W. T. LE BLANC.

BRAIDING MACHINE.

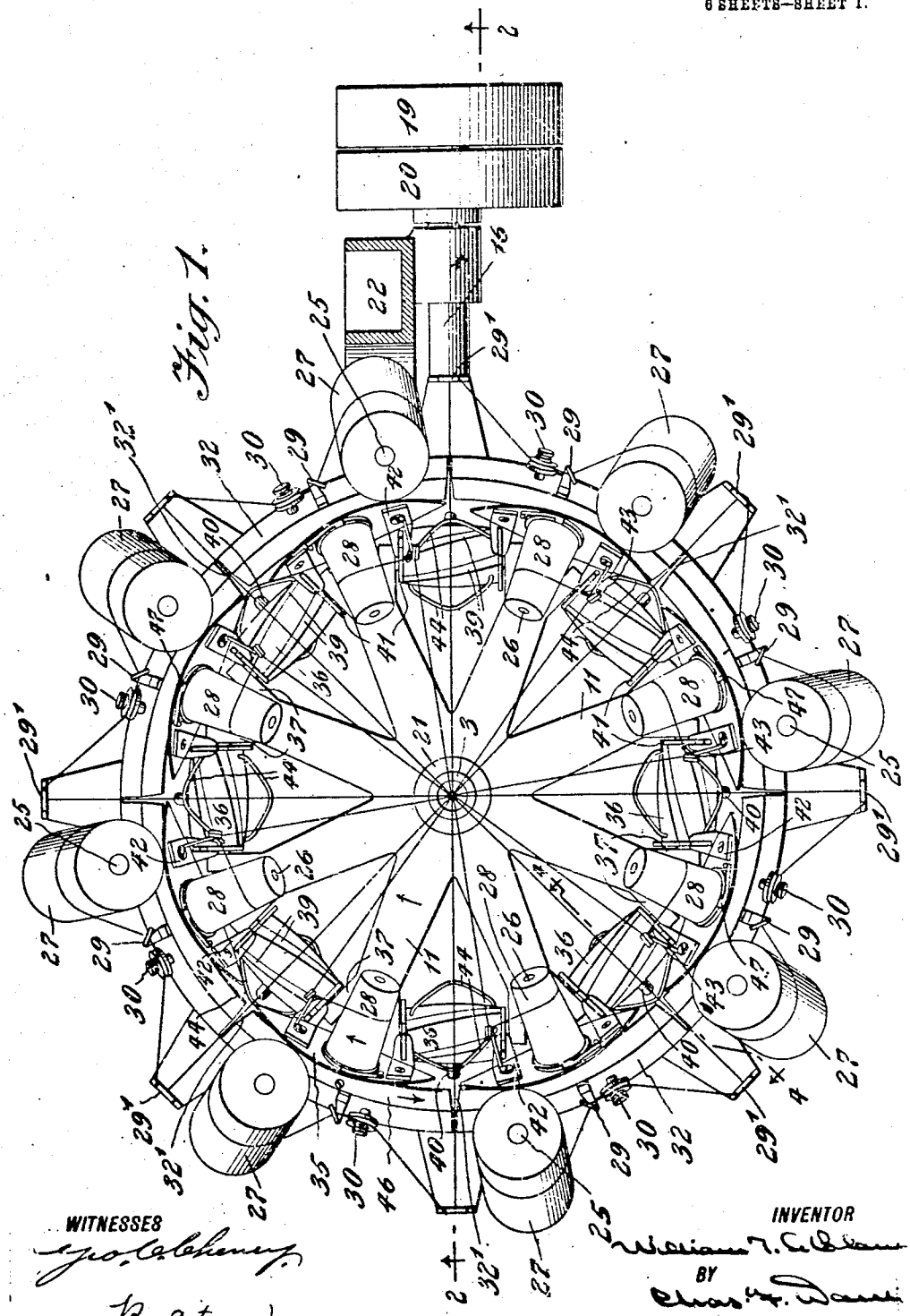
APPLICATION FILED APR. 5, 1909.

958,512.

Patented May 17, 1910.

6 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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6 SHEETS—SHEET 2.

