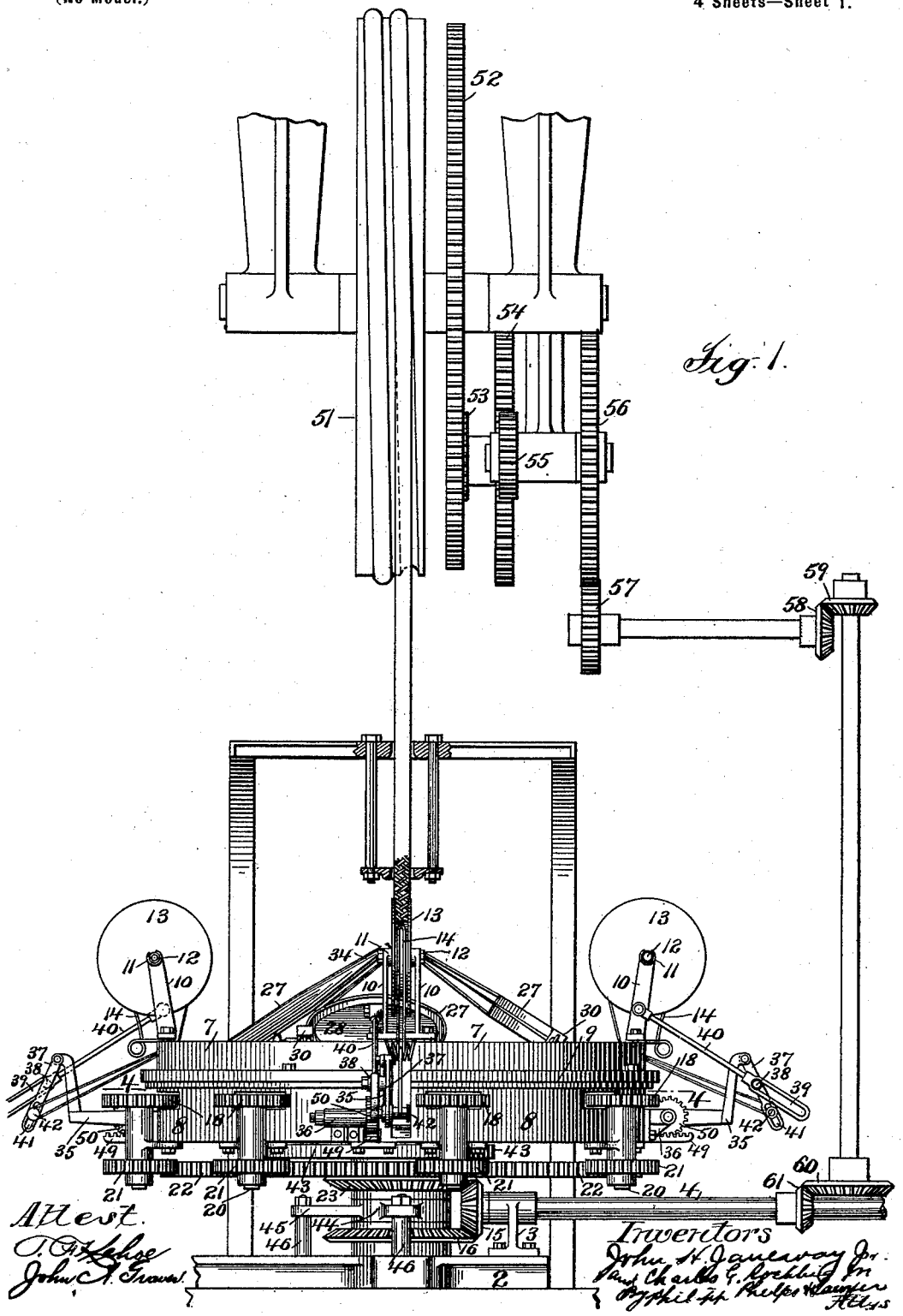
No. 647,410. Patented Apr. 10, 1900.

J. H. JANEWAY, JR. & C. G. ROEBLING, JR.

BRAIDING MACHINE.

(No Model.) (Application filed Jan. 16, 1900.) 4 Sheets—Sheet 1.

Fig. 1.



No. 647,410. Patented Apr. 10, 1900.

