No. 647,466. Patented Apr. 17, 1900.

A. BOTTENBERG.

BRAIDING MACHINE.

(Application filed Nov. 23, 1899.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

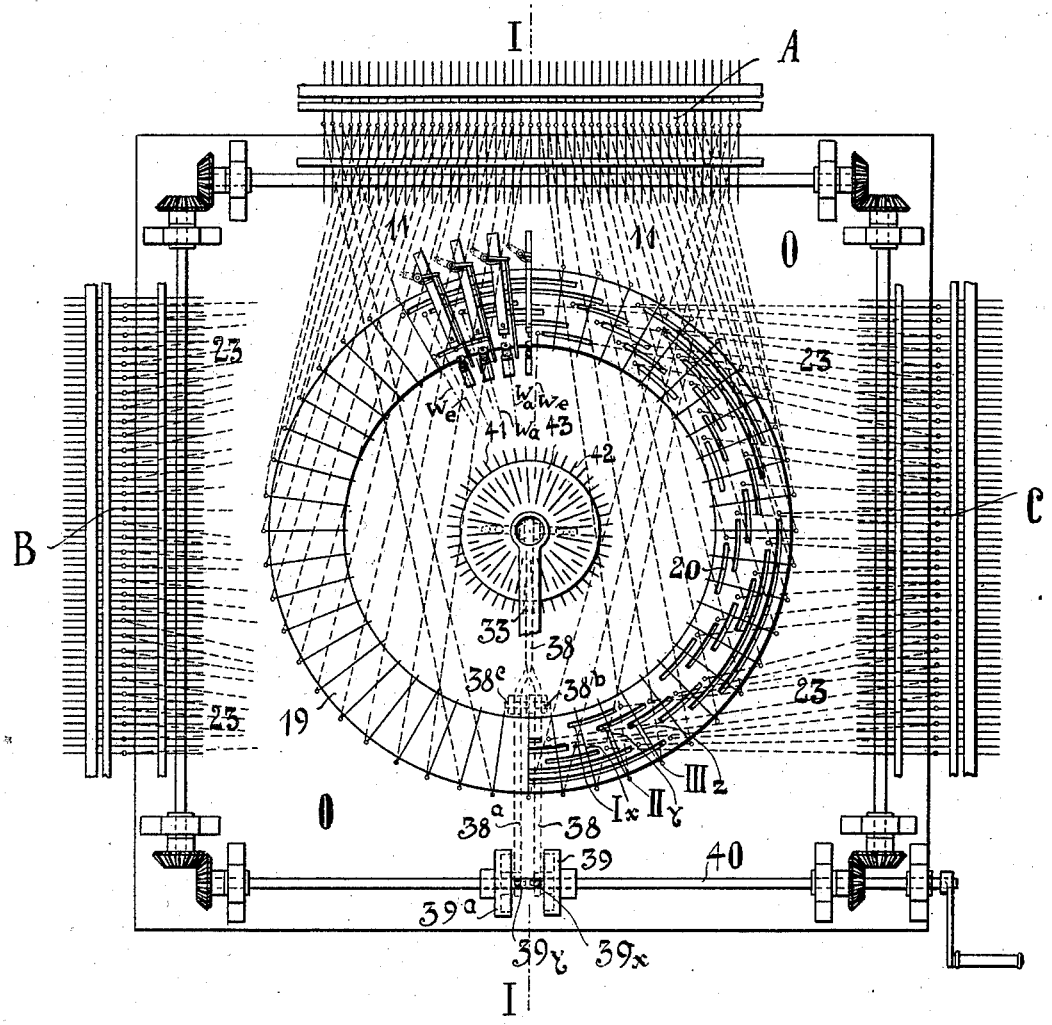
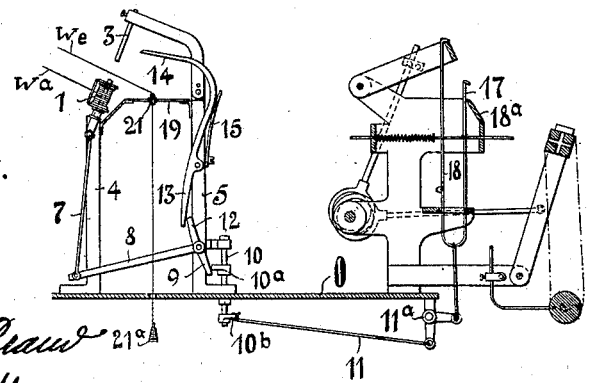


Fig. 13.



Witnesses.

Konrad Braun

William Fiddle

Inventor:

Adolf Bottenberg

No. 647,466. Patented Apr. 17, 1900.

A. BOTTENBERG.

BRAIDING MACHINE.

(Application filed Nov. 23, 1899.)

(No Model.) 5 Sheets—Sheet 2.

