

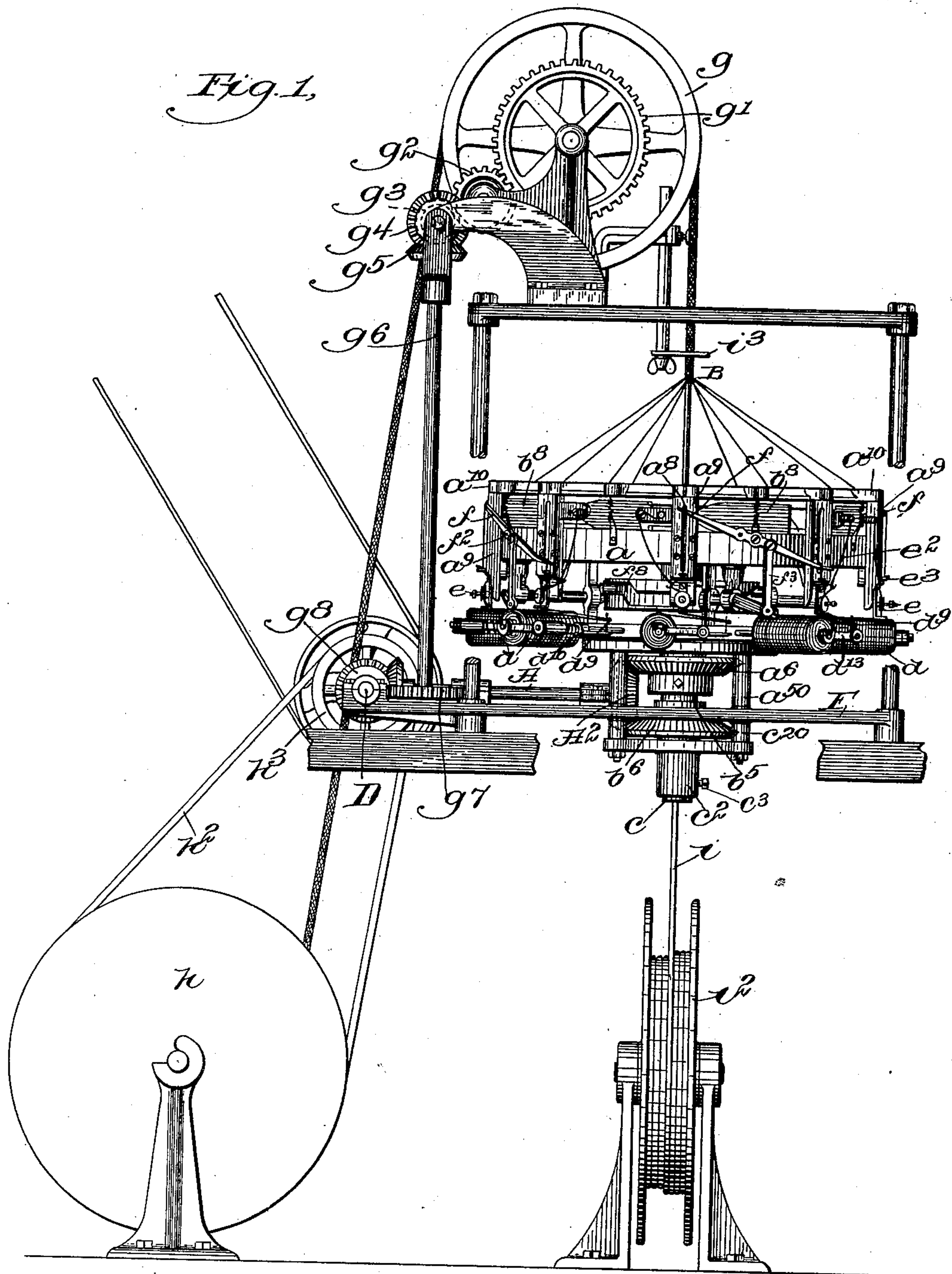
No. 755,003.

PATENTED MAR. 22, 1904.

W. HILL.
BRAIDING MACHINE.
APPLICATION FILED OCT. 14, 1901.

NO MODEL.

3 SHEETS—SHEET 1.



Witnesses:
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Nancy P. Ford.

