

H. A. HANSEN & M. E. PETERSEN.  
WARP UNITING MECHANISM.

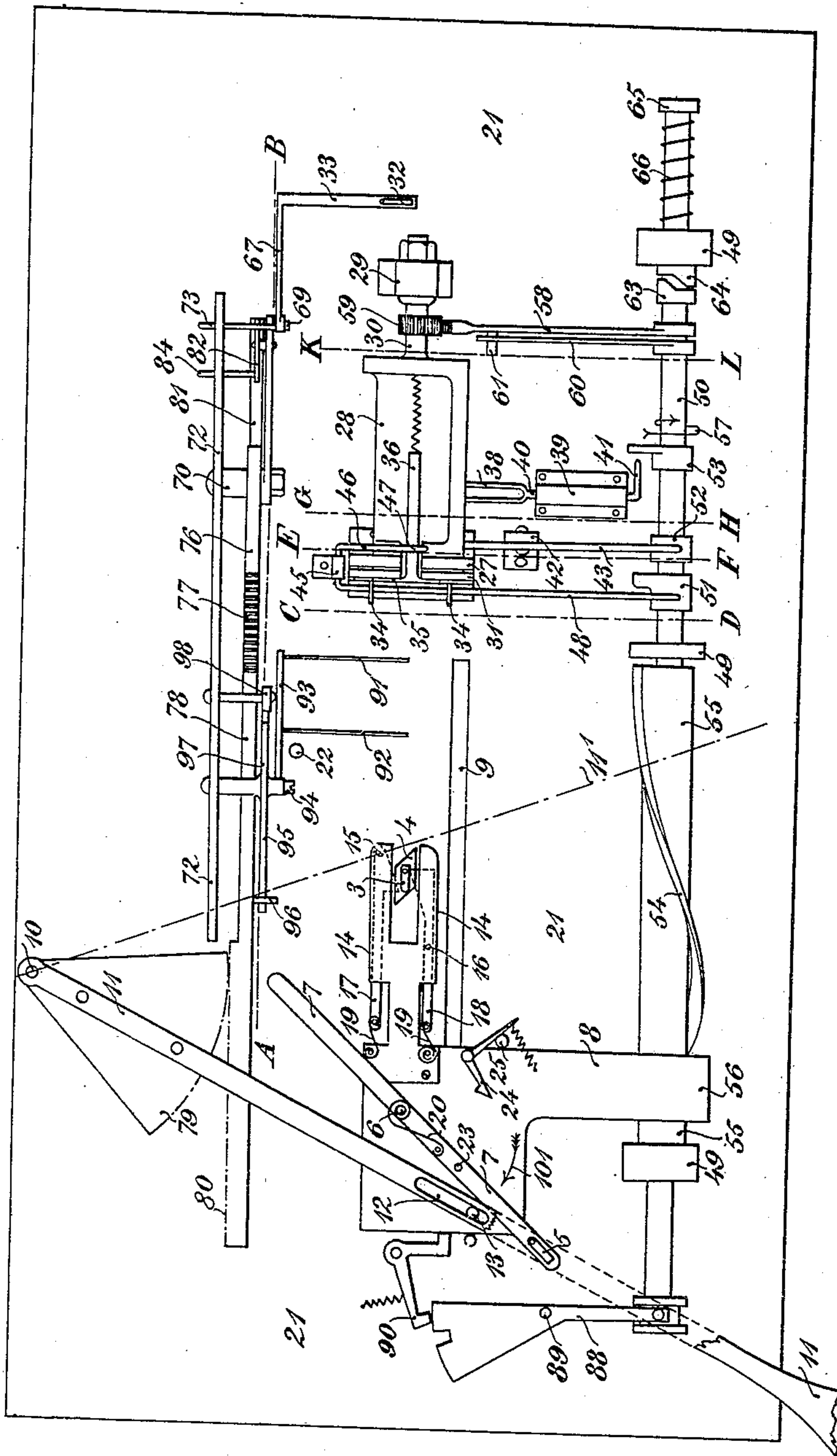
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954,862.