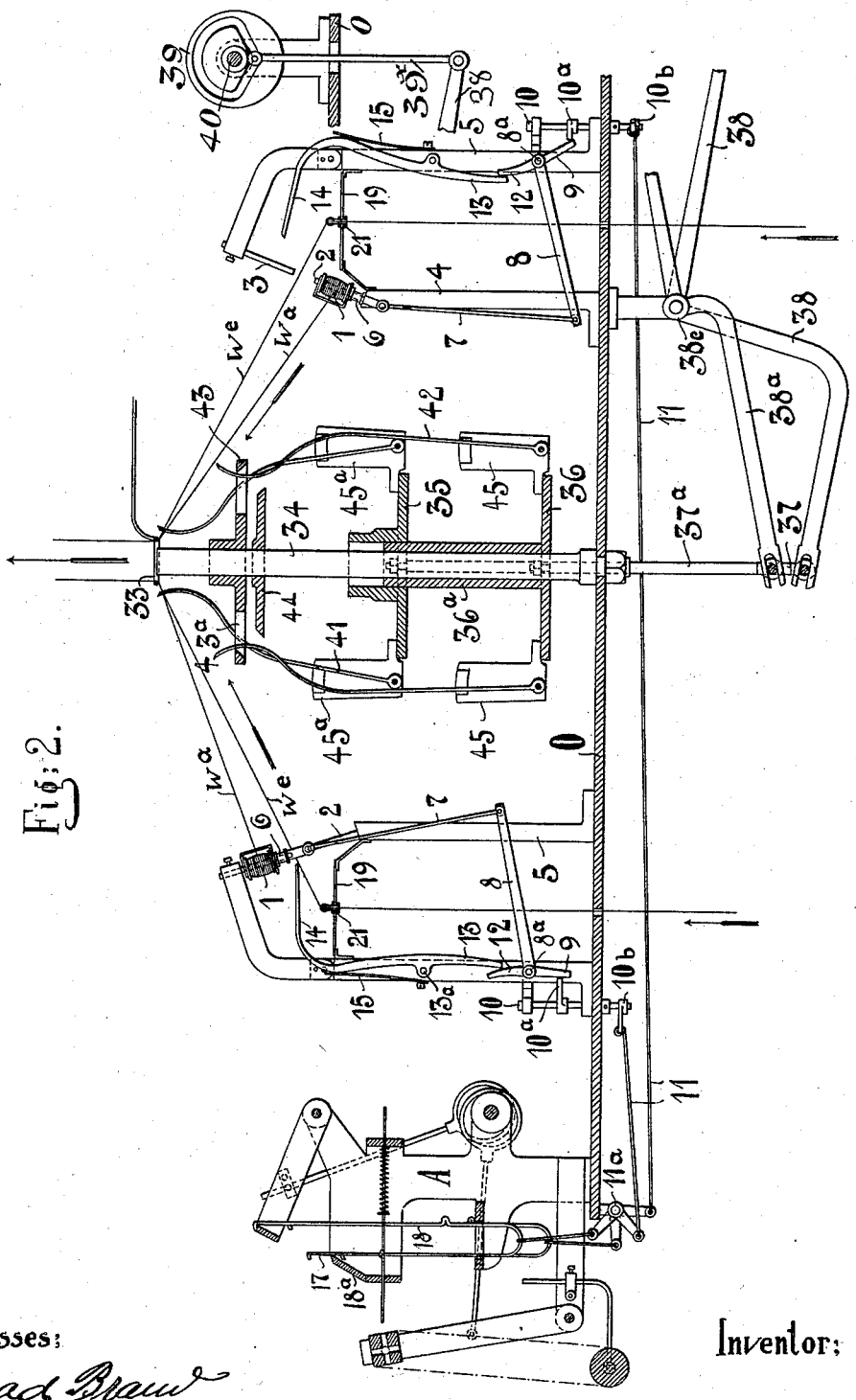


Fig. 2.

Witnesses:
Konrad Braun
William Fiedler

Inventor:
Adolf Bottenberg

No. 647,466. Patented Apr. 17, 1900.

A. BOTTENBERG.

BRAIDING MACHINE.

(Application filed Nov. 23, 1899.)

(No Model.) 5 Sheets—Sheet 3.

Fig. 3.