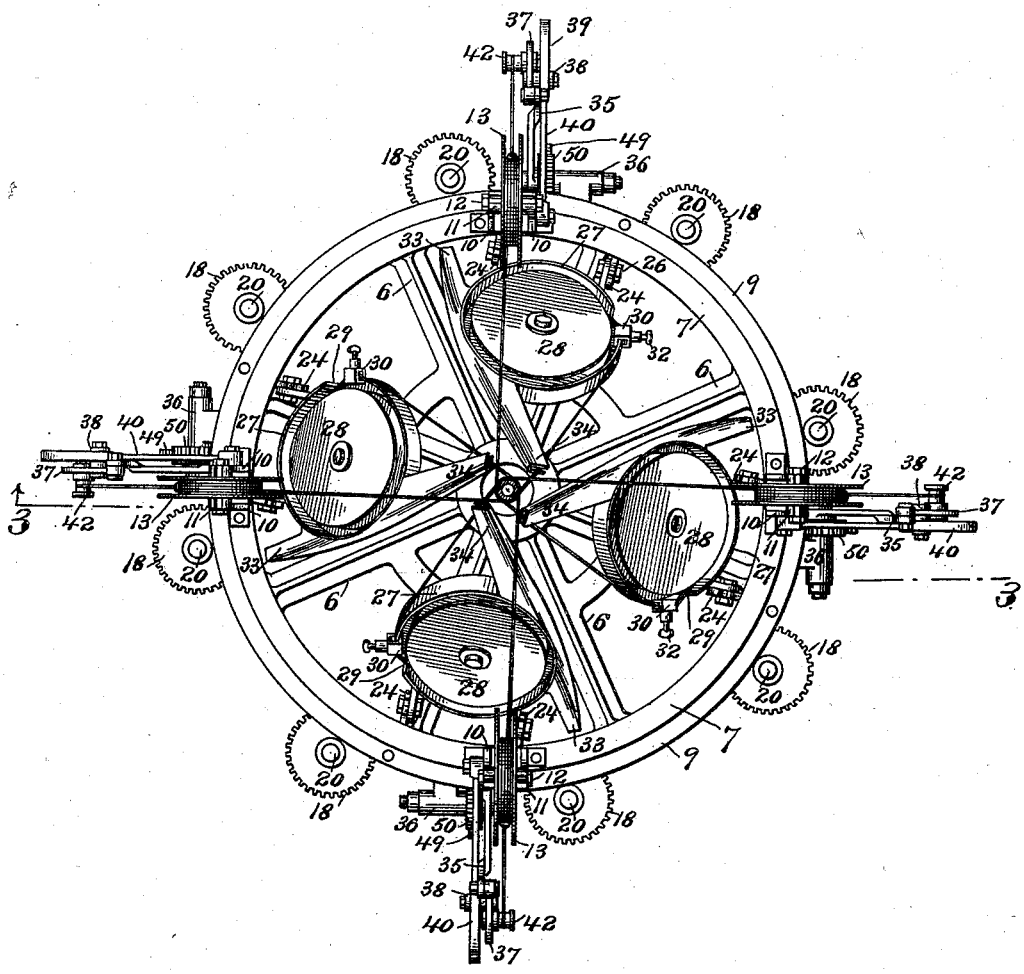
J. H. JANEWAY, JR. & C. G. ROEBLING, JR.

BRAIDING MACHINE.

(No Model.) (Application filed Jan. 16, 1900.)

4 Sheets—Sheet 2.

Fig. 2.



Attest:
C. F. Kehoe
John A. Evans

Inventors
John H. Janeway Jr.
and Charles G. Roebling Jr.
by Philipp Phelps & Sawyer
Attys

No. 647,410. Patented Apr. 10, 1900.

J. H. JANEWAY, JR. & C. G. ROEBLING, JR.

BRAIDING MACHINE.

(No Model.) (Application filed Jan. 16, 1900.) 4 Sheets—Sheet 3.