Inventor:
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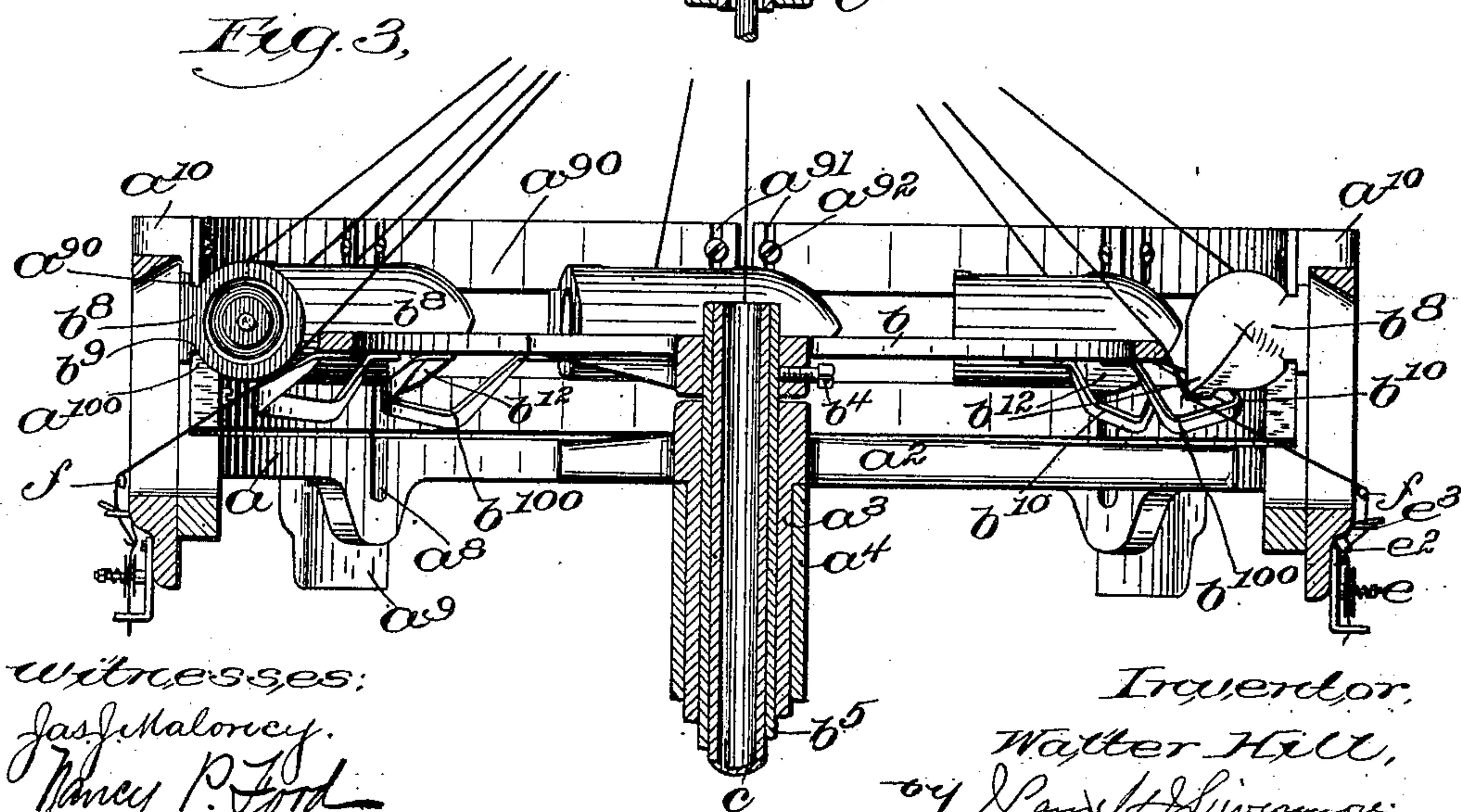
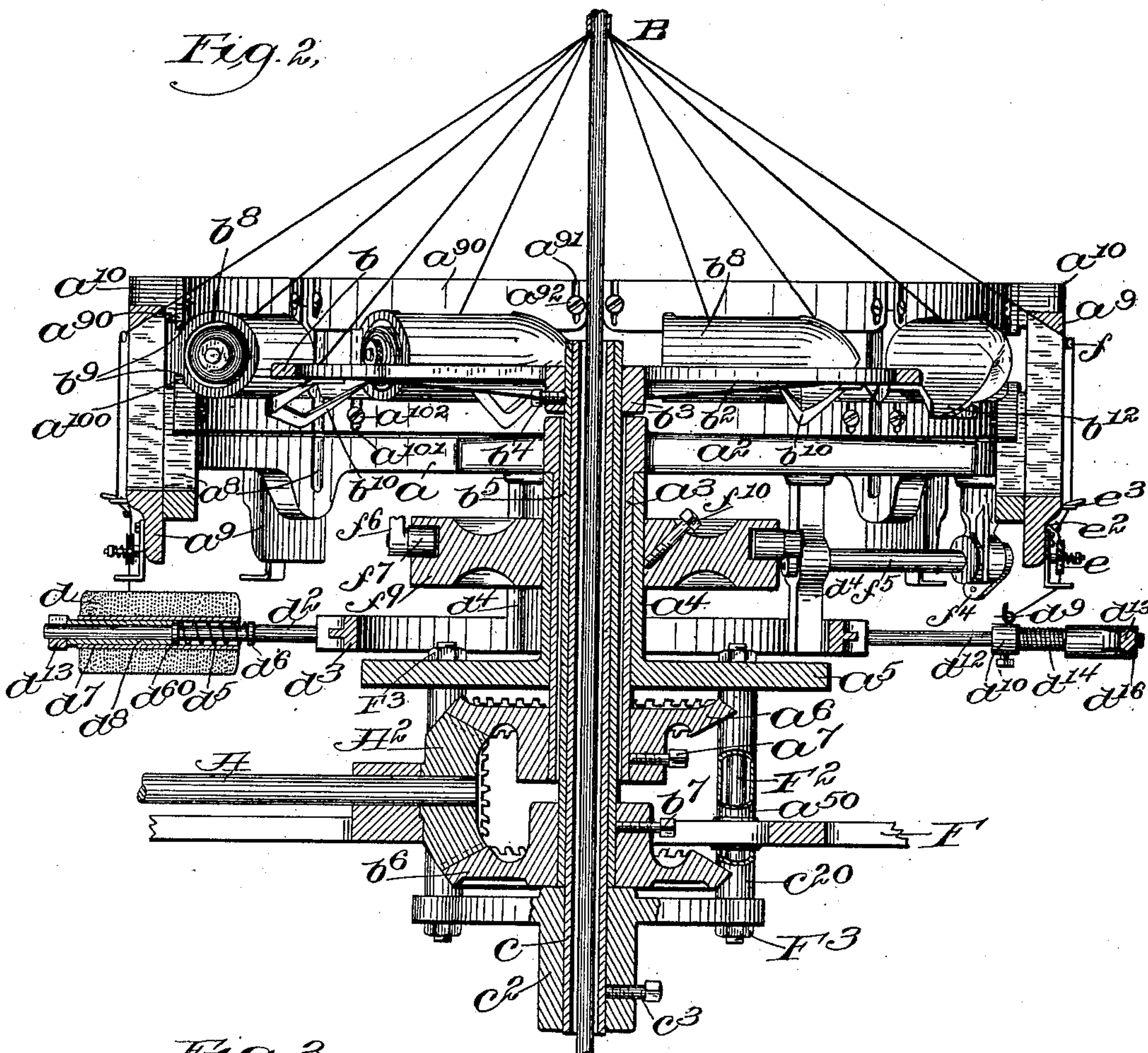
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 4.