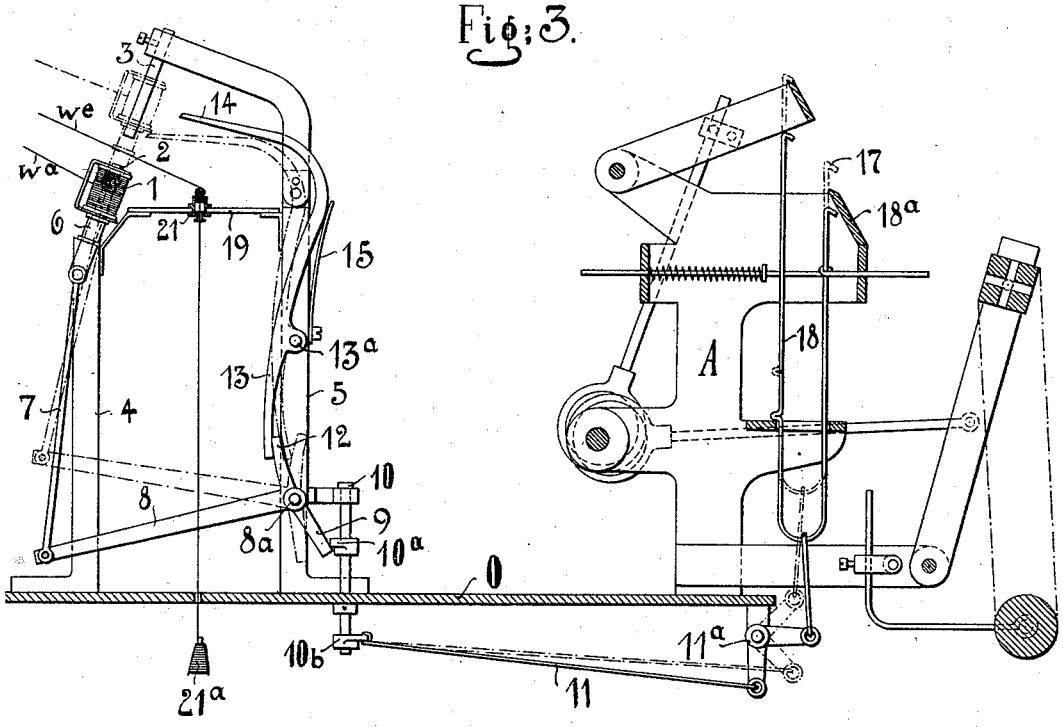
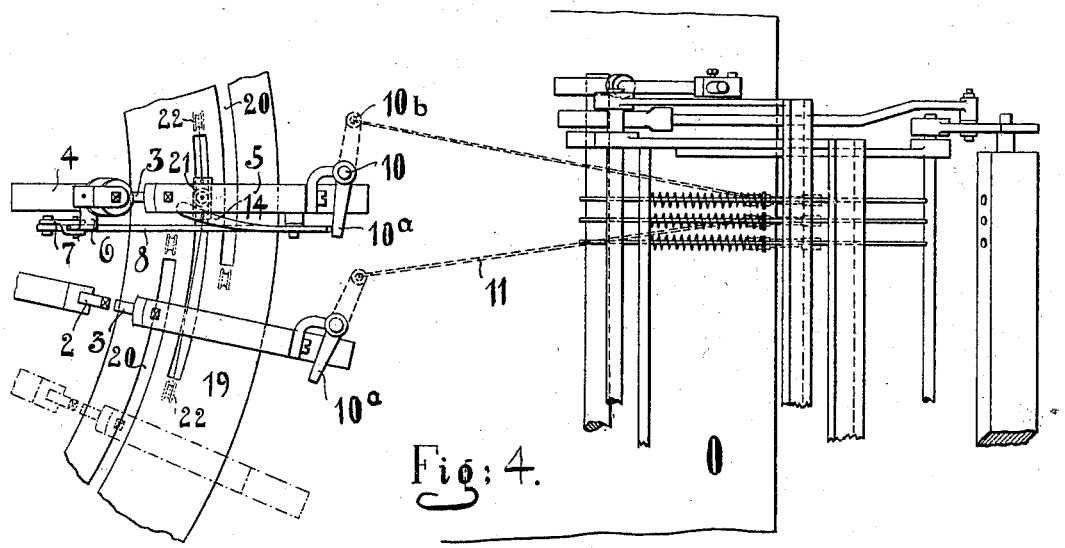


Fig. 4.



Witnesses.

Konrad Braun

William Fiddle

Inventor.

Adolf Bottenberg

No. 647,466. Patented Apr. 17, 1900.

A. BOTTENBERG.

BRAIDING MACHINE.

(Application filed Nov. 23, 1899.)

(No Model.) 5 Sheets—Sheet 4.

Fig. 5.