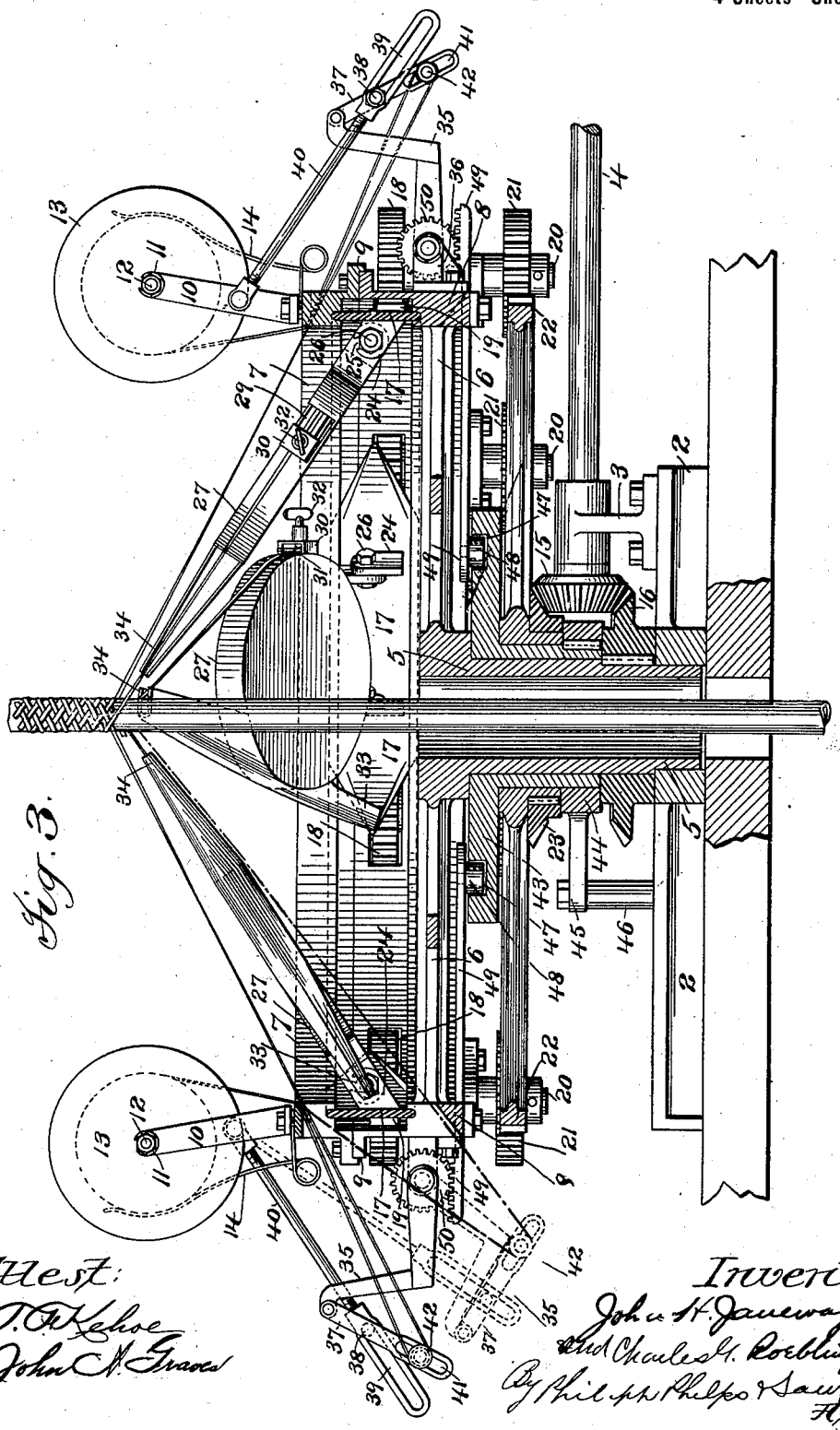


Fig. 3.

Attest:
C. F. Kehoe
John A. Graves

Inventors:
John H. Janeway Jr.
and Charles G. Roebling Jr.
By Philipp Philipp & Sawyer
Attys

No. 647,410. Patented Apr. 10, 1900.

J. H. JANEWAY, JR. & C. G. ROEBLING, JR.

BRAIDING MACHINE.

(No Model.) (Application filed Jan. 16, 1900.)

4 Sheets—Sheet 4.

Fig. 4.