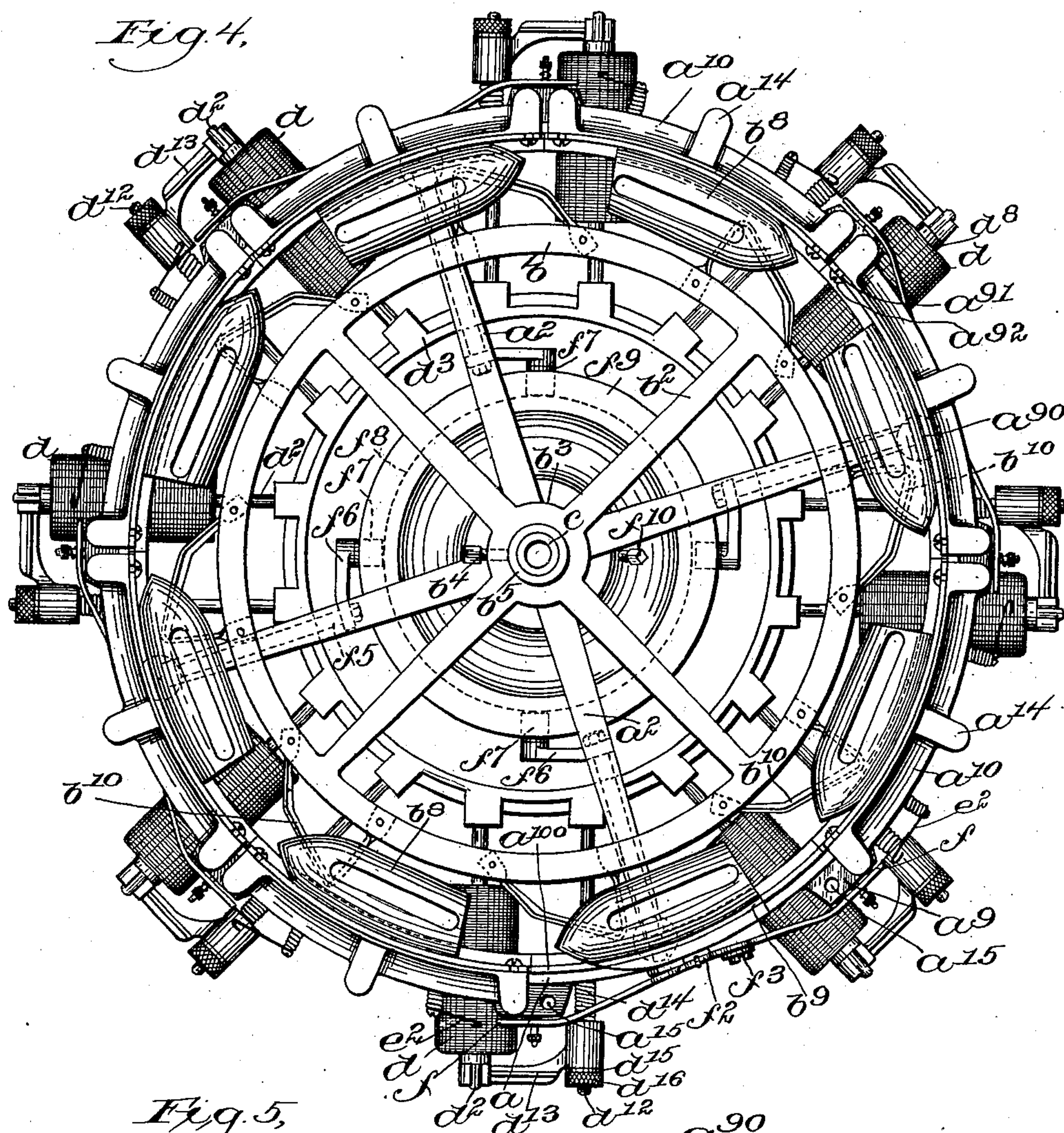
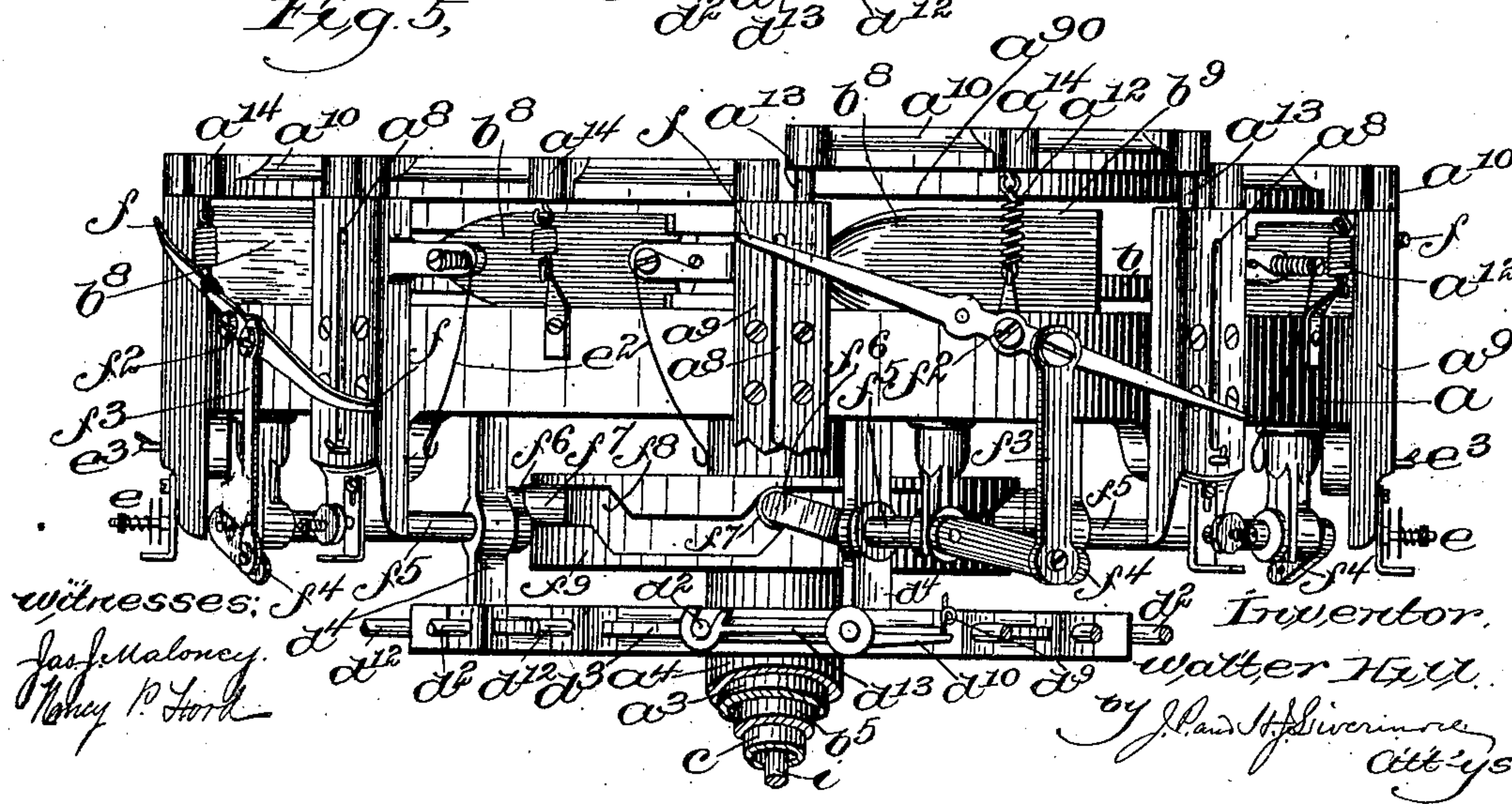