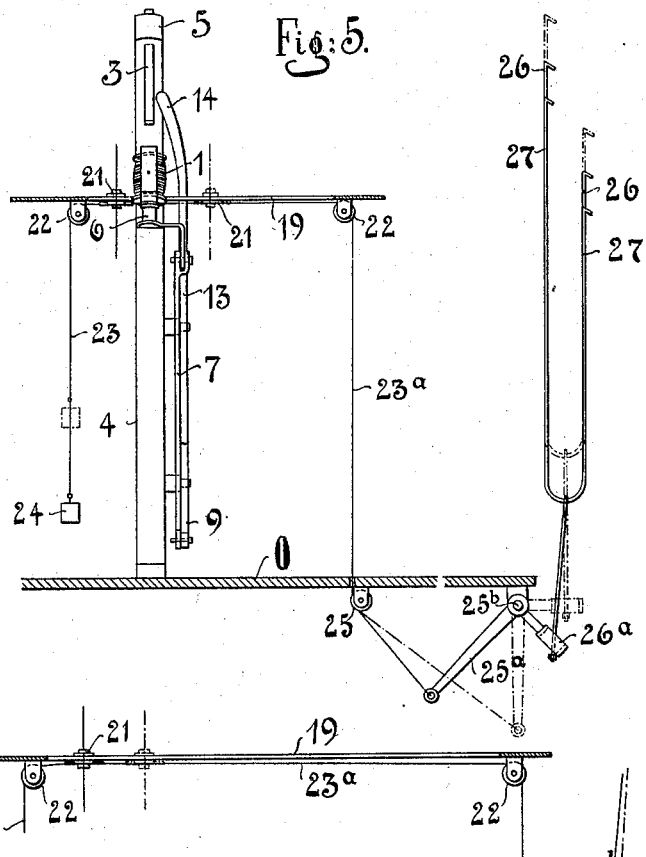


Fig. 6.

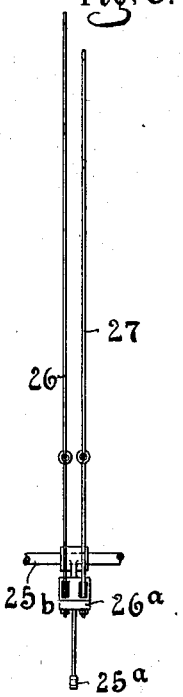


Fig. 8.

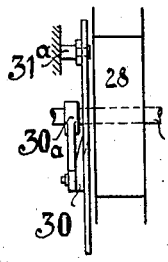


Fig. 7.

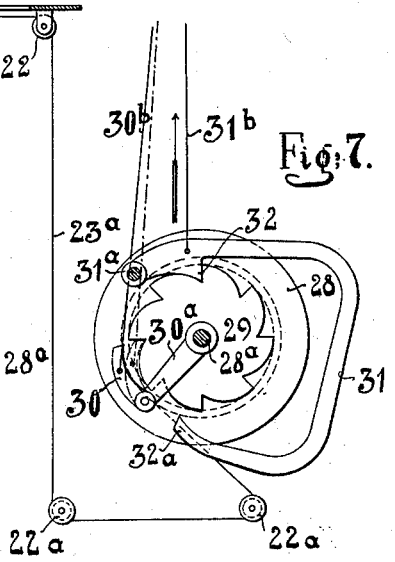
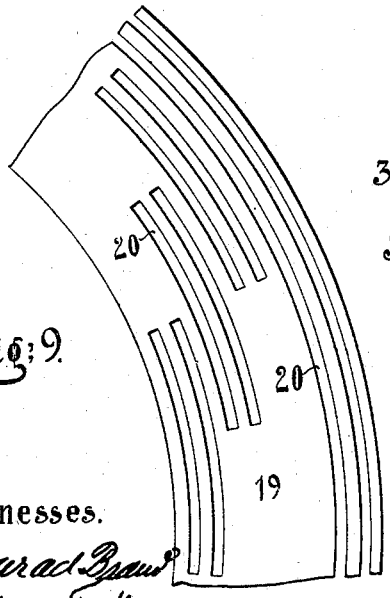


Fig. 9.



Witnesses.

Konrad Braun

William Fiddle

Inventor.

Adolph Bottenberg

No. 647,466. Patented Apr. 17, 1900.

A. BOTTENBERG.

BRAIDING MACHINE.

(Application filed Nov. 23, 1899.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 10.

