being hereinafter more fully described, and then pointed out in the claims.

In the annexed drawings, Figure 1 is a side elevation of one form of my improved braiding-machine wherein twelve lower bobbins and six upper bobbins are employed. Fig. 2 is a horizontal section of said machine, taken at the line Y Y of the preceding illustration, the train of gear-wheels that drive the upper bobbins around the circular path being indicated by dotted circles and the bobbins themselves being seen in line with the centers of their respective heads. Fig. 3 is a plan of a pair of said heads, a bobbin being advanced to a position half-way between them. Fig. 4 is a horizontal section of the machine, taken at the line Z Z of Fig. 1, the gear-wheels that drive the lower bobbins being indicated by dotted circles. Fig. 5 is a plan of one of the heads detached from the machine. Fig. 6 is a plan of a modified form of the fliers and upper-bobbin frame. Fig. 7 is an enlarged axial section of one of the vertical spindles and its attachments, the bobbins of said spindle being omitted. Fig. 8 is a side elevation of an upper-bobbin carrier, the tension device thereof being sectioned.

The main frame of my machine is a ring A, supported upon legs A′ and having journal-bearings for a shaft B capable of being operated by a pulley, (indicated by the dotted circle *b* in Fig. 1.) *b′* is a bevel-wheel secured to said shaft and gearing with a similar wheel *c* at the lower end of a vertical shaft *c′*, the latter having a central bore *c″*, as seen in Fig. 7. Secured to the upper end of this shaft *c′* is a master-wheel C, that directly drives all the lower bobbins and indirectly operates all the upper ones, the latter in the present case being arranged in six distinct pairs, and the various parts to which each of these pairs are applied will hereinafter be designated as "sections" of the machine. Therefore, as six sections are employed, the base-ring A has six sockets *a* projecting from it, and each socket is traversed by a pin or screw *a′*, that holds as many vertical spindles D immovably in place, each spindle having at top a head E. Usually, but not necessarily, these heads are cast with the spindles and preferably have the segmental shape more clearly seen in Fig. 5. Furthermore, these heads must be so arranged with reference to the circle they occupy as to leave between them passages F of sufficient size to permit free play of the fliers, to be presently described. In order to distinguish them, the heads are lettered E E′ E^2 E^3 E^4 E^5, and as they are exact counterparts of each other a detailed description of one will answer for all. Beginning then with the upper and central head E in Fig. 2, it will be noticed that a curved groove *e* is provided in its upper surface, which groove is concentric with the axis of the machine and is traversed by a segmental rack G, whose teeth are capable of being engaged by pinions *g g′*, journaled upon said head.

e′ is a cap that confines the rack G within the race or groove *e*.

H is a toothed wheel also journaled upon the head E and serving to drive the pinions *g g′* at a certain definite speed.

Secured upon the rack G is a bobbin-carrier consisting of a light frame I, having at top a short lateral projection *i*, as seen in Fig. 3, which projection has a number of perforations, through either one of which a thread or strand may be passed after being uncoiled from the bobbin J, journaled vertically in said frame. Projecting from one of the uprights of this frame is a lug K, perforated to permit the free passage of a screw *k*, whose upper or threaded end engages with a clamp-plate L, that is pulled down with a yielding pressure by a spring *k′*, coiled around said

screw, as more clearly seen in Fig. 8. Plate L has a vertical extension *l*, slotted longitudinally at *l'* to admit a guide-screw *l''*, and having at top an eye or loop *l'''*, through which eye is passed a thread or strand *j*, coiled around the bobbin J.

Referring now to Fig. 7, it will be noticed that the shaft *h* of wheel H has at its lower end a pinion *h'*, engaged with a wheel M, having internal teeth, the hub of said wheel being fastened to the upper part of a sleeve N, that surrounds the vertical spindle D and turns freely thereon. Sleeve N has at its lower end a pinion *n*, engaged with the master-wheel C of the machine, a hub O being fastened to said sleeve just below the internally-toothed wheel M, and the hub being provided with two vertical holes *o o'* for the passage of threads or strands that uncoil from the lower bobbins. Hub O is integral with a pair of flier-arms P P', having horizontal extensions *p p'*, near the ends of which are perforations for the passage of the lower threads, these perforations being more clearly seen in Fig. 3.

Q is a spider having no connection whatever with the frame of the machine, but serving merely to steady the different sleeves and thereby keep the various spindles in their proper vertical positions. The ends of this spider are bored out to admit the flier-hubs O, and the spider is supported wholly upon collars R, fastened to the sleeves N, each collar being provided with a pair of lugs *r r'*, that retain the upper ends of shafts around which revolve the lower bobbins S S', the lower ends of said shafts being inserted in the pinions *n*. Each sleeve has secured to it a pair of tension devices, and each of them includes a pivoted flap T, having a lever *t* fastened to it, the upper end of the latter being provided with an eye or loop *t'*, through which is passed a thread or strand from one of the bobbins S or S'. The free end of flap T is pierced to permit the passage of a screw U, whose threaded end engages with a lug *t''*, against which latter said flap is yieldingly held by a spring *u*, coiled around said screw.

u' is a perforated lug through which a strand is passed before being clamped between the flap T and lug *t''*.

V is a grooved wheel over which the braided cord is passed, the common uniting-point where all the strands are interlaced together being just below said wheel and vertically in line with the axial bore *c''* of the upright shaft *c'*.