Fig. 5.



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UNITED STATES PATENT OFFICE.

WALTER HILL, OF WALLINGFORD, CONNECTICUT.

BRAIDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 755,003, dated March 22, 1904.

Application filed October 14, 1901. Serial No. 78,583. (No model.)

To all whom it may concern:

Be it known that I, WALTER HILL, of Wallingford, county of New Haven, and State of Connecticut, have invented an Improvement in Braiding-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to a braiding-machine, and is embodied in a machine of that type in which the two sets of threads are acted upon respectively by parallel members, one of which has a movement relative to the other, one set of threads being guided so as to pass alternately above and below certain threads of the other set, the braid being formed beyond the two members and carried away in the direction of the axis thereof as formed.

The object of the invention is to simplify the machine and to arrange the parts so that the machine can be rapidly operated without danger of breaking the threads and without unduly wearing the parts of the machine itself.

The machine embodying the invention comprises what may be termed a "bobbin-carrier" and a shuttle carrier or propeller, arranged, respectively, to rotate in opposite directions around a common axis, the bobbin-carrier being provided with thread-guides and also with a guideway or shuttle-race for the shuttles, which are propelled in the said shuttle-race by means of the shuttle-propeller. The thread-guides on the bobbin-carrier consist of fingers which are adapted to engage the thread and to cause a movement of the same back and forth in a direction transverse to the shuttle-race in the bobbin-carrier, so that the shuttles will pass over or under the said threads in accordance with the position of the guide-fingers, which act thereon. By this construction a slight movement of the thread suffices to guide the same with relation to the shuttles, since the guides can be brought very close to the shuttles, for the reason that the same member—viz., the bobbin-carrier—constitutes the support for both the shuttles and the guides.

The shuttle-carrier consists of a suitable frame, such as a wheel or ring, having an engaging member for each shuttle, which coop-

erates with a projection from the said shuttle, said engaging member and projection being in loose contact and each having an inclined surface, said inclined surfaces being so related to each other that the thread which is to travel under the shuttles easily slips past between the parts of the cooperating engaging portions which are in contact, the shuttles, as stated, being supported and guided by the bobbin-carrier, in which the shuttle-race is formed.