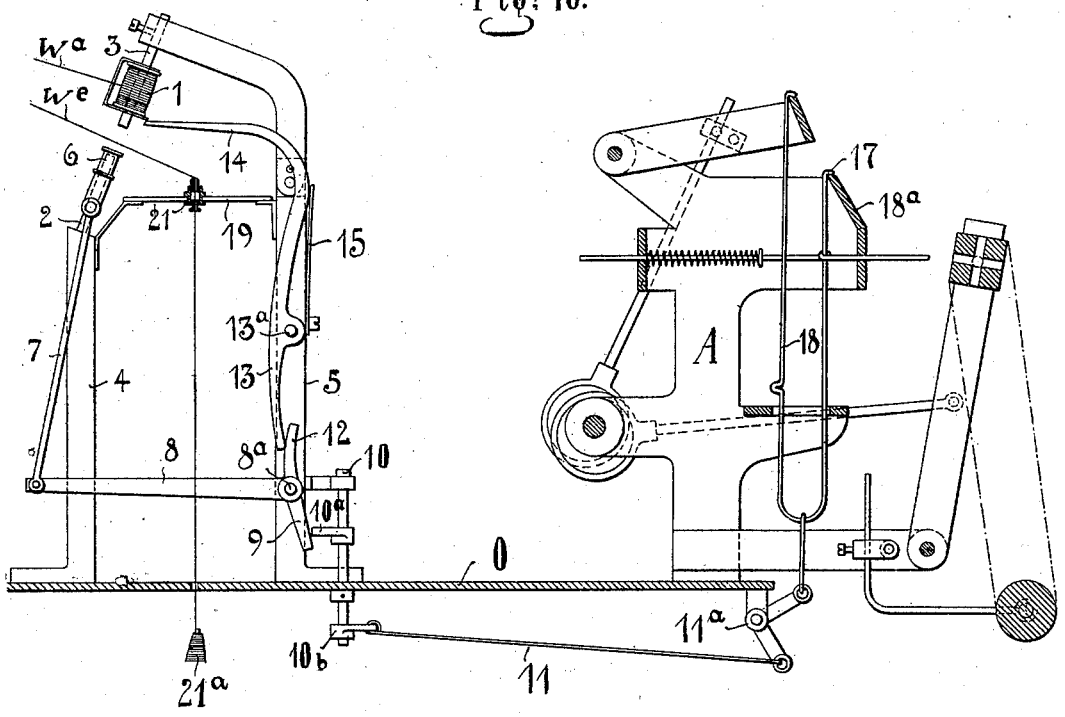


Fig. 11.

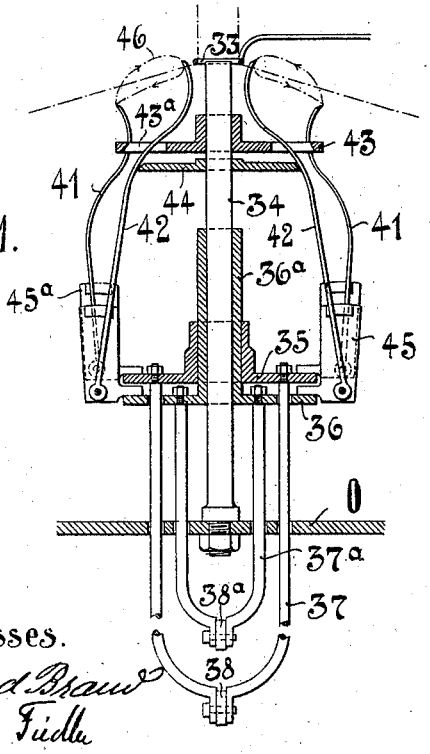
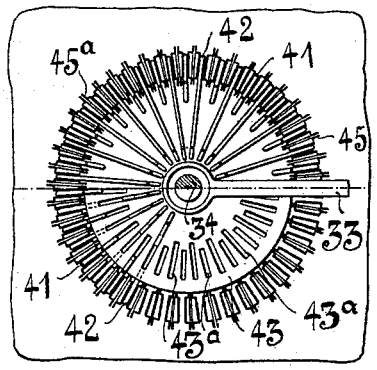


Fig. 12.



Witnesses.

Konrad Braun

William Fiddle

Inventor.

Adolf Bottenberg

UNITED STATES PATENT OFFICE.

ADOLF BOTTENBERG, OF BARMEN, GERMANY.

BRAIDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 647,466, dated April 17, 1900.

Application filed November 23, 1899. Serial No. 738,093. (No model.)

To all whom it may concern:

Be it known that I, ADOLF BOTTENBERG, a subject of the Emperor of Germany, residing at Schwarzbachstrasse No. 126, Barmen, in the Province of Rhenish Prussia, Germany, have invented certain new and useful Improvements in Braiding-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a new braiding-machine; and it has for its object to be able to make laces of any design and to use a greater number of movable bobbins within a certain limited space of the machine than has been possible with the braiding-machines of the old and known construction. In the machines hitherto in use the threads representing the warp-threads are wound on fixed bobbins and those forming the weft-threads are wound on movable bobbins, whereas in my new machine the case is reversed. I use movable bobbins for carrying the warp-threads and stationary ones, from which the weft-threads are drawn off, and the movable bobbins I direct by means of a sort of a jacquard mechanism, also of partly-new character and specially adapted and constructed for this new braiding-machine. The movable or warp bobbins thereby are raised and lowered, whereas the weft-bobbins remain in their places, only the threads coming from them are moved to and fro by means of suitable thread-guides which cause these weft-threads to pass below or above across the warp-threads, according to the position given to the warp-bobbins, which depends upon the design or the figure which it is intended to be produced. In order, however, to create a fabric fit for use, the great number of threads which are united at one point requires that as soon as two threads have been meshed or bound together at the very moment of their intermeshing are held and supported in this position and so long until by a following binding the meshing is secured and cannot be undone again. This requires a new beater the needles of which work in such a manner that the needles supporting two intermeshed threads will not be withdrawn before the needles having to support the meshing or binding following in the same place are fully in their position and that the withdrawing needles do not prevent the other ones from assuming that position.

On the accompanying drawings my new machine is shown in various views.