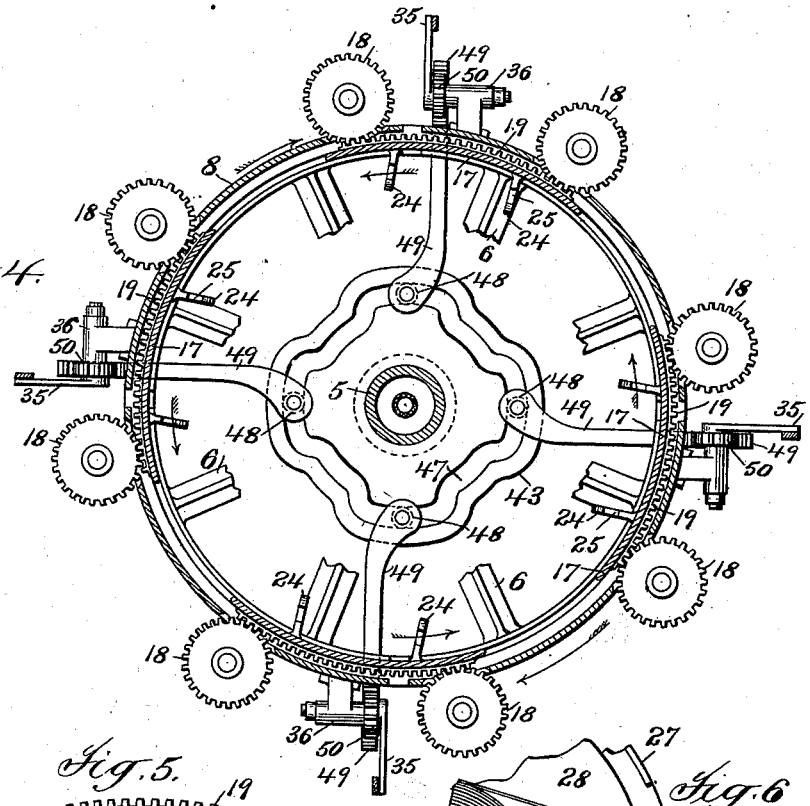


Fig. 5.

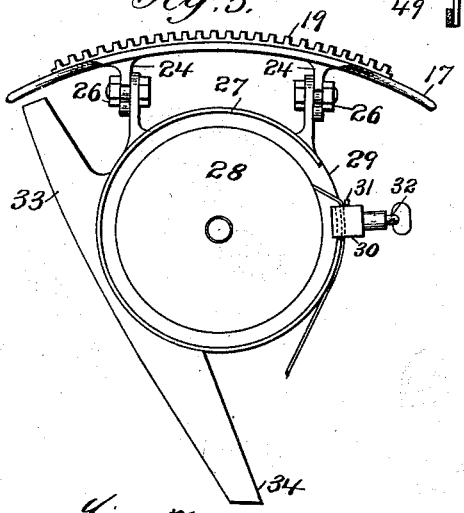


Fig. 6.

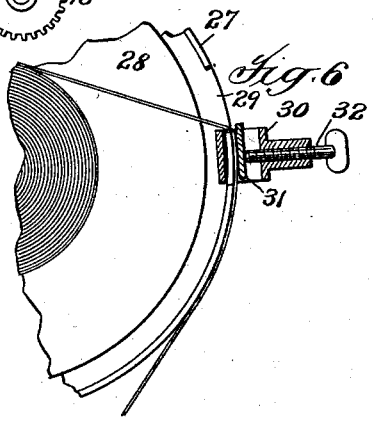
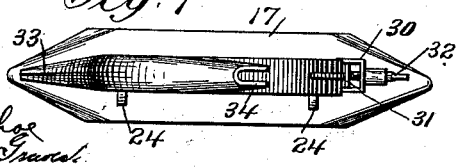


Fig. 7.



Attest.
T. A. Kehoe
John F. Grant.

Inventors
John H. Janeway Jr.
and Charles G. Roebling Jr.
By Philipp Phelps & Lawyer
Attys

UNITED STATES PATENT OFFICE.

JOHN H. JANEWAY, JR., AND CHARLES G. ROEBLING, JR., OF TRENTON, NEW JERSEY, ASSIGNORS TO THE WOVEN STEEL HOSE AND CABLE COMPANY, OF SAME PLACE.

BRAIDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 647,410, dated April 10, 1900.

Application filed January 16, 1900. Serial No. 1,641. (No model.)

To all whom it may concern:

Be it known that we, JOHN H. JANEWAY, Jr., and CHARLES G. ROEBLING, Jr., citizens of the United States, and residents of Trenton, Mercer county, New Jersey, have invented certain new and useful Improvements in Braiding-Machines, fully described in the following specification and the accompanying drawings, forming a part of the same.