As herein shown, the bobbin-carrier consists of an annular frame having bobbin-supports secured to the under sides of radial members of said frame, while the lower member of the shuttle-race is formed in sections along the inner surface of the annular frame, which is provided with a slotted member for each bobbin-thread extending transversely across the shuttle-race between adjacent sections thereof. The said shuttle-race is completed by an upper portion also made in sections and separable from the lower member for the insertion or removal of the shuttles, as will be more fully described hereinafter. The thread-guides consist of fingers which are pivotally supported upon the outer portion of the bobbin-carrier, it being practicable to use a single arm for two guides, the ends of which arm constitute, respectively, guide-fingers for two adjacent threads, the said arm being pivotally supported between the two threads and arranged to oscillate, so as to move one thread up and let the other thread down. The threads are arranged so as to be fed upward from the bobbins substantially without lateral deviation, passing over the fingers and thence to the braiding-point, being inclined from the top of the finger toward the middle of the machine, where the braiding takes place. The shuttles therefore run close to the threads, so that it is necessary only to move the fingers up and down a short distance without, in fact, materially altering the direction of feed of the thread in order to pass the same over and under the shuttles. The thread as it comes from the bobbins is passed through an adjustable tension device, and between the said tension device and the point of engagement with the guide-finger

the thread is passed over a take-up, such as a spring-arm, the stress of which is merely sufficient to take up the slack in the thread as the guide-finger moves downward, so that the thread beyond the guide-finger will not sag, but will be properly passed over or under the shuttle. The movement of the several guide-fingers may be controlled by a cam, which is shown as stationary and mounted on the spider which supports the bobbin-carrier, the said cam being shown as consisting of a disk having a groove in its periphery arranged to coact with cam-rolls suitably connected with rock-shafts, so as to oscillate the guide-fingers. The cam, which can be readily removed and replaced, affords means for easily varying the pattern of the braid, as by varying the shape of the cam-groove the fingers can be caused to pass the thread over one, two, or any number of shuttles desired and under an equal number of shuttles.

An important feature of the invention is embodied in the shuttle-race, both members of which are made in sections, so that the threads may be guided up and down between adjacent sections, so as to pass over and under the shuttles. The several sections are also shown as adjustable to compensate for wear, this construction, while not essential, being of material advantage and forming a feature of the invention.

Figure 1 is a side elevation of a machine embodying the invention. Fig. 2 is a vertical section, on an enlarged scale, of the main operating portions of the machine. Fig. 3 is a partial similar section showing the thread-guides in the other position. Fig. 4 is a top plan view on the same scale as Fig. 2, and Fig. 5 is a side elevation of the same part of the machine.

Referring to Fig. 2, the bobbin-carrier a is shown as an annular frame connected by radial arms a^2 with an elongated bearing portion a^3 , which bears in a sleeve a^4 , connected to or formed integral with a spider a^5 , secured to the base or frame F . To rotate the bobbin-carrier, the bearing-sleeve a^3 is provided with a beveled gear a^6 , shown as connected with said sleeve by means of a set-screw a^7 , the said gear meshing with a beveled gear A^2 , secured to a counter-shaft A , which in turn is geared to the driving-shaft D , as shown in Fig. 1.

The shuttle-propeller b is shown as an annular ring connected by radial arms b^2 with a hub b^3 , secured, as by a set-screw b^4 , to a hollow shaft b^5 , which has a bearing in a tubular support c , through which the wire which is to receive a braided covering or the core around which the braid is to be formed extends. The said tubular support c is shown as supported in a hanger c^2 , to which it is secured, as by a set-screw c^3 , the said hanger being clamped to the under portion of the frame F by means of bolts F^2 , which also constitute means for supporting the spider a^5 , the said spider and

the hanger c^2 being positioned with relation to the frame by means of sleeves a^{50} and c^{20} , through which sleeves the bolts F^2 pass, the parts being clamped together by means of nuts F^3 , as shown.

To rotate the shaft b^5 , the said shaft is provided with a beveled gear b^6 , secured to the shaft, as by a set-screw b^7 , the said gear meshing with the gear A^2 , above described, so that the rotation of the counter-shaft A will cause the bobbin-carrier a to rotate in one direction and the shuttle-propeller b to rotate in the opposite direction.

The bobbins d are shown as mounted on spindles d^2 , which project radially from a ring d^3 , connected with the bobbin-carrier arms a^2 by means of downwardly-extending hangers d^4 . The bobbins are retarded or tensioned to prevent the thread from unwinding too fast and hanging slack, the tension being provided for by means of a spring d^5 , which bears at one end against a collar d^6 , which is fast on the spindle, and at the other end against a collar d^{60} , which is loose on the spindle, the collar d^7 , upon which the material is wound, having a core or bearing-sleeve d^8 , the end of which bears against the collar d^{60} , so that the said collar, spring-pressed against the sleeve d^8 , acts as a brake to prevent the material from unwinding too rapidly. The bobbin-support is also provided with thread-guides d^9 , Figs. 1 and 2, shown as "pigtails," mounted on arms d^{10} , which extend laterally from rods d^{12} parallel to the spindles d^2 , the said rods also serving to support retaining members d^{13} . These retaining members are shown as arms pivoted on the rods d^{12} and adapted to hook over the ends of the spindles d^2 to engage and retain the bobbins against the stress of the tension-springs d^5 . The retaining members are adjustable along the rods d^{12} , each of the said rods being provided at its end with a thumb-nut d^{16} , screw-threaded on the end of the rod and bearing against a washer d^{15} , interposed between it and the hub or pivotal portion of the retaining member d^{13} , the opposite side of the said hub being acted upon by a spring d^{14} , which presses the hub up against the washer. When, therefore, the said thumb-nut is once adjusted, an empty bobbin can be removed and replaced by a full bobbin, the tension remaining the same without further adjustment.

The carrier a is provided with a tension device e for each thread, the said tension device being of any suitable construction and arrangement which is capable of adjustment, the ordinary sewing-machine tension being herein shown as employed for the purpose.

From the tension device e the thread is passed over a take-up e^2 , which is shown as a light spring secured to a portion of the carrier a , and through a guide or pigtail e^3 to the guide-finger f , over which it passes to the point B , where the braiding takes place.