Patented Apr. 12, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



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WARP UNITING MECHANISM.

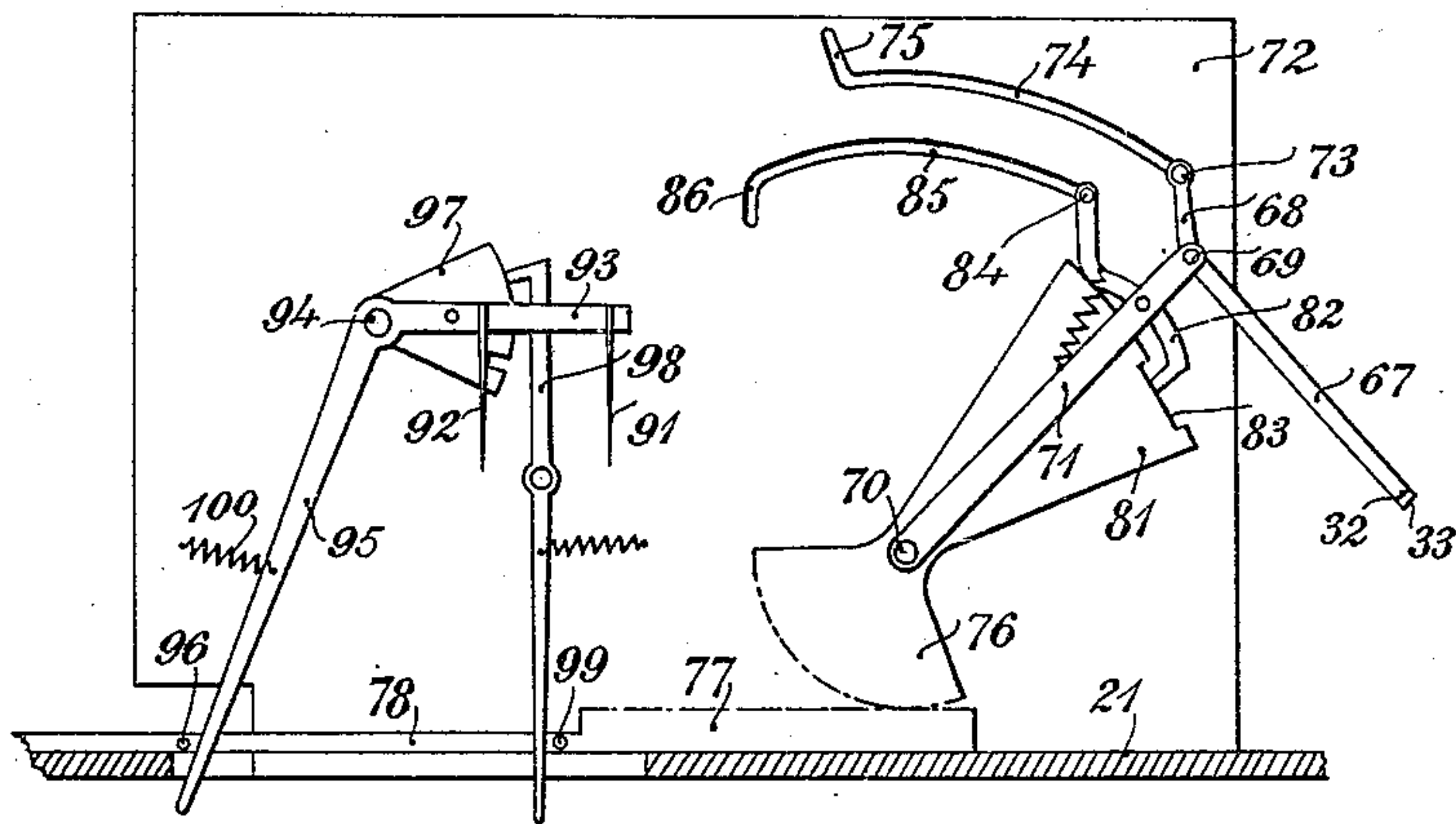
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