Figure 1 gives a general view of the machine in plan in skeleton form. Fig. 2 is a vertical section along line I I of Fig. 1. Fig. 3 shows the device for raising and lowering the warp-thread bobbins in side view. Fig. 4 shows the same in plan. Fig. 5 shows the mechanism for shifting the weft-thread guides to and fro. Fig. 6 shows the wires governing said guides in view at right angle to Fig. 4. Fig. 7 shows the arrangement for giving certain weft-threads a longer stroke or path reaching across more than two warp-threads. Fig. 8 is a side view of Fig. 7. Fig. 9 is part of an enlarged view of a guide-plate for the weft-thread guides and showing a modified arrangement of slits for the thread-guides. Fig. 10 is a view similar to that of Fig. 2 with the warp-bobbin in raised position and showing the weft-thread to pass below this raised warp-thread. Fig. 11 is a vertical section of the beater, showing the lower set of needles in a raised position. Fig. 12 is a plan view of the beater. Fig. 13 is a similar view as that shown in Fig. 3.

The bobbins 1, carrying the warp-threads *wa*, move up and down upon two pins 2 and 3, which are suitably arranged in a slightly-oblique position upon standards 4 and 5, fixed on a plate or table O, so that the thread going from the bobbin to the braiding-iron or braiding-point runs out as near as possible at right angle from the bobbin. The free ends of the pins 2 and 3 are so much apart from each other that the weft-threads *we* can pass between them conveniently when the warp-bobbins are in their lower position, as well as in their raised position.

The standards 4 5 are arranged in a circle and so close together as is practically admissible in order to get them in the smallest space possible upon the table O. In the example shown there are forty-eight, three of which, however, are only shown in their out-

lines, the other ones being merely indicated by single lines in order not to overcrowd the figure.

It is advisable to make one set of the standards 4 or 5, by preference the outer one, of two parts connected by a knuckle-joint, so as to be able to put on and take off the bobbins conveniently. These two parts may be held together to form a rigid structure by a pin or any other suitable contrivance.

The moving up and down of the warp-bobbins is performed by means of the jacquard A in Fig. 1 in the following manner: Each bobbin 1 rests with its lower end upon a hub 6, which can also be moved up and down upon the pins 2 and 3 and the downward motion of which reaches just far enough so as to bring the top end of the bobbin and the upper end of the pin 2 in a level, leaving free the space between the ends of both pins 2 and 3. The hub 6 is jointed to a connecting-rod 7, the lower end of which is connected to the long arm 8 of a bell-crank lever, having its fulcrum 8^a on the outer standard 5. The other arm 9 of this bell-crank lever, looking downward, leans against a lever 10^a on a pin 10, and a second lever 10^b on pin 10 is actuated by a pulling-rod 11 of the jacquard device, Figs. 2, 3, and 10, in such a manner that when the respective wire 18 is raised by means of a bell-crank lever 11^a, inserted between the rod 11 and the wire 18, the arm 9 of the bell-crank lever is pushed toward the left by the lever 10^a, Fig. 3, and the arm 8 is raised, and thus the hub 6 is pushed up onto the upper pin 3, so that now a weft-thread could pass underneath the warp-thread if the passage between the two pins were not blocked by the hub 6 or the connecting-rod 7. Means must therefore be provided allowing the bobbins to be held up while the hubs 6 can descend in their lower position. This is done in the following manner: A third arm 12 of the bell-crank lever standing upward actuates another lever 13 14, pivoted to the standards 5 at 13^a, so that the arm 14, which is bent inward—that is, toward the warp-bobbin—can be brought within reach of the bobbin and holds the same in its upper position, but allows the hub 6 to go down. The hook 17 of the jacquard-wire 18 therefore is so arranged that it will rest upon the blade 18^a, Fig. 10, and this downward motion of the wire 18 is sufficient to allow the hub 6 to descend so much that its head is now in a line with the upper end of the pin 2, therefore just clearing the passage between the two pins 2 and 3 and allowing the weft-thread to pass through. The different levers are so proportioned and the path of the end of the arm 14 is so arranged that it just allows the bobbin 1 to pass by and that it will then be supported by the arm 14. A spring 15 is provided, holding the lever 13 14 in its forward position, while the weight of the arm 8 forces it backward as soon as the hook 17 of the wire 18 is pushed off from the blade 18^a by the jacquard-needle. It will be understood that by this arrangement the weft-threads can be placed above or below the warp-threads.

Now the weft-threads *we* are worked in the following manner: Between the inner and outer standards 4 and 5 a ring-shaped plate 19 is fixed, into which are cut arched slits 20, and in these slits are guided the vertical thread-guides 21 for the weft-threads, coming from bobbins 21^a below the table. In the example shown in Fig. 1 the inner slits 20 are so arranged that the threads guided by them can move across two warp-threads. The outer ones are longer and allow the threads guided in them to be moved across a greater number of warp-threads. This arrangement may be varied according to the pattern to be produced. Fig. 1 shows that, for instance, the weft-thread 1 can be carried across the warp-threads $x\ y$, and the weft-thread 11 can be shifted so as to cross the warp-threads $y\ z$.