The guide-fingers f are arranged, as will be hereinafter described, to play up and down across the path of the shuttles b^8 , thus guiding the threads without, however, materially varying the angles made by the threads in passing over the fingers, and as the fingers f travel with the carrier a it is obvious that the change of direction of the threads is accomplished without any material friction and without any substantial lateral strain upon the threads such as would tend to break the same, and the conditions remain the same regardless of the speed at which the machine is operated. In order that this slight movement of the threads may suffice to carry the same over and under the shuttles b^8 , the said shuttles are supported and guided in the shuttle-race, which is a part of the bobbin-carrier a , each shuttle being shown as provided with grooves b^9 , which are cut to fit tongues formed on portions of the bobbin-carrier. As herein shown, both members of the shuttle-race are formed in sections, between which the threads guided by the fingers f are carried over and under the shuttles b^8 . The main annular member of the carrier a is shown as divided into sections by slots a^8 , and at each slot there is a supporting member a^9 correspondingly slotted, each member a^9 serving to support one end of one of the sectional upper members a^{10} , the guide-tongues of the upper and lower members being respectively indicated by the reference-letters a^{90} and a^{100} .

In order to compensate for wear, the shuttle-race, in accordance with the invention, is adjustable, the machine being provided with means for moving one of the supporting members of the shuttle-race toward the other to afford a proper fit as the members become worn. As herein shown, both members of each section of the shuttle-race have the guide-tongues a^{90} and a^{100} adjustably supported, so as to be movable toward or from each other, the tongues a^{90} being shown as provided with slots a^{91} , through which extend locking-screws a^{92} , to secure the same to the members a^{10} , while the tongues a^{100} are similarly provided with slots a^{101} and screws a^{102} , by which they are adjustably secured to the annular portion of the carrier a . This construction is best illustrated in Figs. 2 and 3.

In order to admit of the ready insertion or removal of the shuttles b^8 , the upper sectional members a^{10} are arranged to be lifted up, as shown in Fig. 5, in order to permit the shuttles to be inserted, the said members a^{10} being maintained in position by their own weight, assisted, if necessary, by springs a^{12} . The said sectional members are provided with guiding and supporting pieces a^{13} , which enter openings a^{15} , Fig. 4, in the slotted members a^9 at each side of the slots a^8 . For convenience each sectional member a^{10} may be provided with a finger-piece a^{14} at the middle, and the springs

a^{12} are shown as connected with said finger-pieces and the carrier a .

The shuttle-propeller b is shown as provided with engaging members b^{10} , having their surfaces inclined upward toward the rear with relation to the direction of rotation of the shuttle-propeller b , each shuttle being pointed in front and having a projecting portion b^{12} , Figs. 2 and 3, having a downwardly-inclined surface in front, but a shoulder at the rear, where by it is engaged with a part of the said member b^{10} . Any thread, therefore, which projects across the path of the shuttle below the point thereof will be guided first downward by the shuttle b^8 and then upward by the member b^{10} and easily slipped past between the shuttle and said connecting member b^{10} , as is necessary. This construction is best illustrated in Fig. 3, where certain of the threads are shown as passing under the shuttles. As shown in said Fig. 3, the members b^{10} , which consist of bent strips of metal secured at their ends to the annulus of the propeller b , project across the path of the shuttles b^8 , the front part being bent downward from its point of connection with the annulus until it is below the bottom of the shuttle, and from this point (b^{100}) it is inclined upward and outward and then bent across the path of the shuttle in line with the direction of the bottom thread. The upwardly-inclined part which crosses the path of the shuttle constitutes the engaging portion against which the portion b^{12} rests, and, as clearly shown, the thread after slipping down the inclined surface of the portion b^{12} will ride up the inclined surface of the member b^{10} and will slip between the members with substantially no resistance, the engaging surfaces being in line with the thread, which thus slips between readily. For the better understanding of the drawings referred to it may be stated that the section is taken between adjacent sections of the shuttle-race with two of the shuttles crossing the threads at opposite sides, said shuttles being shown, respectively, in front and rear elevation as projecting forward from the line of section.

The guide-fingers f (see Figs. 1 and 5) are shown as consisting of bars pivotally connected at f^2 to the outside of the annular bobbin-carrier member, each bar constituting, as has been stated, two of said guide-fingers and extending past two of the spaces between the members of the sectional shuttle-race, the pivotal support f^2 being midway between the said slots. To move the fingers f up and down, therefore, in the rotation of the carrier a , it is necessary only to oscillate the said bars, and for this purpose each bar is connected by a link f^3 with a crank-arm f^4 , carried by a rock-shaft f^5 , mounted in suitable bearings suspended from the under side of the carrier-arms a^2 , the said rock-shaft f^5 having another radial arm, f^6 , provided with a cam-roll f^7 , which travels in the cam-groove