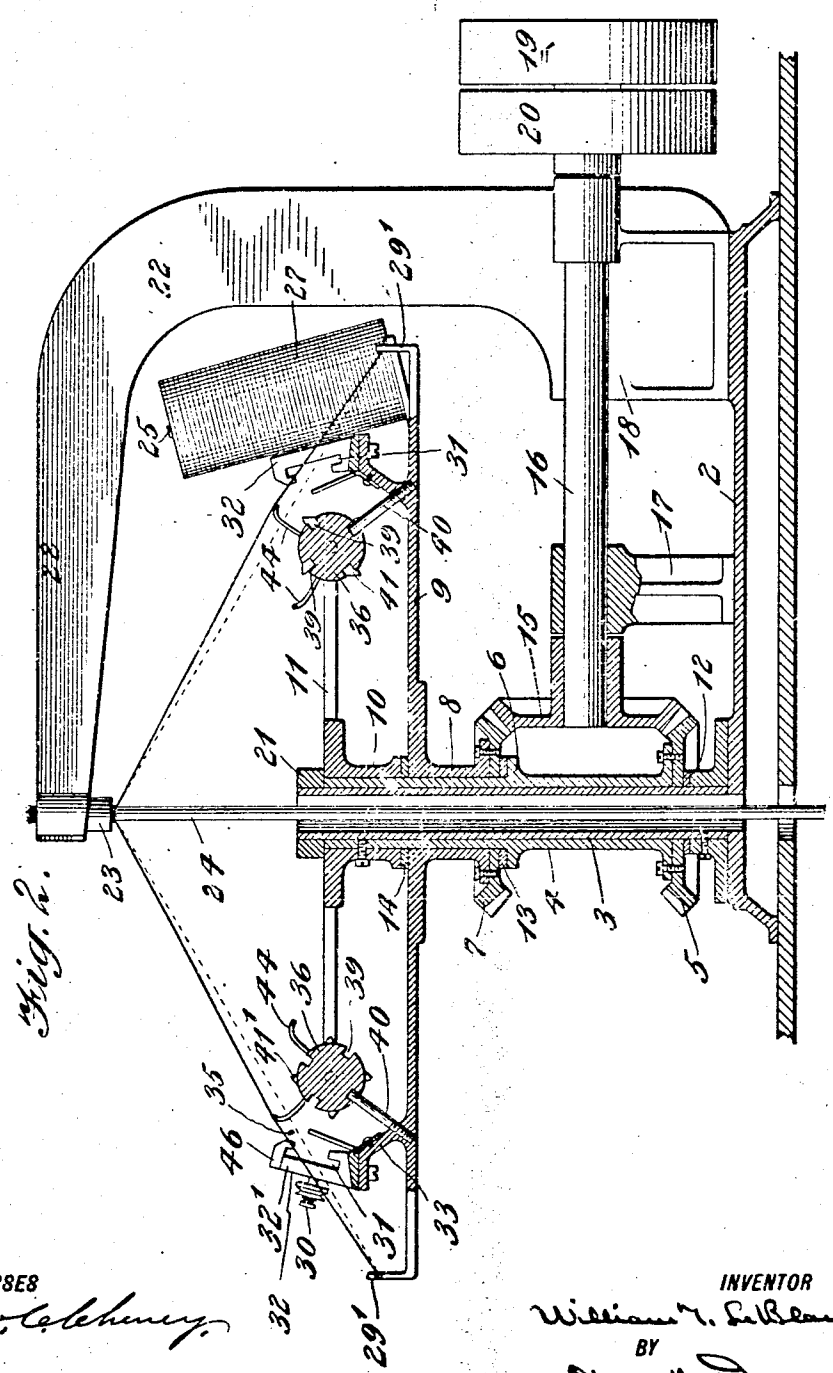

Fig. 2.

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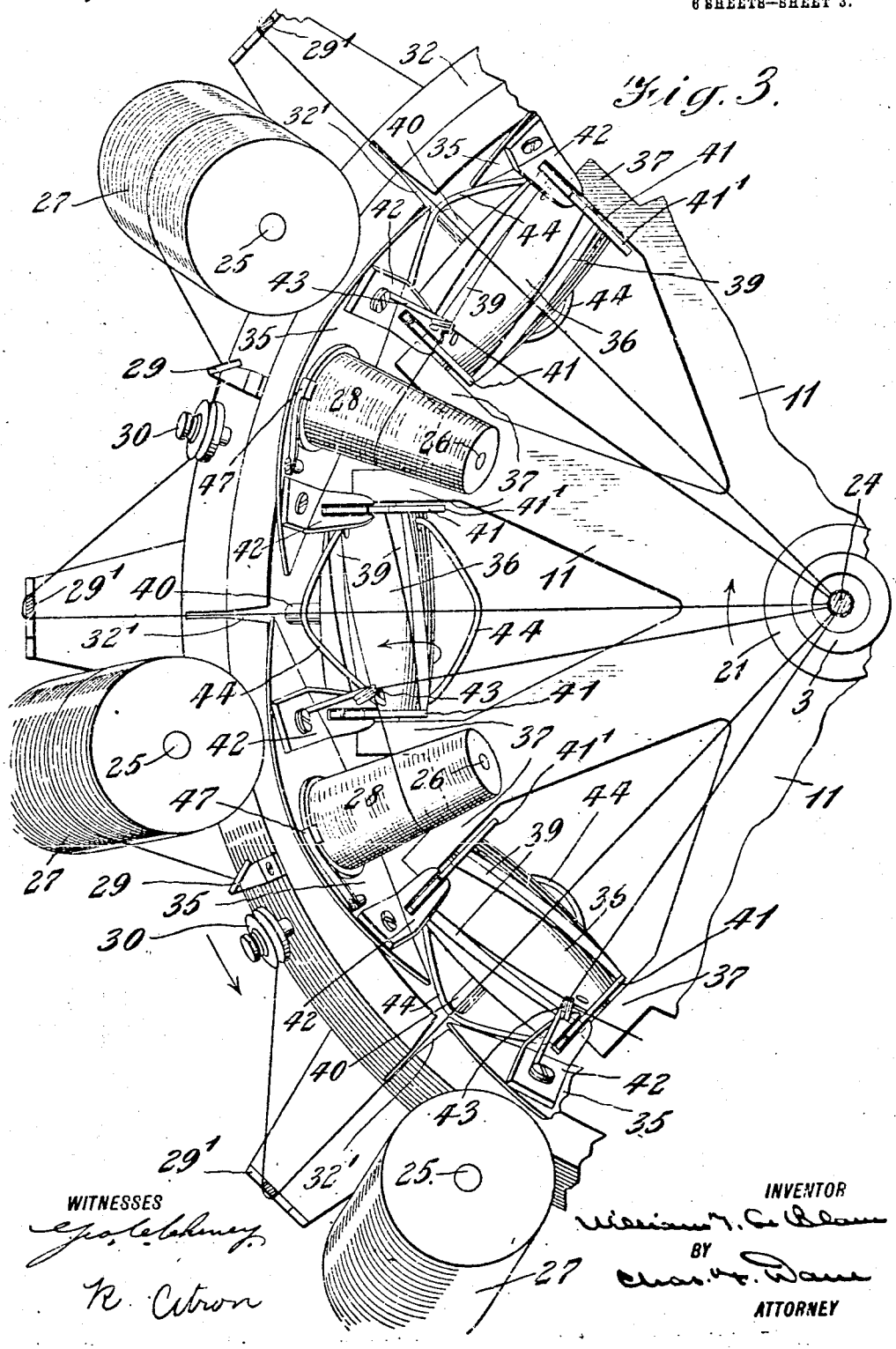
6 SHEETS—SHEET 3.

Fig. 3.



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6 SHEETS—SHEET 4.

Fig. 4.