The movements of the weft-thread guides are governed by a jacquard mechanism in the following manner, (I beg to observe that the general arrangement of the jacquard apparatus used is in all three cases of the known system and therefore needs no special description:) At each end of the slots 20 a little roller 22 is fixed below the plate 19, Figs. 4 and 5. Cords 23, tied to the thread-guides 21 at one side, are carried over these rollers, and to the end of these cords is fixed a weight 24, having the tendency to pull the thread-guide in one direction. At the other side of the thread-guide 21 a cord 23^a is fixed, and this cord is laid around a roller 25 below the table, and its end is tied to an arm of a bell-crank lever 25^a on a spindle 25^b. At the other arm 26^a of said lever are connected wires 26 and 27 of different length, so that when the one wire is drawn the respective weft-thread guide will cross only one warp-thread and when the other wire is drawn two or more warp-threads can be crossed, according to the length of the wire. This arrangement makes it necessary that at least the double number of wires is required, and I therefore arrange two jacquard apparatus B and C for this purpose, one to the right and the other to the left of the machine, Fig. 1. Since the moving of those thread-guides which have to pass across more than two warp-threads by means of jacquard-wires direct is not very practical, I move these thread-guides by means of the device shown in Figs. 7 and 8. The cord 23^a is carried over and around the guide-rollers 22 22^a and thence around a pulley 28 on a spindle 28^a, and by means of a ratchet-wheel 29 and a pawl 30, linked to a lever 30^a, loosely held on spindle 28^a, this pulley can be turned in one way, a counterweight (same as the counterweight 24 in the arrangement of Fig. 5) pulling the same backward when the pawl 30 is brought out of reach of the teeth of the wheel 29. A second pawl 31, pivoted to a pin 31^a, is arranged, and this has for its object to check the return motion of the pul-

ley 28 when the pawl 30 is out of gear with the teeth of the ratchet-wheel 29, and which is therefore provided with hooks 32 and 32^a. A lifting-cord 30^b of a jacquard-wire is fixed to the pawl 30, pulling it upward, and thus turning the wheel 29 and the pulley 28. A similar cord 31^b releases the pawl 31 from its engagement with the ratchet-wheel. In order, however, to prevent too much back run of the pulley 28 when the pawl 31 is raised up, this is so shaped and curved that its end 32 when raised high enough reaches into the teeth of the ratchet-wheel and then again stops the back run of the pulley 28, as desired.

The cords 30^b and 31^b are connected to the lifting-wires of one of the jacquard apparatus of the machine.

Figs. 1, 3, and 10 indicate how the warp and weft threads *wa* and *we*, respectively, are guided from their bobbins onto the braiding-iron 33 in the center of the machine, where the braiding or interlacing of the various threads is effected in a similar manner as is the case with the ordinary braiding-machines—that is, by causing the threads to cross each other, now the one up, the other underneath, and vice versa, as the case may be. These intermeshings of the threads must be fixed, and for this purpose I have provided the arrangement (beater) shown by Figs. 2, 11, and 12 and which I will now describe.

On a post 34, fixed upon the table O centrally below the braiding-ring 33, I arrange two disks 35 and 36, one upon the other, the latter one having a long hub 36^a, and the other one 35 is placed around this hub so that it can slide thereon up and down. These disks are supported each by double rods 37 and 37^a, respectively, which at their lower ends are linked to the inner ends of double-armed levers 38 38^a, pivoted below the table at 38^b and 38^c, respectively, and made to oscillate up and down by cams 39 and 39^a on the driving-shaft 40 and connecting-rods 39^x and 39^y, Figs. 1 and 2. Around the circumference of the disk 35 are arranged and fixed thereto by link-joints a set of needles 41, and in a similar manner a set of needles 42 are arranged around the circumference of the table 36. The total number of these needles is suitably equal to the number of the warp-threads, and they are so distributed that always the end of one needle reaches in the space between two warp-threads. At their upper ends the needles are guided in slits 43^a of a disk 43, fixed at the top of the post 34, and below said disk is arranged another one 44, serving to prevent the needles from falling inward more than is required and to guide them on their downward motion. Near their lower ends the needles are guided between elastic sheet-metal guides 45 and 45^a, respectively. These guides consist of two feathering or elastic sheet-metal plates bulged out toward each other in the middle part, so as to allow a narrow passage only just wide enough to hold the needle securely between them. Outside and inside of this narrowed passage the plates leave a wider space between them. Therefore the plates clamp the needles tight between them while they are caused to move in the middle part, and they allow the needles free play as long as they are guided before and behind said bulged-out parts. The curve in which the needles are bent and shaped, together with the guide-plates 43 and 44, thus causes the end points of the needles to prescribe the curved way indicated in dotted lines in Fig. 11. From this it will be seen that the needles while rising gradually move inward in a regular steady curve. Arrived at the innermost and highest point, they suddenly fall down, (being free at this place and not clamped between the bulged parts of the plates 45, this is possible,) and then they begin also their way back in regular course. This special movement of the upper ends of the needles is necessary and chosen in order to be able to cause the needles of one set to remain so long within the meshes of the threads until the respective needles of the other set have gained such a position that they will support the meshing when the preceding needles have returned, so that the meshing or interlacing of the threads will be fixed and cannot be undone in consequence of the retirement of the needles.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a braiding-machine standards 4 and 5, fixed circularly on a table O, a pin 2 at top of standard 4, a pin 3 projecting obliquely downward from the end of standard 5 in a line with pin 2, both pins 2 and 3 leaving an open passage between their ends, bobbins 1 movably held on pin 2, a hub 6 on pin 2 a rod 7 supporting said hub, a bell-crank lever 8, 9 linked to the lower end of lever 6 and pivoted to the standard 5 at 8^a, in combination with a lever 10^a on a pin 10 fixed to the table O, a lever 10^b on said pin, a rod 11, a bell-crank lever 11^a, connected to the rod 11 by its downward arm, a double lifting-wire 18 of a jacquard-machine A connected to the other arm of lever 11^a, a fixed plate 18^a for holding up the lifting-wires at their hooks 17, and keep the parts 11^a, 11, 10^b, 10, 10^a and the lever 8, 9 at rest; an arm 12 standing upward from lever 8, 9, a double-armed lever 13, 14 bearing against the arm 12 of lever 8, 9 and pivoted to the standard 5 at 13^a, a spring 15 pressing the bent arm 14 of lever 13, 14 below the raised bobbin 1 and holding it in its raised position, the whole as described and illustrated and for the purpose set forth.