f^8 , formed in a cam member f^9 , fixed with relation to the frame, being shown as secured to the part a^4 of the spider a^5 by means of a set-screw f^{10} , as best shown in Figs. 2 and 4.
 5 The said cam f^9 being stationary, the several cam-rolls f^7 will be caused to travel along the groove f^8 , the shape of which is best shown in Figs. 1 and 5, so that the rock-shafts f^5 will be oscillated, causing the fingers to swing on
 10 the pivotal supports f^2 , one finger letting the thread down in one slot a^8 , so that it will pass under the shuttle, while the other finger carries the thread up to be passed through another slot near the top, so as to travel over
 15 another shuttle. By this arrangement it is obvious that the pattern or style of braiding may be easily controlled by properly shaping the cam and that cams of different shapes may be readily applied to the machine.
 20 The braid as it is wound is drawn from the machine (see Fig. 1) over the pulley g , driven by spur-gears g^1 g^2 g^3 and bevel-gears g^4 g^5 , the latter being on a vertical shaft g^6 , having a worm-gear g^7 intermeshing with a worm g^8
 25 on the driving-shaft D. The braid passes from the said pulley g to a drum h , which is rotated by means of a belt h^2 , suitably driven, as by a pulley h^3 on the main shaft D, the said belt h^2 being capable of slipping, so as to
 30 keep a tension on the braid without actually pulling the same through the machine. It is obvious that any suitable friction device may be used for this purpose.
 As indicated, the machine may be used for
 35 braiding fabric around a wire i , and the wire is shown as fed from a reel i^2 , which is below the machine, the said wire passing upward through the hollow sleeve c , which affords the bearing for the driving-shaft b^5 of the shuttle-propeller b . The wire i after it has been
 40 braided passes through a forked guide i^3 , which is vertically and horizontally adjustable, so that by moving the said guide with relation to the carrier a the inclination of the
 45 threads may be varied, making a closer weave the nearer the said guide is moved toward said carrier.
 The operation of the machine is as follows: The several shuttles b^8 having been placed in
 50 position in the shuttle-race and the threads therefrom carried inward and upward to the braiding-point, while the threads from the bobbins d are carried through the guides or pig-tails a^9 to tension e , take-up e^2 , and pig-
 55 tails e^3 and over the fingers f to the braiding-point, the machine is started and the bobbin-carrier a is caused to travel in one direction, while the shuttles b^8 are propelled in the
 60 shuttle-race in the opposite direction, each shuttle being engaged by one of the engaging members b^{10} . As the bobbin-carrier a travels, however, so that the shuttles b^8 one by one pass the bobbin-threads, the fingers f move up and down, guiding the threads and determining
 65 the positions of the said threads with relation

to the shuttles. As the guide-finger f moves upward it raises the thread so that the shuttle b^8 , traveling in the opposite direction, will pass under the said thread, the point of the shuttle, if necessary, engaging the under side
 70 of the thread, and as the finger f moves downward the thread will be lowered, since it is held taut by the feed, tension, and take-up, and will slip under the shuttle, being guided along between the inclined under surfaces
 75 thereof and the inclined upper surface of the engaging member b^{10} and readily slipping between the said member and the shuttle without danger of being caught or broken. The tension device e is adjusted so as to maintain
 80 the proper tension upon the thread between the said tension device and the braiding-point, the spring-finger or take-up e^2 , as stated, merely taking up the slack as the fingers move downward.
 85

There is comparatively little lateral strain upon the thread at any period in the operation, and the angle at which the thread is bent in passing over the finger f is in any position
 90 an obtuse angle, so that there is very little rubbing or wearing effect on the thread as it travels from the bobbin to the braiding-point and practically no lateral travel of the thread along any surface.

The shuttle-threads are tensioned in any
 95 suitable or usual way, it being practicable, for example, to tension the cops with which the shuttles are loaded in substantially the same way as has been shown and described in connection with the cops for the bobbins. For
 100 these reasons the machine can be operated at a high speed without danger of breaking the threads, while the construction is extremely simple and not likely to get out of repair.

Any suitable or usual construction of bobbin
 105 may be employed, it being necessary only to provide suitably-constructed shuttles, so as to aid in guiding the bobbin-threads.

It is not intended to limit the invention to the specific construction and arrangement of
 110 mechanism shown and described, since modifications may be made without departing from the invention.

It is to be noted that the shuttle used in the present instance is readily removable from the
 115 raceway and that it carries the cop or thread bobbin and the proper tensioning device for the thread. In other words, the shuttle is a structure such as is commonly defined by the term "shuttle," and is not merely a spool carrier or plate.
 120

I claim—

1. In a braiding-machine, the combination with a bobbin-carrier provided with a shuttle-race; of means for guiding the bobbin-threads
 125 back and forth across said shuttle-race; a shuttle carrier or propeller provided with an engaging member extending across the path of travel of the shuttle and inclined upward from a point below the shuttle toward the braiding-
 130

point; and shuttles provided with engaging members inclined downward toward the cooperating engaging member of the propeller.

2. In a braiding-machine, the combination with a bobbin-carrier provided with a shuttle-race; of means for guiding the bobbin-threads back and forth across said shuttle-race; a shuttle carrier or propeller having an engaging shoulder, the engaging surface of which is in line with the bobbin-thread; and shuttles having corresponding engaging shoulders, the shuttles and propeller having inclined surfaces converging toward said shoulders.

3. In a braiding-machine, a bobbin-carrier; shuttles; and guides for the bobbin-threads consisting of arms pivotally connected with the bobbin-carrier between adjacent bobbins; and means for oscillating said arms, whereby each arm constitutes a guide for two of the bobbin-threads.

4. In a braiding-machine, the combination of a bobbin-carrier having a shuttle-raceway formed therein; a series of removable shuttles freely movable in said raceway; a propeller making loose contact with said shuttles; means for rotating the carrier and propeller in opposite directions; and means carried by the bobbin-carrier for guiding the threads extending from the bobbins on the bobbin-carrier and causing them to interweave with the shuttle-threads.

5. In a braiding-machine, the combination of a bobbin-carrier having a substantially continuous shuttle-raceway formed therein; a series of shuttles freely movable in said raceway, said shuttles occupying a horizontal position and maintaining the bobbins or cops carried thereby in a like position; a propeller making loose driving contact with said shuttles; means for rotating the carrier and propeller relatively to each other; and thread-guides for the threads of the bobbins carried by the bobbin-carrier and adapted to cause said threads to interweave with the shuttle-threads, substantially as described.