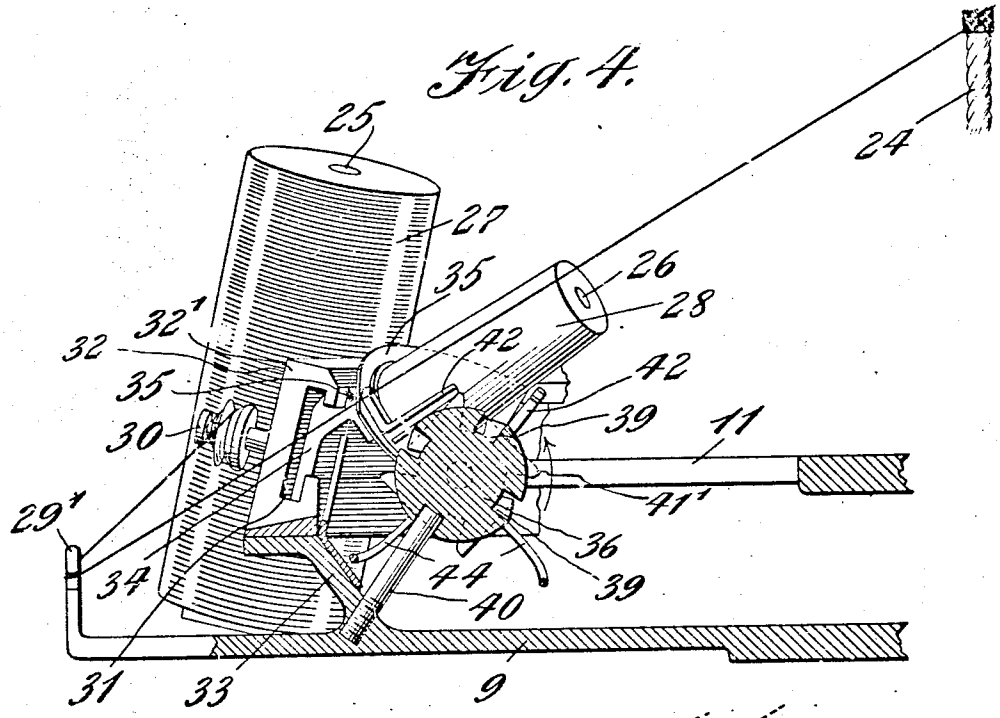
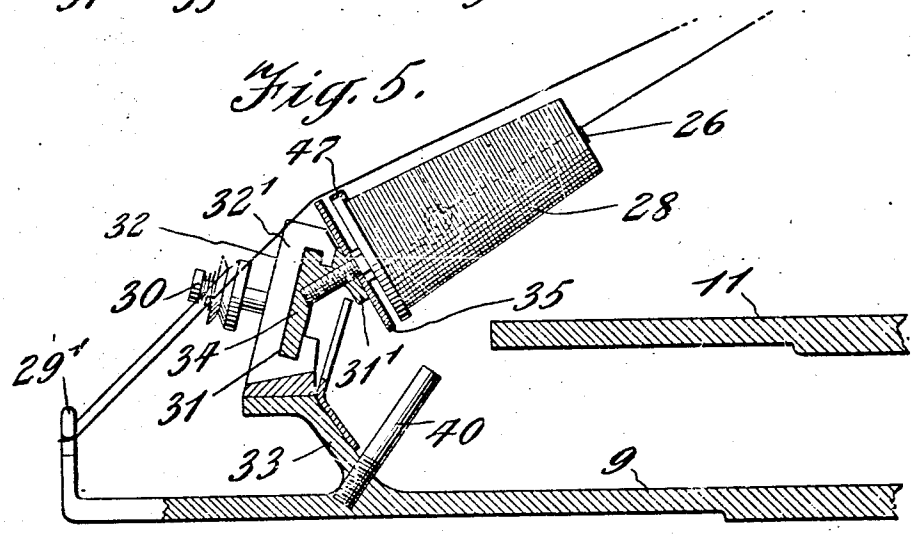


Fig. 5.



WITNESSES

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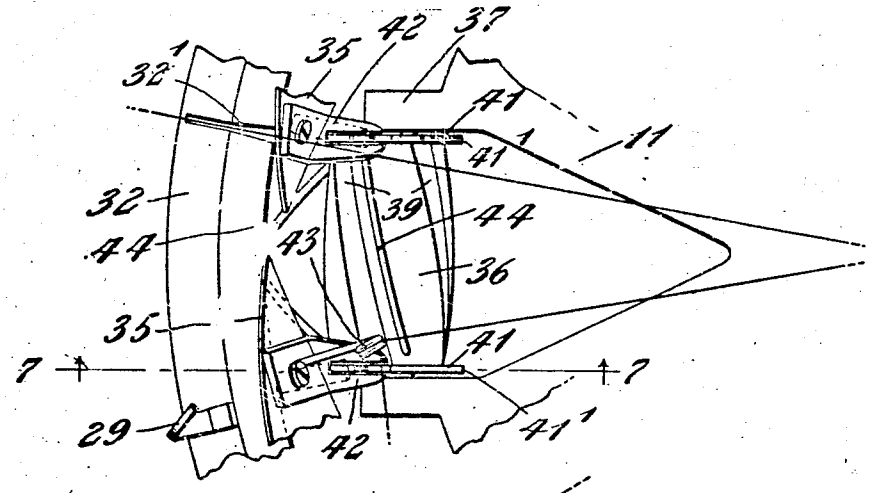
958,512. Patented May 17, 1910.

6 SHEETS—SHEET 5.

Fig. 6.