The improvements of the present invention have been designed with reference particularly to machines for braiding metal strips about electric cables, hose, and other similar flexible articles. They will therefore and for convenience be described in detail in that connection. It is to be understood, however, that the invention is not so limited, as the improvements are also applicable with useful results to the braiding of other like materials—such, for example, as wires, cords, threads, tapes, or other strands.

In the accompanying drawings, Figure 1 is an elevation of a metal-strip-braiding machine embodying all the features of the present invention, said machine including braiding mechanism, feeding mechanism for feeding the article to be braided, and power mechanism for driving said braiding and feeding mechanisms. Fig. 2 is a plan view of the braiding mechanism proper. Fig. 3 is a sectional elevation, on an enlarged scale, taken on the line 3 of Fig. 2. Fig. 4 is a horizontal section on the line 4 of Fig. 1, illustrating particularly the mechanism for driving the shuttles and the mechanism for vibrating the bobbin-strip guides. Figs. 5, 6, and 7 are detail views of the shuttles.

Referring to said drawings, 2 represents the base of the machine, and 3 a bracket thereon, in which is journaled a power-shaft 4, by which the braiding and feeding mechanisms are driven, as hereinafter described. Upon the base-plate 2 is also journaled the bobbin-carrier, consisting of a sleeve or hollow tube 5, through which the article to be braided passes, provided with radial arms 6, supporting upper and lower circular plates 7 8, secured together by bolts passing through flanges 9, with which said plates or rings are provided. The upper ring or plate 7 is provided with the required number of bobbin-supports, four being shown, each of said supports consisting of vertical standards or posts 10, having bearings 11 at their upper ends for receiving a bolt or stud 12, which passes through a central opening in the bobbin 13, which carries the braiding-strands of material, consisting of strips of metal in the machine shown. The bobbins 13 are removable from their supports, and each stud or bolt 12 may be screw-threaded at one end or at each end for the reception of a threaded nut, as shown, so that the bolt may be removed from the standards 10 whenever it is desired to remove or insert a bobbin. This construction of bobbin-support will also serve the useful function of enabling the ease of rotation of the bobbin to be checked or regulated as desired, as the nut or nuts on the bolts 12 may be screwed up, so as to bend the standards 10 inwardly against the ends of the bobbins, and thus cause them to act as a brake. For ordinary purposes, however, a tension device—such as the spring 14, secured at one end to the bobbin-carrier and bearing at the other end against the coil of braiding-strip—will be sufficient. The bobbin-carrier is driven in the direction indicated by the outer arrows in Fig. 4 by means of a bevel-gear 15 upon the driving-shaft 4, which engages a like gear 16, keyed to the lower end of the sleeve or hub 5, as shown in Fig. 3. The bobbin-carrier is also provided with a circular raceway for the shuttles, which in the machine shown are independent shuttles—that is, have no common carrier for supporting and driving them—the opposing faces of the upper and lower rings 7 8 being grooved for this purpose, as best shown in Figs. 3 and 4, so as to receive the upper and lower edges of the back or supporting plates 17 of the shuttles, which are curved horizontally, as shown in Figs. 4 and 5, to conform to the curvature of the raceway in the bobbin-carrier. These shuttle-plates 17 are driven in the opposite direction to that of the bobbin-carrier, as indicated by the inner arrows in Fig. 4, by a series of driving-wheels, shown as consisting of pin-