6. In a braiding-machine, the combination of a bobbin-carrier rotatable about a vertically-disposed axis and having a shuttle-raceway formed therein, said raceway lying in a substantially horizontal plane; a series of shuttles loosely mounted in said raceway and having their longitudinal axes in a plane parallel with the raceway; a propeller making loose driving contact with said shuttles; guides supported upon the bobbin-carrier for the threads extending from the bobbins mounted upon said carrier, said guides positively placing the threads alternately above and below the shuttles; and means for causing the bobbin-carrier and propeller to rotate in reverse directions.

7. In a braiding-machine, the combination of a bobbin-carrier; a shuttle-guide formed in said carrier; one or more shuttles loosely mounted in said guide; means for moving said shuttles in opposition to the movement of the

bobbin-carrier; and thread-guides connected to the bobbin-carrier for directing the threads from the bobbins alternately above and below the shuttles, substantially as described.

8. In a braiding-machine, the combination of a bobbin-carrier; a shuttle-guide carried thereby; a series of shuttles freely movable in or upon said guide; a shuttle-driver making loose contact with said shuttles; bobbin-thread guides carried by the bobbin-carrier, said guides positively raising and lowering the threads, substantially as described; and means for moving the carrier or driver, one relatively to the other.

9. In a braiding-machine, the combination of a bobbin-carrier; a shuttle-guide formed therein; one or more shuttles loosely mounted in said guide; means making loose connection with said shuttles for driving the same; means for rotating the bobbin-carrier and the shuttle-driving means in opposite directions; thread-guides carried by the bobbin-carrier; and means for actuating said thread-guides.

10. In a braiding-machine, the combination of a bobbin-carrier; a shuttle-guide carried thereby; a shuttle-propeller; a series of shuttles driven by but wholly disconnected from said propeller; and bobbin-thread guides supported upon the carrier for positively placing the bobbin-threads above and below the plane of the shuttle-guide.

11. In a braiding-machine, the combination of a bobbin-carrier; a shuttle-raceway formed therein; a plurality of shuttles loosely mounted in said raceway and freely removable therefrom; a shuttle-propeller making loose driving contact with said shuttles; means for rotating said propeller in opposition to the movement of the bobbin-carrier; and movable thread-guides mounted upon said carrier for guiding the bobbin-threads to opposite sides of the shuttles through openings formed in the carrier and extending across the shuttle-raceway.

12. In a braiding-machine, the combination of an annular bobbin-carrier formed of a series of sections separated one from the other to form openings for the passage therethrough of the bobbin-threads; a shuttle-raceway formed in said carrier; a plurality of shuttles loosely mounted in and freely removable from said raceway; a propeller for said shuttles making loose driving contact therewith; guide-fingers for the bobbin-threads mounted upon the carrier adjacent to the spaces or openings intermediate the sections of the carrier; and means for actuating said fingers to positively place the bobbin-threads above and below the plane of the shuttle-raceway.

13. In a braiding-machine, the combination of a bobbin-carrier provided with a shuttle-race; thread-guides mounted on the bobbin-carrier for moving the bobbin-threads across said shuttle-race; a series of shuttles loosely mounted in the shuttle-race, each shuttle be-

ing provided with an inclined engaging surface or projection; and a shuttle-propeller having inclined engaging members making loose driving contact with the corresponding projections on the shuttles.

14. In a braiding-machine, the combination of a bobbin-carrier; a horizontally-disposed shuttle-race formed upon or in said carrier; a series of shuttles guided by said race and having their major axes in a horizontal plane; means for propelling the shuttles; guides for the bobbin-threads movable in a plane adjacent to and substantially parallel with said shuttle-race; and a stationary cam for moving said guides past said shuttle-race, whereby, by a relatively short movement of the guides, the bobbin-threads may be so positioned as to readily pass over and under the shuttles, substantially as described.

15. In a braiding-machine, the combination of a bobbin-carrier; a raceway formed therein; a series of shuttles loosely mounted in said raceway; a propeller making loose driving contact with said shuttles; guides for the bobbin-threads, said guides being mounted upon the carrier and movable in a plane adjacent to and substantially parallel with the shuttle-race, the threads passing through openings formed in and extending across the raceway and toward the braiding-point at the middle of the carrier; tension devices interposed between the bobbins and said guides; and a take-up between each of said tension devices and the corresponding guide.

16. In a braiding-machine, the combination of a bobbin-carrier; a sectional shuttle-raceway formed in said carrier, whereby spaces are left intermediate the adjacent sections; a series of horizontally-disposed shuttles mount-

ed in said raceway; and means for guiding the bobbin-threads above and below the shuttles between the adjacent sections, whereby a relatively small movement of the bobbin-thread is required to clear the shuttle, substantially as described.

17. In a braiding-machine, the combination of a rotary bobbin-carrier provided with a sectional shuttle-raceway having spaces between the adjacent sections thereof; a series of horizontally-disposed shuttles loosely mounted in said raceway; means for propelling the shuttles in said raceway; and means for guiding the bobbin-threads above and below the shuttles between adjacent sections of said shuttle-raceway, substantially as described.

18. In a braiding-machine, a bobbin-carrier having a sectional shuttle-raceway formed therein, the upper members of said raceway being movable to facilitate the placing of the shuttles in said raceway or the removal of the shuttles therefrom, substantially as described.

19. In a braiding-machine, the combination of a bobbin-carrier having a shuttle-raceway formed therein, one side of said raceway having readily-removable sections; and a series of shuttles loosely mounted in said raceway, whereby any one of the shuttles may be readily removed and as readily replaced by movement of one of said sections, substantially as described.

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

WALTER HILL.

Witnesses:

A. C. BROOKS,
W. J. COONEY.