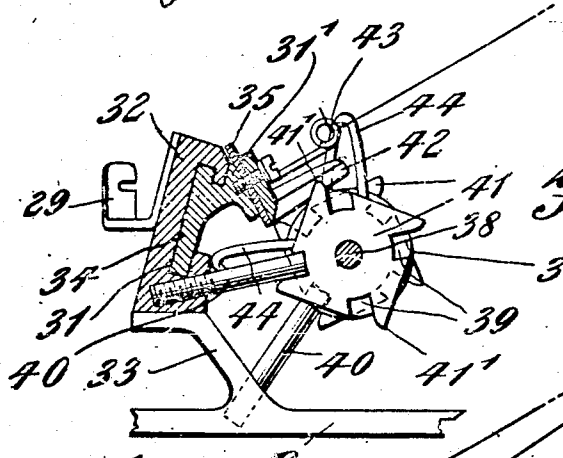


Fig. 7.

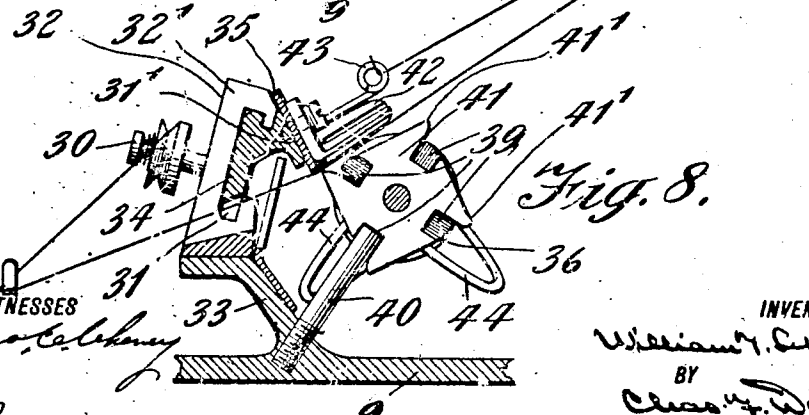


Fig. 8.

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BRAIDING MACHINE.

APPLICATION FILED APR. 5, 1909.

958,512. Patented May 17, 1910.

6 SHEETS—SHEET 6.

Fig. 9.

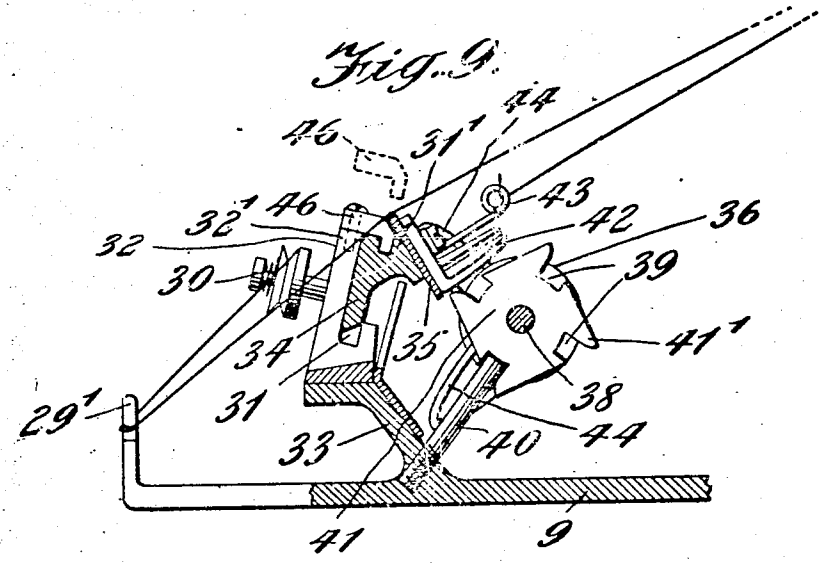


Fig. 10.

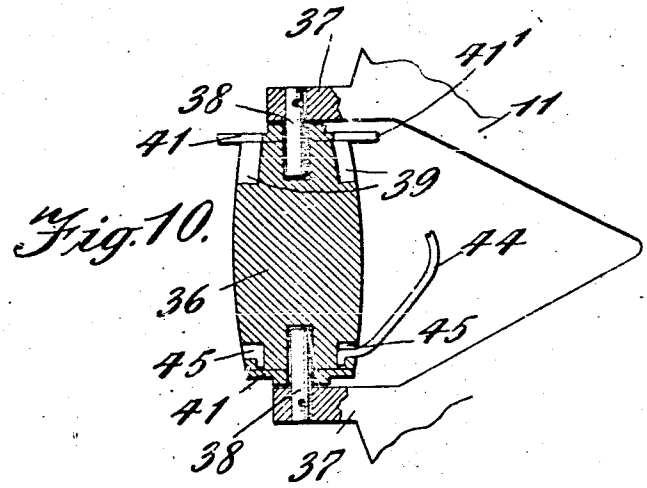
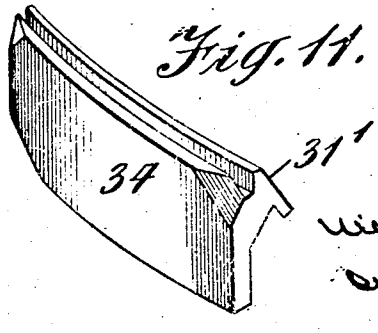


Fig. 11.



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UNITED STATES PATENT OFFICE.

WILLIAM T. LE BLANC, OF NEW YORK, N. Y.

BRAIDING-MACHINE.

958,512. Specification of Letters Patent. Patented May 17, 1910.

Application filed April 5, 1909. Serial No. 487,917.

To all whom it may concern:

Be it known that I, WILLIAM T. LE BLANC, a citizen of the United States, and resident of New York, in the county of Kings and State of New York, have invented certain new and useful Improvements in Braiding-Machines, of which the following is a specification.

This invention relates to braiding machines, and the objects of the invention are generally to provide an improved machine of this class of simple and cheap construction the parts of which are light and so organized as to render the machine capable of being run at higher speeds than machines as heretofore constructed, while producing the best results in braiding.

One of the principal features of the machine that distinguishes it from other braiding machines heretofore used is the employment of simple pattern-changing mechanism for producing at will braids having their threads interlaced in various ways, and this pattern-changing mechanism is so constructed and operated as to produce various changes in the mode of interlacing the threads and hence in the braid produced, by mere adjustment of simple and light thread-weaving devices capable of effective operation at high speeds.