ions 18, engaging racks 19, formed on the plates 17, these pinions 18 being mounted upon the upper ends of shafts 20, journaled in vertical bearings on the plate 8 and provided at their lower ends with pinions 21, meshing with a large gear-wheel 22, concentric with and rotating in the opposite direction to the bobbin-carrier and driven by a bevel-gear 23, meshing with gear 15 on the driving-shaft 4. The pinions 18 are arranged about the shuttle-raceway equidistant from each other, the distance between each two pinions and the length of the racks 19 on the shuttle-plates 17 being such that the shuttle-plates 17 will be at all times in engagement with either one or two of the pinions 18. In place of gear-wheels or pinions friction-wheels may be used in the above-described driving mechanism; but the gear-wheels are desirable with heavy strands or where the strain is considerable for any reason. The shuttle-plates 17 are provided with inwardly-extending brackets 24, having slots 25 on their upper edges for receiving bolts 26, with which each bobbin-frame is provided and by which said bobbin-frame is secured to said shuttle-plate, the bobbin-frames, by reason of this construction, being removable from their plates 17. The bobbin-frame of the shuttle consists of a cylindrical casing 27, in which is mounted the shuttle-bobbin 28, said casing 27 being cut away, as shown at 29, to provide an opening for the passage of the braiding-strip from the bobbin 28 to the braiding-point. This bobbin-casing 27 is also provided with a clamping device for maintaining the strip from the bobbin 28 under tension, this clamping device consisting of a bracket 30, secured to the casing 27 near the opening 29 and containing a loose and removable clamping-plate 31, held in engagement with the strip from the bobbin by means of a thumb-screw 32, mounted in the bracket 30, as best shown in Fig. 4. The connections between the casing 27 and the supporting-plate 17 of the shuttle are such as to support the casing 27 in an upwardly and inwardly inclined position, as illustrated in Fig. 3, and this position may be varied as desired to braid the strips in longer or shorter spirals and in accordance with the feed by adjusting the angle of the bobbin by the bolts 26. On the forward side of the casing 27—that is to say, the side which is in the lead as the shuttles are driven during the braiding operation—there is provided a guard or clearing-plate 33 for engaging the bobbin-strips and assuring the passage of the strips above or below each other, in accordance with the run of the shuttles, as the case may be. The inner or upper ends 34 of these guard-plates 33 also furnish guides for the strips from the bobbins 28, as best illustrated in Fig. 2, so as to secure their proper position at the braiding-point and prevent interference with each other. The bobbin-carrier is also provided with vibrating guides for alternately raising and lowering the bobbin-strips above and below the path of movement of the shuttles, so that the strips from the bobbins will be interwoven or braided with those from the shuttles. These vibrating guides are preferably constructed so as to serve the function of positive take-ups for maintaining the bobbin-strips under the proper tension during the braiding operation and during the movement of the bobbin-strips across the path of the shuttles. Each of these combined guides and take-up devices consists of an angular lever 35, pivoted at its inner end in a bracket 36, secured to the lower plate 8 of the bobbin-carrier and carrying at its outer end a swinging arm 37, connected by a pin-and-slot connection 38 39 to the end of a link 40, pivoted at its inner end to one of the standards or supports 10. The free end of the arm 37 carries a guiding-stud 42, around which the bobbin-strip passes to the braiding-point, as shown. The stud 42 is preferably adjustable on the arm 37, this result being secured in the construction shown by a longitudinal slot 41 in the arm 37, in which the stud 42 may be adjusted as desired to secure just the desired throw of the strips in accordance with the braiding action. As the lever 35 is rocked on its pivot its outer end and the arm 37 and link 40 will be moved alternately upward and downward into the extreme positions shown by full lines and dotted lines, respectively, in Fig. 3, and thus move the bobbin-strip alternately above and below the path of movement of the shuttles. It will be understood that as the lever 35, arm 37, and link 40 are moved down the arm 37 and its guiding-stud 42 will swing inward and upward toward the bobbin under the pull on the strip until it engages the under side of a projection on lever 35, so as to compensate for the movement of the lever 35 away from the bobbin, the pin 38 moving outward in the slot 39, while on the upward movement the upper end of the slot 39 will engage the pin 38 and force the arm 37 outward to act as a take-up for the strip.

The rocking movement of the levers 35 and connected parts is produced in the machine shown by stationary cam-plate 43, fixed to the base 2 of the machine by means of a collar 44, keyed to the hub of said cam-plate and provided with arms 45, secured to standards 46, extending upwardly from the base 2. This cam-plate 43 is provided with a cam-groove 47, which receives bowls 48 upon the inner ends of radially-movable cam-bars 49, suitably supported and guided in the lower plate or ring 8 of the bobbin-carrier, and which at their outer ends carry racks which engage pinions 50, fast to the axes of the inner ends of the levers 35. The cam-groove 47 contains as many cam-surfaces as there are vibrating bobbin-strip guides, the said cam-surfaces being equidistant from each other, so that during the braiding operation all of the bobbin-strip guides are simultaneously actuated in the same direction. As the bobbin-carrier rotates the rack-bars 49 carried thereby will

be moved alternately inward and outward, and thus will rock the levers 35 and connected parts downwardly and upwardly, as shown in Fig. 3.