In constructing my braiding-machine I prefer to cast all the heads together and then turn the circular groove or race *e* in said casting, after which act the small webs of metal connecting said heads are cut away. By this expedient a perfectly true groove is afforded and the manufacture of the machine is materially facilitated. Care must also be taken to have the gearing run perfectly true and at such relative speeds as to cause the flier of one section to make an exact quarter-revolution while a carrier is passing from the center of one head to the center of the next head in the route. In threading up the machine the bobbins are first applied to their respective holders, and the threads or strands leading from said bobbins are disposed of in the following manner: Beginning with the upper central bobbin J, (seen in Fig. 1,) the strand *j* of said bobbin is passed between the lug K and clamp-plate L, as represented in Fig. 8, then through holes or notches in the frame I. The strand is next carried through the loop *l'''*, then through either one of the perforations in the lateral projection *i* of the frame, and finally up to the wheel V. Screw *k* is now turned to clamp the strand more or less firmly between the lug K and plate L, and thereby afford the desired "tension." The thread *s* of the lower bobbin S is now passed through the perforated lug *u'*, then up between the flap T and through the eye *t'* of lever *t*. Said thread is next passed through the perforation *o* of the flier-hub O, then through other holes in the flier P' *p'*, and finally up to the wheel V. The thread *s'* of the companion bobbin S' is then passed through the tension device T' and rove through the flier P *p* in precisely the same manner, after which act the screws U are tightened to afford the desired frictional hold on each of said threads.

After all the upper and lower threads have been arranged as above described the machine is set in motion, so as to turn the master-wheel C in the direction indicated by the arrow in Fig. 2, the result being to drive all the carriers I forward through the races *e* of the different heads E E', &c., and to revolve all the lower bobbins S S' around their respective fixed spindles D. Now by referring to Fig. 2 it will be noticed that the shafts of all the upper bobbins J are radially in line with the center of their respective heads and that the segment-racks G are in gear with the pinions *g*, but not yet engaged with the other pinions, *g'*. It will further be noticed that the flier-arms P P' now stand at right angles to radial lines drawn through the centers of the heads; but as the racks G move foward in the direction of the arrow seen on the rack in the head E^4 the arms P P' fly around in the direction indicated by the arrows adjacent to the heads E^2 E^3 E^4. Consequently when the fliers have made one-eighth of a complete revolution the carriers I will be spanning the passages F between said heads and will now be in gear with the two pinions *g g'* and be driven forward by their joint action, (see Fig. 3;) but by the time the carriers have advanced to the centers of the next heads the fliers of said heads will have made one-fourth of a complete revolution. It will thus be apparent that the upper bobbins pass at right angles through the fliers of each alternate head, thereby interlacing the strands in a very intricate manner and affording a

very superior article of braiding. It is also evident that, as all the upper bobbins move continuously forward in a circular path, the machine can be driven at the highest possible speed without danger of breaking it or causing an interference between the various strands.

In running at a very high speed some provision must be made for enabling a knotted strand to pass through the machine and yet preserve the same tension both before and after this passage. Such a provision for an upper thread is the device seen in Fig. 8, an inspection of which illustration shows that if there should be a knot in the thread *j* the obstruction would not pass between the lug K and plate L. Consequently some little extra strain would be exerted on the upper portion of the thread, which pull would be sufficient to overcome the stress of spring *k'* and cause an elevation of said plate. Sufficient clearance would then be afforded between the lug and plate to allow the knot to move forward, and as soon as it has passed the point of contact the spring at once restores the tension. Practically the same automatic action occurs with the tension appliances seen in Fig. 7, as any arrest of a knot between the flap T and lug *t''* would cause the thread *s* to pull inward against the loop *t'*. Therefore the lever *t* would swing in the direction of the arrow and open the flap T far enough to permit the knot to pass through, after which passage the spring *u* would restore said flap to its normal position. The other tension device, T', in this illustration is shown without a thread passing through it, so as to render the construction more apparent.

In Fig. 6 the extensions *p p'* are shown curved instead of extending at right angles from the flier-arms P P', as in Fig. 3. Fig. 6 shows also that the rearward extension may be omitted from the top of the bobbin-carrier I and a hole *i'* be made near the inner edge of said top piece.

The axial bore *c''* of shaft *c'* is used for the passage of a wire when the threads or strands are braided around such a metallic core or center. Finally, in a more simple form of my machine, a single bobbin can be applied to each of the fixed spindles.

I claim as my invention—

1. The combination, in a braiding-machine, of a series of fixed spindles D, surmounted by heads E, having a circular race *e;* toothed racks G, traversing said race and provided with carriers I, having bobbins J journaled in them; sleeves N surrounding said spindles D, and having fliers P secured to them, which fliers revolve completely around said heads E; a bobbin S applied to each sleeve, and having their threads rove through the flier-arms; one set of gears for driving the racks G through the circular race *e*, and another set of gears for revolving the sleeves N and bobbins S, around the spindles D, all in the manner described, and for the purpose stated.

2. The combination, in a braiding-machine, of a series of fixed spindles D, surmounted by heads E, having a circular race *e;* toothed racks G, traversing said race, and provided with carriers I, having bobbins J journaled in them; gears *g*, *g'*, H, *h*, *h'*, M, for driving said racks; sleeves N surrounding said spindles D, and having fliers P P', and the wheel M secured to them, which fliers revolve completely around said heads; a pair of bobbins S, S', applied to each sleeve, and having their threads rove through the flier-arms; gear-wheels *n*, that operate said sleeves; and a master-wheel C, that drives all the wheels *n*, in the manner described, and for the purpose stated.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN W. HILTON.

Witnesses:

JAMES H. LAYMAN,

JOHN C. ROGERS.