Other important features of the invention will be hereinafter described and claimed and are illustrated in the accompanying drawings, in which—

Figure 1 is a plan, partly in section, of a braiding machine embodying my present invention; Fig. 2 is a central vertical section of the same, the section being taken in the line 2—2, Fig. 1; Fig. 3 is an enlarged plan of a portion of the machine shown in Fig. 1, and illustrates in greater detail than in said figure various thread-supplying and pattern-controlling devices; Fig. 4 is an enlarged sectional detail, the section being taken in the line 4—4, Fig. 1, illustrating a pair of inner and outer bobbin-holders together with a pattern-controlling device for determining the manner in which the inner and outer threads fed from the bobbins shall be interlaced; Fig. 5 is a substantially similar sectional detail illustrating the manner in which the outer threads are raised above the inner threads by means of a switch-plate; Fig. 6 is an enlarged plan of one of the pattern-controlling devices and coöperating parts and illustrates the manner in which the outer thread is raised above its normal line of travel; Fig. 7 is an enlarged sectional detail, taken in the line 7—7, Fig. 6, and illustrates the manner in which the pattern-controlling device is operated and operates; Fig. 8 is an enlarged sectional detail similar to Fig. 5 and illustrates the pattern-controlling device and a coöperating switch-plate in a position to permit an outer thread to pass the pattern-controlling device while said thread is held below its normal line of travel and below the inner thread with which it is interlaced; Fig. 9 is an enlarged sectional detail similar to Fig. 8, illustrating the opposite condition, that is, the parts in position with the outer thread raised above its normal line of travel and above the inner thread and with the pattern-controlling device in position to close the path for the thread illustrated in Fig. 8; Fig. 10 is an enlarged detail illustrating in sectional plan the construction of one of the pattern-changing devices, and Fig. 11 is a perspective of a removable section of one of the carriers for the bobbins.

Similar characters designate like parts in all the figures of the drawings.

Referring first to Figs. 1 and 2, many of the parts of the machine are preferably substantially the same as in braiding machines heretofore constructed, and for the purpose of illustration these parts are so shown. For example, the machine shown in these views is illustrated as having a bed or base 2 from which rises a hollow fixed post 3 having an external journal surface on which turns a long sleeve 4. At the lower end thereof this sleeve 4 has secured thereto a large bevel-gear 5 by means of which the sleeve is rotated, and at a point a considerable distance above said bevel-gear said sleeve has an annular support 6 for another large bevel-gear 7 which is fixed to the hub portion 8 of the rotary carrier 9 journaled on the upper portion of the sleeve 4. The rotary carrier or table 9 in turn constitutes a support for the hub portion 10 of another rotary carrier or table 11, which is fixed to the upper end of the sleeve 4. The bearing surfaces of the various parts just described are separated in the well known manner by antifriction or fiber washers, such as are illustrated at 12, 13 and 14. The two carriers or tables 9 and 11 are intended to be rotated in opposite directions by means of the gears 5 and 7, these being driven in the

usual manner by a bevel-gear 15 secured to the end of a main driving-shaft 16 mounted in suitable bearings, such as 17 and 18, rising from the base of the machine, said shaft having at its end the usual fast-and-loose pulleys 19 and 20. At the outer end of the tubular base 3 is placed a stop 21 for limiting upward movement of the carrier 11.

In connection with the devices just described there is also shown the usual overhanging arm 22 rising from one side of the base of the machine and extending at its free end to the braiding point, it having at such a point the usual gatherer 23 in alinement with the axis of the base 3 through which the core to be braided is passed. This core is indicated at 24, and may be fed upward in the usual manner by a pull-off device (not shown).

The two carriers 9 and 11 support, as is usual, two sets of thread-supplying devices, which are generally in the form of bobbins mounted on bobbin-holders, one set being located outside the other and so positioned that the threads of one set may be readily shifted to one side or the other of the threads of the other set and interlaced therewith as they pass the threads of such other set.

In Fig. 1, eight sets of bobbin-holders are shown on each carrier and each holder carries a bobbin. The bobbin-holders of the outer set are designated respectively by 25 and those of the inner set by 26. Correspondingly the bobbins of the outer set are designated by 27 and those of the inner set by 28. As in other machines of this type, the two sets of bobbin-holders and the bobbins carried thereby are intended to move orbitally on their carriers in opposite directions, it being obvious that one of the carriers 9 and 11 is rotated in one direction by its bevel-gear 7 while the other is rotated in the opposite direction by the bevel-gear 5, both of these bevel-gears being rotated in time with each other but in opposite directions by the driving bevel-gear 15.

An important feature of the two sets of thread-supplying devices is that both of them are of simple construction, the main element of each bobbin-holder being merely a spindle or pin fixed at its outer end to its carrier and free at its inner end to permit its bobbin to be quickly placed in position or removed. This reduces considerably the weight of the parts to be rotated and also facilitates the insertion of filled bobbins and removal of empty ones. It will be noticed also that these bobbin-holders of the two sets are all inclined at their free ends toward the braiding point, the angle of inclination being immaterial so long as it is sufficient to prevent the bobbins from being thrown from their holders by centrifugal force during rotation of their carriers, while at the same time permitting the threads to pass properly from the bobbins to the braiding point.

All of the bobbins 27 of the outer set are mounted on bobbin-holders 25 secured directly to the lower carrier or table 9. The thread from each of these outer bobbins is also shown as guided and tensioned by a thread-guide and a tension device carried directly by said lower carrier 9, these thread-guides and tension devices being designated respectively by 29, 29′ and 30. The bobbin-holders of the inner set are not, however, in this construction carried directly by the table 11, but are mounted on switch-plates secured to carrier-segments movable in an annular guideway on the lower carrier 9, and the switch-plates are connected through suitable means with the carrier 11, which in this case is formed as a spider having a number of arms equal to the bobbins which it supports.