The article or form on which the strands are to be braided, as before stated, passes upwardly through the hub 5 of the bobbin-carrier and may be an electric cable, hose, or other flexible article or a mandrel from which the braiding is removed when made. The article or mandrel so braided is fed past the braiding-point in the present machine by means of a drum 51, connected by a train of gears 52 53 54 55 56 57 58 59 60 61 between said drum and the shaft 4, as illustrated in Fig. 1, so that the braiding mechanism and feeding mechanism are driven from the same shaft. The speed of the feeding movement will depend upon the result desired and be adjusted according to such result.

From the foregoing description it will be understood that during the braiding operation the bobbin-carrier is rotated in one direction and the shuttles driven in the opposite direction by the driving-wheels 18 21 on the carrier, which wheels in turn are rotated by the gear 22, which is driven in the opposite direction to that in which the bobbin-carrier rotates. As the bobbin-carrier is thus rotated and the shuttles driven in the opposite direction the rack-bars 49, moving with the bobbin-carrier, will be moved alternately inward and outward by the stationary cam-plate 43, and thus through the pinions 50 vibrate the bobbin-strip guides upwardly and downwardly, as before described, and move the bobbin-strips above and below the path of movement of the shuttles.

It will be understood that modifications may be made in the form and arrangement of parts in machines embodying our invention, and we are not to be limited to the exact construction illustrated.

What is claimed is—

1. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving wheels arranged about the path of the shuttles and journaled in supports moving with the carrier, and vibrating guides for the bobbin-strands supported to move with the carrier, substantially as described.

2. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving wheels arranged about the path of the shuttles and journaled in supports moving with the carrier, an oppositely-rotating wheel for rotating said wheels, and vibrating guides for the bobbin-strands supported so as to move with the carrier, substantially as described.

3. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving pinions arranged about the path of the shuttles and journaled in supports so as to move with the carrier, an oppositely-rotating gear-wheel for rotating said pinions, and vibrating guides for the bobbin-strands supported to move with the carrier, substantially as described.

4. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving wheels arranged about the path of the shuttles and journaled in supports moving with the carrier, and radially-vibrating guides for the bobbin-strands supported to move with the carrier, substantially as described.

5. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving wheels arranged about the path of the shuttles and journaled in supports moving with the carrier, and combined vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, substantially as described.

6. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving wheels arranged about the path of the shuttles and journaled in supports moving with the carrier, and combined radially-vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, substantially as described.

7. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving wheels arranged about the path of the shuttles and journaled in supports moving with the carrier, vibrating guides for the bobbin-strands supported to move with the carrier, and a stationary cam for actuating said guides, substantially as described.

8. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving wheels arranged about the path of the shuttles and journaled in supports moving with the carrier, radially-vibrating guides for the bobbin-strands supported to move with the carrier, and a stationary cam for actuating said guides, substantially as described.

9. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving wheels arranged about the path of the shuttles and journaled in supports moving with the carrier, combined vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, and a stationary cam for actuating said guides and take-ups, substantially as described.

10. The combination of a rotating bobbin-carrier, oppositely-driven independent shuttles, shuttle-driving wheels arranged about the path of the shuttles and journaled in supports moving with the carrier, combined radially-vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, and a stationary cam for actuating said guides and take-ups, substantially as described.

11. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined vibrating

guides and positive take-ups for the bobbin-strands supported to move with the carrier, and means for vibrating said guides and take-ups, substantially as described.

12. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined pivoted vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, and means for vibrating said guides and take-ups, substantially as described.

13. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined radially-vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, and means for vibrating said guides and take-ups, substantially as described.

14. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined radially-vibrating pivoted guides and positive take-ups for the bobbin-strands supported to move with the carrier, and means for vibrating said guides and take-ups, substantially as described.

15. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, and means for vibrating said guides and take-ups comprising a pinion and radially-movable rack-bar for each guide and take-up, substantially as described.

16. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined pivoted vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, and means for vibrating said guides and take-ups comprising a pinion and radially-movable rack-bar for each guide and take-up, substantially as described.

17. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined radially-vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, and means for vibrating said guides and take-ups, comprising a pinion and radially-movable rack-bar for each guide and take-up, substantially as described.

18. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined radially-vibrating pivoted guides and positive take-ups for the bobbin-strands supported to move with the carrier, and means for vibrating said guides and take-ups, comprising a cam, and a radially-movable cam-bar for each guide and take-up, substantially as described.

19. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, and a stationary cam and connections for vibrating said guides and take-ups, substantially as described.

20. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, combined vibrating guides and positive take-ups for the bobbin-strands supported to move with the carrier, and means for vibrating said guides and take-ups, including a radially-movable bar for each guide and take-up and means for actuating the bars, substantially as described.

21. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, vibrating guides for the bobbin-strands supported to move with the carrier, and means for vibrating said guides, including a pinion and radially-movable rack-bar for each guide, substantially as described.

22. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, vibrating guides for the bobbin-strands supported to move with the carrier, and means for vibrating said guides including a radially-movable bar for each guide, substantially as described.

23. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, vibrating guides for the bobbin-strands supported to move with the carrier, and means for vibrating said guides comprising a pinion and radially-movable rack-bar for each guide and a stationary cam for actuating the rack-bars, substantially as described.

24. The combination of a rotating bobbin-carrier, oppositely-driven shuttles, suitable shuttle-driving means, vibrating guides for the bobbin-strands supported to move with the carrier, and means for vibrating said guides including a radially-movable bar for each guide and a cam for actuating the bars, substantially as described.

25. The combination with a suitably-driven bobbin-carrier, shuttle, and suitable shuttle-driving means, of a vibrating guide for the bobbin-strand consisting of lever 35 carrying arm 37, a bobbin-strand guide on said arm, and link 40 having a sliding connection with arm 37, substantially as described.

26. The combination with a suitably-driven bobbin-carrier, shuttle, and suitable shuttle-driving means, of a vibrating guide for the bobbin-strand consisting of lever 35, carrying arm 37, an adjustable guide for the bobbin-strand on said arm, and link 40 having a sliding connection with arm 37, substantially as described.

27. The combination with a suitably-driven bobbin-carrier, oppositely-driven shuttle, and suitable shuttle-driving means, of a vibrating guide for the bobbin-strand supported to move with the carrier, and consisting of lever 35, provided with pinion 50, arm 37 on said lever carrying a guide for the bobbin-strand, link 40 having a sliding connection with the

arm 37, and means for actuating said lever 35 including radially-movable rack-bar 49 moving with the carrier and engaging pinion 50, substantially as described.

28. The combination with a suitably-driven bobbin-carrier, oppositely-driven shuttle, and suitable shuttle-driving means, of a vibrating guide for the bobbin-strand supported to move with the carrier, and consisting of lever 35 carrying arm 37, link 40 having a sliding connection with arm 37, and means for actuating said lever 35 including a radially-movable bar connected to said lever, substantially as described.

29. The combination with a lever and means for rocking said lever, of arm 37 on said lever, strand-guide 42 adjustable on said arm, and link 40 having a slot-and-pin connection 38, 39 with said arm, substantially as described.

30. The combination with a suitably-driven bobbin-carrier, comprising upper and lower plates 7, 8 with a raceway formed between their opposing faces, of a plurality of shuttles each provided with a supporting-plate in said raceway having an outer vertical driving-face, a plurality of driving-wheels journaled in the carrier and grouped about the raceway to engage and drive the shuttles, and driving-wheel 22, substantially as described.

31. The combination with a suitably-driven bobbin-carrier and suitable raceway, of a shuttle provided with a supporting-plate as 17, an inwardly-extending bobbin-casing, as 27, and an inwardly-extending clearing-plate 33 in line with and at the forward side of the casing, substantially as described.

32. The combination with a suitably-driven bobbin-carrier and suitable raceway, of a shuttle provided with a supporting-plate as 17, an inwardly-extending bobbin-casing as 27, and a clearing-plate 33 at the forward side of the casing provided with a guide 34 at its inner end for the shuttle-strand, substantially as described.

33. A shuttle consisting of supporting-plate 17, a bobbin-casing 27 carried by said supporting-plate and pivotally mounted thereon to swing transversely to the line of movement of the shuttle for adjustment of the bobbin angularly to the shuttle movement, and means for retaining it in its position of adjustment, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

JOHN H. JANEWAY, JR.
CHARLES G. ROEBLING, JR.

Witnesses:
AUSTIN C. COOLEY,
HARVEY COOLEY.