2. In a braiding-machine standards 4 and 5 fixed circularly on a table O, a ring-plate 19 fixed to said standards, slots 20 of various length cut into said plate, thread-guides 21 carried in the slots 20 of plate 19, guide-rollers 22 fixed below plate 19 at both ends of the slots 20, cords 23, 23^a fixed at both sides of said thread-guides and carried over rollers

22, a counterweight 24 at the free end of cords 23, a guide-roller 25 below table O guiding cord 23^a, in combination with a spindle 25^b fixed below said table, a lever 25^a on said spindle and having the end of cord 23^a fixed to it, an arm 26^a connected with lever 25^a, lifting-wires 26, 27 jointed to lever 26^a, the whole as described and illustrated and for the purpose set forth.

3. In a braiding-machine standards 4 and 5 fixed circularly on a table O, a ring-plate 19 fixed to said standards, slots 20 of various length cut into said plate, thread-guides 21 carried in the slots 20 of plate 19, guide-rollers 22 fixed below plate 19 at both ends of the slots 20, cords 23, 23^a fixed at both sides of said thread-guides and carried over rollers 22, a counterweight 24 at the free end of the cords 23, guide-rollers 22^a below table O guiding cords 23^a in combination with a spindle 28^a journaled in suitable bearings below table O, a pulley 28 on said spindle a ratchet-wheel 29 connected to pulley 28, an arm 30^a held loosely on spindle 28^a, a pawl 30 linked to said lever 30^a, a lifting-cord 30^b attached to said pawl 30 and coming from the lifting-wire of a jacquard apparatus and capable of pulling said pawl upward, so as to turn the ratchet 29, a curved pawl 31 pivoted to a fixed pin 31^a and engaging with its hooks 32, 32^a with the ratchet-wheel 29 in either position, a lifting-cord 31^b attached to said pawl 31 and coming from the lifting-wire of a jacquard-machine capable of raising the pawl, the whole as described and illustrated and for the purpose set forth.

4. In a braiding-machine a shaft 40 fixed upon the table O, cams 39 and 39^a keyed to said shaft, a double-armed lever 38 pivoted at 38^b below the table O and actuated by said cam 39, a double-armed lever 38^a pivoted at 38^c below the table O and actuated by said cam 39^a, double rods 37 pivoted to the free end of lever 38 and rising upward through the table O, double rods 37^a similarly connected to the outer end of lever 38^a and reaching also upward through the table O, in combination with a post 34 bolted to the table O, a braiding-ring 33 fixed centrally over the post 34, a disk 36 having a long hub 36^a placed movably on said post 34 and being supported by the double rods 37^a, a disk 35 placed movably upon the hub 36^a of disk 36 and being supported by the double rods 37, needles 42 linked to the disk 36, elastic sheet-metal guides 45 on said disk and guiding the needles 42, needles 41 linked to the disk 35, elastic sheet-metal guides 45^a on said disk 35 and guiding the needles 41, a disk 43 keyed fast to the upper end of post 34 and having slits 43^a for guiding the needles 41 and 42 therein, a disk 44 keyed fast below said disk 43 upon post 34 and guiding the needles at its circumference, the whole as described and illustrated and for the purpose set forth.

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

ADOLF BOTTENBERG.

Witnesses:
KONRAD BRAND,
WILLIAM FIEDLER.