The particular construction of the switch-plates, carrier segments, etc., just referred to, differs radically from anything heretofore used in braiding machines, so far as I am aware. The lower carrier 9, however, may have an annular guideway somewhat similar to that heretofore used in other braiding machines. This annular guideway is indicated at 31 and is formed in a ring 32 supported on and fastened to an annular extension 33 of the lower or main carrier 9. The carrier-segments which move in this guideway are designated generally by 34. Each is preferably a curved member shaped to conform to the contour of the guideway 31 in which it is to travel and having a supporting face 31′ to which a switch-plate may be secured. Switch-plates of suitable construction are secured to these carrier-segments and move therewith in a direction opposite to the direction of travel of the carrier 9 and its annulus 32, the function of these switch-plates being to control the manner in which the threads of the outer set are interlaced with the threads of the inner set and thereby control the pattern braided by the machine. The switch-plates employed are preferably of the type or construction illustrated at 35. Each is a pointed segment with a wide central portion, it being so constructed as to guide one of the outer threads over either its inner or its outer face, so that the threads will pass either above or below, as the case may be, the normal line of travel of the threads of the inner set. Each plate is preferably disposed with its face substantially perpendicular to the line of travel of said inner threads.

An important feature of this machine is that the forward end of each switch-plate is disposed above the normal path of travel of the threads of the outer set, and the switch-plate normally operates to depress the

threads of the outer set below the threads of the inner set and thus interlace the same as the two sets pass each other traveling in opposite directions. This normal action of the switch-plates is, however, in my machine capable of wide variation by the employment in connection with the switch-plates of pattern-changing devices which, taken either separately or considered collectively with the switch-plates, constitute pattern-controlling or pattern-changing means for determining the number and sequence of the threads of one set which shall pass at one side or the other of the threads of the other set during the braiding operation, the manner in which the threads of the two sets are interlaced obviously governing the weave or pattern produced. These pattern-changing devices, together with certain other parts which will be hereinafter referred to, constitute in the construction illustrated herein the means for connecting the spider-armed carrier 11 with the segmental elements 34 of the upper carrier and with the switch-plates, bobbin-holders, etc., supported by said segments.

The particular construction of the means employed for controlling and varying the mode of interlacing the threads of the two sets may be varied within quite wide limits. That illustrated is a light, simple and easily adjusted and operated means for the purpose, requiring no change of the parts of the machine itself but merely the adjustment or operation, or both, of parts which are a permanent part of the machine. In this construction the main element of each pattern-changing device is illustrated as a rotary member 36 supported at its opposite ends for rotation between the ends of a pair of spider-arms 37 of the carrier 11, these arms being here divided at their free ends in such a manner as to form separate supports for the ends of different rotary pattern-changing members 36. Each of the rotary parts 36 is illustrated (see Fig. 10) trunnioned at its opposite ends on pins 38 and as having extending lengthwise thereof spiral grooves 39 into which pass at intervals driving-pins 40 projecting up from the lower carrier 9. The guide-grooves of the rotary members 36 are here shown as four in number, and the driving-pins 40 move into and out of these grooves successively in such a manner that as one pin is withdrawing from a spiral groove 39 another pin 40 is entering another of the grooves 39 of the same rotary member, thus assuring a positive rotation of this rotary pattern-changing member. These members 36 have at their ends plates, such as 41, with four projecting fingers, which in the rotation of the parts 36 enter and pass through slots in ears 42 fastened to the switch-plates at opposite ends thereof. The construction is such that the rotary pattern-changing elements 36 with their end plates are always in engagement with at least one of the ears 42 with which they coöperate, and hence are always in positive driving connection with the switch-plates and the carrier-segments 34, which are thus always carried positively in their orbits by these connections from the spider-armed carrier. Each switch-plate is also shown as having a thread-guide 43 for one of the threads of the inner set.

The manner in which the elements 36 are rotated by the driving-pins 40 of the lower carrier as those pins move in one direction while the elements 36 are carried by the spider-arms in an orbit in the opposite direction, will be obvious from the foregoing and from the drawings illustrating these parts. The manner in which these parts 36 operate to control the pattern and to vary the manner in which the threads of the two sets are interlaced as they travel rapidly past each other in opposite directions will now be described.

Each of the rotary elements 36 carries in addition to the parts before described one or more thread-shifting devices constituting the pattern-changing devices proper. These thread-shifting devices may be of any suitable type and construction so long as they are capable of performing the functions specified. In the construction illustrated each is a light piece of wire curved to form a projection of sufficient extent for raising the outer threads as they pass under those threads. These wires are indicated at 44, there being preferably two for each of the rotary elements 36. These thread-shifting devices are preferably spring wires and may be snapped into proper locking sockets at opposite ends of the parts 36, such as the L-shaped sockets 45 (see Fig. 10). There are four sets of these sockets disposed about the periphery of each rotary element 36, which permits the wires 44 to be adjusted to different positions about the periphery of the rotary element, and also to different positions relative to each other. As each of the elements 36 is positively rotated, it will be clear that the movements of the thread-shifting devices 44 will at all times bear a positive relation to the movements of all of the other parts, no matter what the rotative positions may be to which these wires have been adjusted. The rotation of said parts affords one means for controlling the pattern made by the machine, that is to say, the wires move in paths such that at definite periods they shift the outer threads above their normal line of travel and above the normal line of travel of the forward ends of the switch-plates.

It will be noticed that the high point of each thread-shifting device 44 is adjacent to the forward end of a switch-plate at the moment when one of the outer threads is to

be raised (see Fig. 3), at which time the device 44 may operate to raise the thread so that it will pass along the upper edge of the next switch-plate instead of following its normal path under the lower edge of said switch-plate.

It will be obvious that by properly regulating the number and positions of the thread-shifting devices carried by each rotary element 36 and by positively rotating the parts 36 in the manner illustrated and described, many variations in the normal operation of passing each outer thread under each switch-plate may be obtained. Thus, by properly adjusting or setting the different spring wires 44 to proper circumferential positions about their respective rotary elements 36, the outer threads may be caused to pass above every other switch-plate or above two or more switch-plates successively, as desired, and various other modifications of the mode of interlacing the two sets of threads are possible by the employment of the devices illustrated or of suitable modifications within the scope of my invention, without removing from the machine any part thereof and without adding any weight thereto. It will be seen, too, that all of these parts of the pattern-changing apparatus which permit the weaving of various kinds of braids are light and easy running elements and do not reduce the speed of operation of the machine.

In Fig. 9 I have illustrated at 46 a removable section of the ring 32 in which is formed the guideway for the carrier-segments. This removable section is long enough to permit the carrier-segments 34 with their attached switch-plates, bobbin-holders, etc., to be dropped into the guideway 31 through the opening presented at said point at the top of the ring 32 and then shifted to their proper orbital positions. When all of the carrier-segments are in place the section 46 of the ring may be fastened in position as illustrated in full lines in Fig. 9, to close the opening. Various features of the machine require no extended description. For example, any suitable means may be employed for controlling the movements of the threads of the inner set including the tension thereof. In addition to the thread-guides 43, shown in connection with these threads, spring-catches or detents are illustrated at 47 for holding the bobbins of the inner set in place on their switch-plates.

What I claim is:

1. In a braiding machine, the combination with a pair of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, and means embodying two coöperative thread-guiding devices associated and movable orbitally with one of said thread-supplying devices and controlling the interlacing of the threads, one of said thread-guiding devices being operative to direct the passage of one thread to either one side or the other of the other thread and the other of said thread-guiding devices being movable to different positions relative to said first-mentioned thread-guiding device and thereby controlling the thread guiding operation of the latter.

2. In a braiding machine, the combination with a pair of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, and means embodying two coöperative thread-guiding devices associated and moving orbitally with one of said thread-supplying devices and controlling the interlacing of the threads, one of said thread-guiding devices being operative to direct the passage of one thread to either one side or the other of the other thread and the other of said thread-guiding devices being rotatively movable to different positions relative to said first-mentioned thread-guiding device and thereby controlling the thread guiding operation of the latter.

3. In a braiding machine, the combination with a pair of thread-supplying devices, of a pair of rotary carriers supporting said thread-supplying devices respectively, means for rotating said carriers in opposite directions, and means embodying two coöperative thread-guiding devices associated and movable orbitally with one of said thread-supplying devices and controlling the interlacing of the threads, one of said thread-guiding devices being operative to direct the passage of one thread to either one side or the other of the other thread and the other of said thread-guiding devices being movable to different positions relative to said first-mentioned thread-guiding device and thereby controlling the thread guiding operation of the latter.

4. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said sets of devices and moving them in opposite orbits, and a set of pairs of coöperative thread-guiding devices associated and movable orbitally with one of said sets of thread-supplying devices and controlling the interlacing of the two sets of threads, one of said thread-guiding devices of each pair being operative to direct the passage of threads of one set to either one side or the other of threads of the other set and the other thread-guiding device of each pair being movable to different positions relative to said first-mentioned device of each pair and thereby controlling the thread-guiding operation of the latter device.

5. In a braiding machine, the combination with a pair of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, means embodying two coöperative thread-guiding devices

associated and movable orbitally with one of said thread-supplying devices and controlling the interlacing of the threads, one of said thread-guiding devices being operative to direct the passage of one thread to either one side or the other of the other thread and the other or second of said thread-guiding devices being movable to different positions relative to said first-mentioned thread-guiding device and thereby controlling the thread guiding operation of the latter, and means for moving said second thread-guiding device to its said different thread-controlling positions during its orbital movement.

6. In a braiding machine, the combination with a pair of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, means embodying two coöperative thread-guiding devices associated and movable orbitally with one of said thread-supplying devices and controlling the interlacing of the threads, one of said thread-guiding devices being operative to direct the passage of one thread to either one side or the other of the other thread and the other or second of said thread-guiding devices being rotatively movable to different positions relative to said first-mentioned thread-guiding device and thereby controlling the thread guiding operation of the latter, and means for moving said second thread-guiding device to its said different thread-controlling positions during its orbital movement.

7. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, and pattern-changing means movable orbitally with one of said sets of thread-supplying devices and controlling one set of threads, said pattern-changing means embodying a set of devices adjustable to different pattern-controlling positions determining the number and sequence of threads of one set to pass at one side or the other of a thread of the other set.

8. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, and pattern-changing means movable orbitally with one of said sets of thread-supplying devices and controlling one set of threads, said pattern-changing means embodying a set of devices each of which is adjustable separately to different pattern-controlling positions determining the number and sequence of threads of one set to pass at one side or the other of a thread of the other set.

9. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, and pattern-changing means supported by one of said carriers and controlling one set of threads, and embodying a set of devices adjustable to different pattern-controlling positions determining the number and sequence of threads of one set to pass at one side or the other of a thread of the other set.

10. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, and pattern-changing means supported by one of said carriers and controlling one set of threads, and embodying a set of devices each of which is adjustable separately to different pattern-controlling positions determining the number and sequence of threads of one set to pass at one side or the other of a thread of the other set.

11. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, pattern-changing means movable orbitally with one of said sets of thread-supplying devices and controlling one set of threads, said pattern-changing means embodying a set of devices adjustable to different pattern-controlling positions determining the number and sequence of threads of one set to pass at one side or the other of a thread of the other set, and means for imparting to said pattern-changing devices independent thread-shifting movements while they are being carried in their orbits.

12. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, pattern-changing means movable orbitally with one of said sets of thread-supplying devices and controlling one set of threads, said pattern-changing means embodying a set of devices adjustable to different pattern-controlling positions determining the number and sequence of threads of one set to pass at one side or the other of a thread of the other set, and means for imparting to said pattern-changing devices rotary thread-shifting movements while they are being carried in their orbits.

13. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, pattern-changing means supported by one of said carriers and controlling one set of threads, and embodying a set of devices adjustable to different pattern-controlling positions determining the number and sequence of threads of one set to pass at one side or the other of a thread of the other set, and

means supported by one of said carriers for imparting to said pattern-changing devices thread-shifting movements while they are being carried in their orbits.

14. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, pattern-changing means supported by one of said carriers and controlling one set of threads, and embodying a set of devices adjustable to different pattern-controlling positions determining the number and sequence of threads of one set to pass at one side or the other of a thread of the other set, and means supported by the other of said carriers for imparting to said pattern-changing devices rotary thread-shifting movements while they are being carried in their orbits.

15. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, a set of switch-plates normally controlling the interlacing of two sets of threads, and pattern-changing means movable and coöperative with said switch-plates and controlling one set of threads, said pattern-changing means embodying a set of devices adjustable to different pattern-controlling positions determining whether said threads shall pass at one side or the other of said switch-plates.

16. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, a set of switch-plates normally controlling the interlacing of two sets of threads and having their forward ends above the normal line of travel of the outer set of threads, and pattern-changing means movable and cooperative with said switch-plates and embodying a set of devices adjustable to different pattern-controlling positions determining whether the threads of the outer set shall pass over or under the forward ends of the switch-plates.

17. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, a set of switch-plates normally controlling the interlacing of two sets of threads, and pattern-changing means movable relatively to and coöperative with said switch-plates and controlling one set of threads, said pattern-changing means embodying a set of devices adjustable to different pattern-controlling positions determining whether said threads shall pass at one side or the other of said switch-plate.

18. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, a set of switch-plates normally controlling the interlacing of two sets of threads and having their forward ends above the normal line of travel of the outer set of threads, and pattern-changing means movable relatively to and coöperative with said switch-plates and embodying a set of devices adjustable to different pattern-controlling positions determining whether the threads of the outer set shall pass over or under the forward ends of the switch-plates.

19. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, a set of switch plates, a set of rotary pattern-changing devices coöperative with said switch-plates and controlling the number and sequence of threads of one set to pass at one side or the other of threads of the other set, and means for rotating said pattern-changing devices.

20. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, a set of switch-plates, a set of rotary pattern-changing devices coöperative with said switch-plates and controlling the number and sequence of threads of one set to pass at one side or the other of threads of the other set, and a circuit of devices for intermittently engaging and rotating said pattern-changing devices.

21. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, a set of switch-plates, a set of rotary pattern-changing devices coöperative with said switch-plates and controlling the number and sequence of threads of one set to pass at one side or the other of threads of the other set, and means for rotating said pattern-changing devices in one direction and in planes passing through the axis of the orbit of their travel.

22. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, a set of switch-plates, a set of rotary pattern-changing devices coöperative with said switch-plates and controlling the number and sequence of threads of one set to pass at one side or the other of threads of the other set, said switch-plates and pattern-changing devices being associated and movable with one of said carriers, and means on

the other carrier for rotating said pattern-changing devices.

23. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, a set of switch-plates, a set of rotary pattern-changing devices coöperative with said switch-plates and controlling the number and sequence of threads of one set to pass at one side or the other of threads of the other set, said switch-plates and pattern-changing devices being associated and movable with one of said carriers, and a circuit of devices on the other carrier for intermittently engaging and rotating said pattern-changing devices.

24. In a braiding machine, the combination with two sets of bobbin-holders, of a pair of rotary carriers supporting said bobbin-holders respectively, means for rotating said carriers in opposite directions, a set of rotary pattern-changing devices controlling the number and sequence of threads of one set to pass at one side or the other of threads of the other set and each adjustable to different rotary positions determining the mode of interlacing said threads, and means for rotating said pattern-changing devices in planes passing through the axis of the orbit of their travel.

25. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, and a set of thread-weaving devices associated and movable orbitally with one of said sets of thread-supplying devices and comprising a set of switch-plates, a set of thread-shifting devices coöperative with said switch-plates in controlling the interlacing of the two sets of threads, means for rotating said thread-shifting devices in planes passing through the axis of the orbit of their travel, and means for effecting a driving connection between said thread-shifting devices and switch-plates.

26. In a braiding machine, the combination with two sets of thread-supplying devices, of means for supporting said devices and moving them in opposite orbits, and a set of thread-weaving devices associated and movable orbitally with one of said sets of thread-supplying devices and comprising a set of switch-plates, a set of thread-shifting devices coöperative with said switch-plates in controlling the interlacing of the two sets of threads, means for rotating said thread-shifting devices in planes passing through the axis of the orbit of their travel, and means carried by said thread-shifting devices for intermittently engaging and driving said switch-plates.

27. In a braiding machine, the combination with two sets of thread-supplying devices, of means including two rotary carriers for supporting said devices and moving them in opposite orbits, and a set of thread-weaving devices associated and movable orbitally with one of said sets of thread-supplying devices and comprising a set of switch-plates slidably mounted on one of said rotary carriers, a set of thread-shifting devices mounted on the other of said rotary carriers and being coöperative with said switch-plates in controlling the interlacing of the two sets of threads, means for rotating said thread-shifting devices in planes passing through the axis of the orbit of their travel, and means carried by said thread-shifting devices for intermittently engaging and driving said switch-plates.

28. In a braiding machine, the combination with two sets of thread-supplying devices, of means including two rotary carriers for supporting said devices and moving them in opposite orbits, and a set of thread-weaving devices associated and movable orbitally with one of said sets of thread-supplying devices and comprising a carrying means slidably mounted on one of said rotary carriers, a set of switch-plates and one of said sets of thread-supplying devices mounted on said carrying means, a set of thread-shifting devices mounted on the other of said rotary carriers and being coöperative with said switch-plates in controlling the interlacing of the two sets of threads, means for rotating said thread-shifting devices in planes passing through the axis of the orbit of their travel, and means carried by said thread-shifting devices for operatively engaging and driving said carrying means and the supported switch-plates and thread-supplying devices.

Signed at New York, in the county of New York, and State of New York this 3rd day of April, A. D. 1909.

WILLIAM T. LE BLANC.

Witnesses:
CHAS. F. DANE,
R. CITRON.