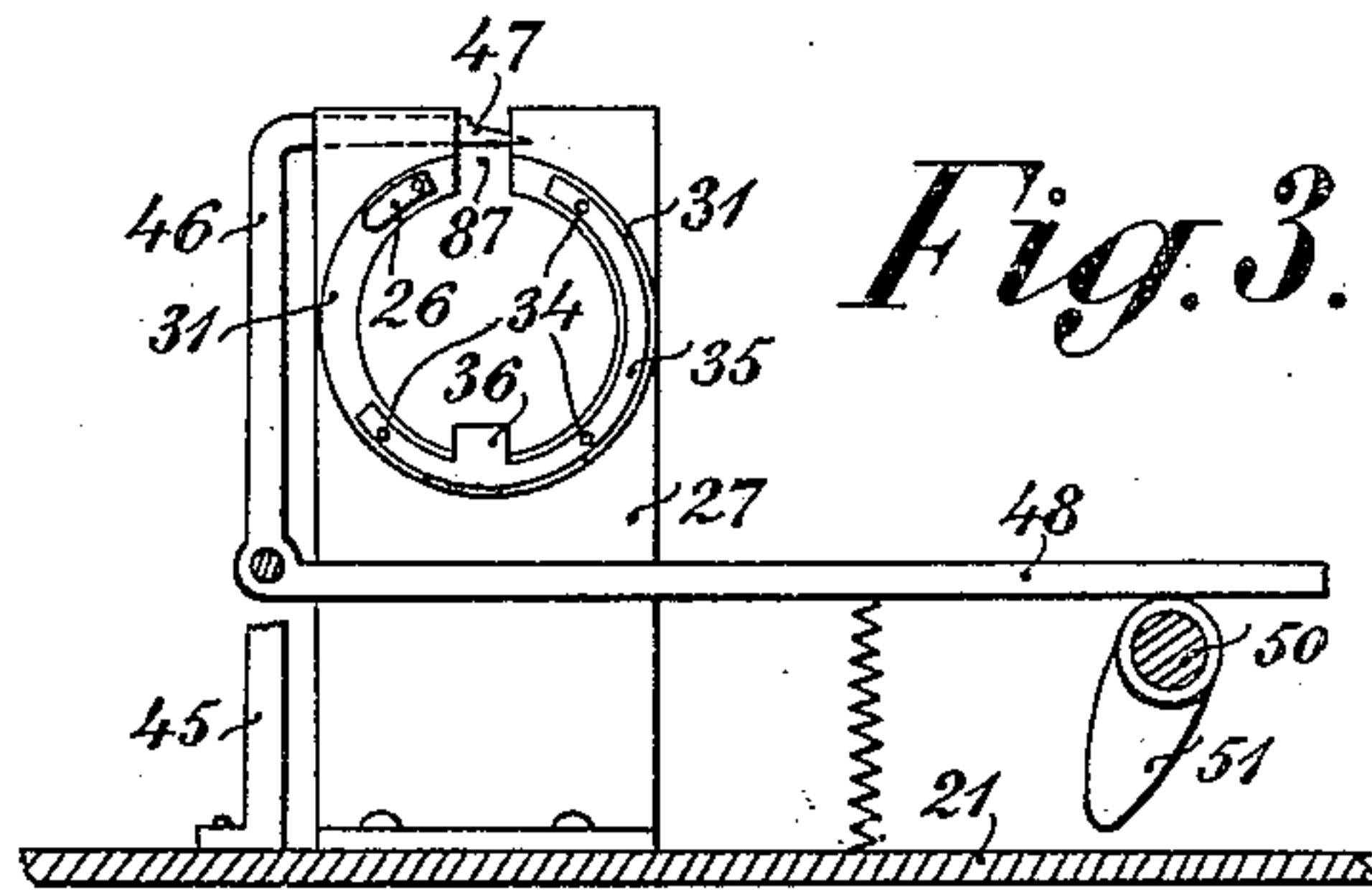
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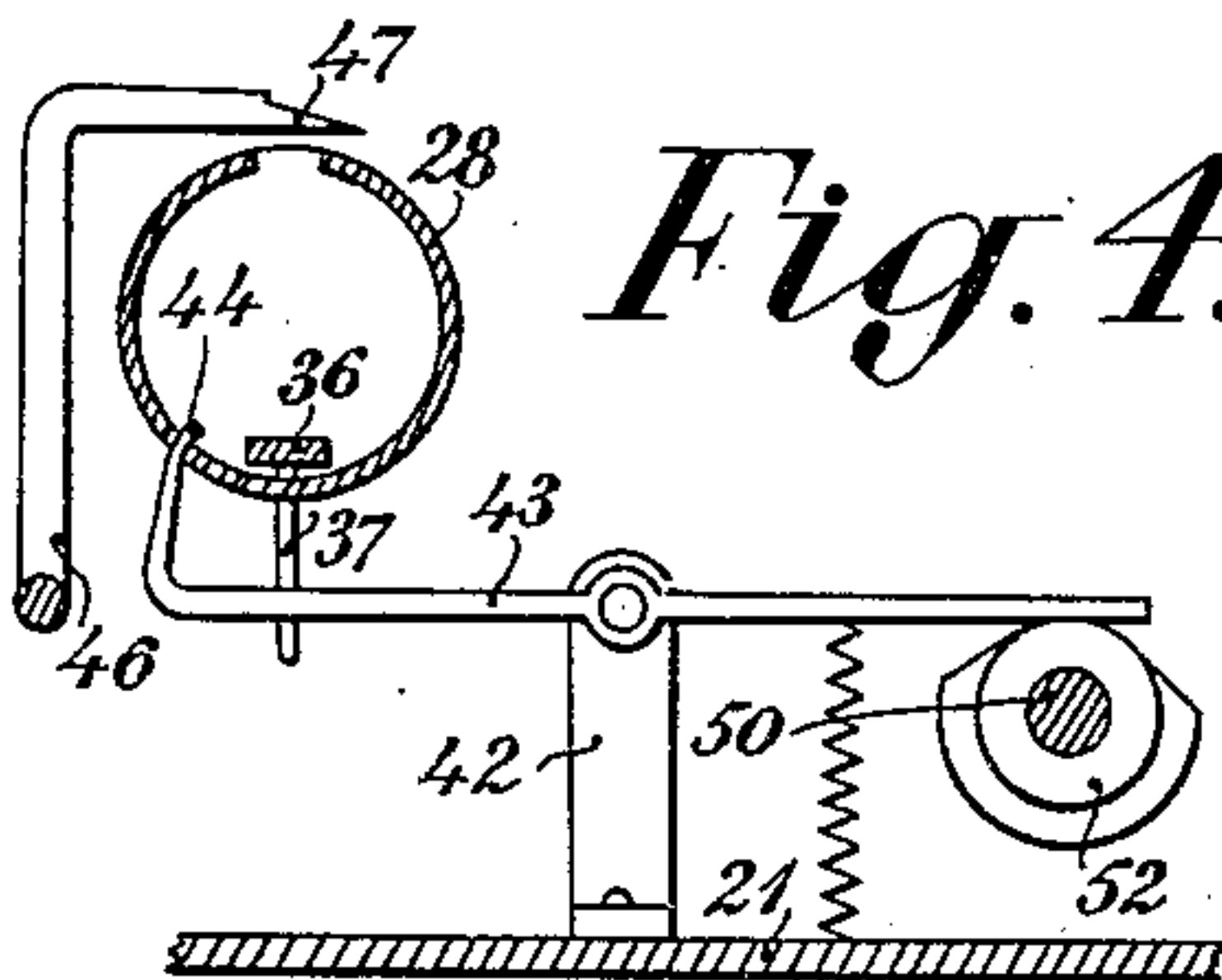
*Fig. 2.*



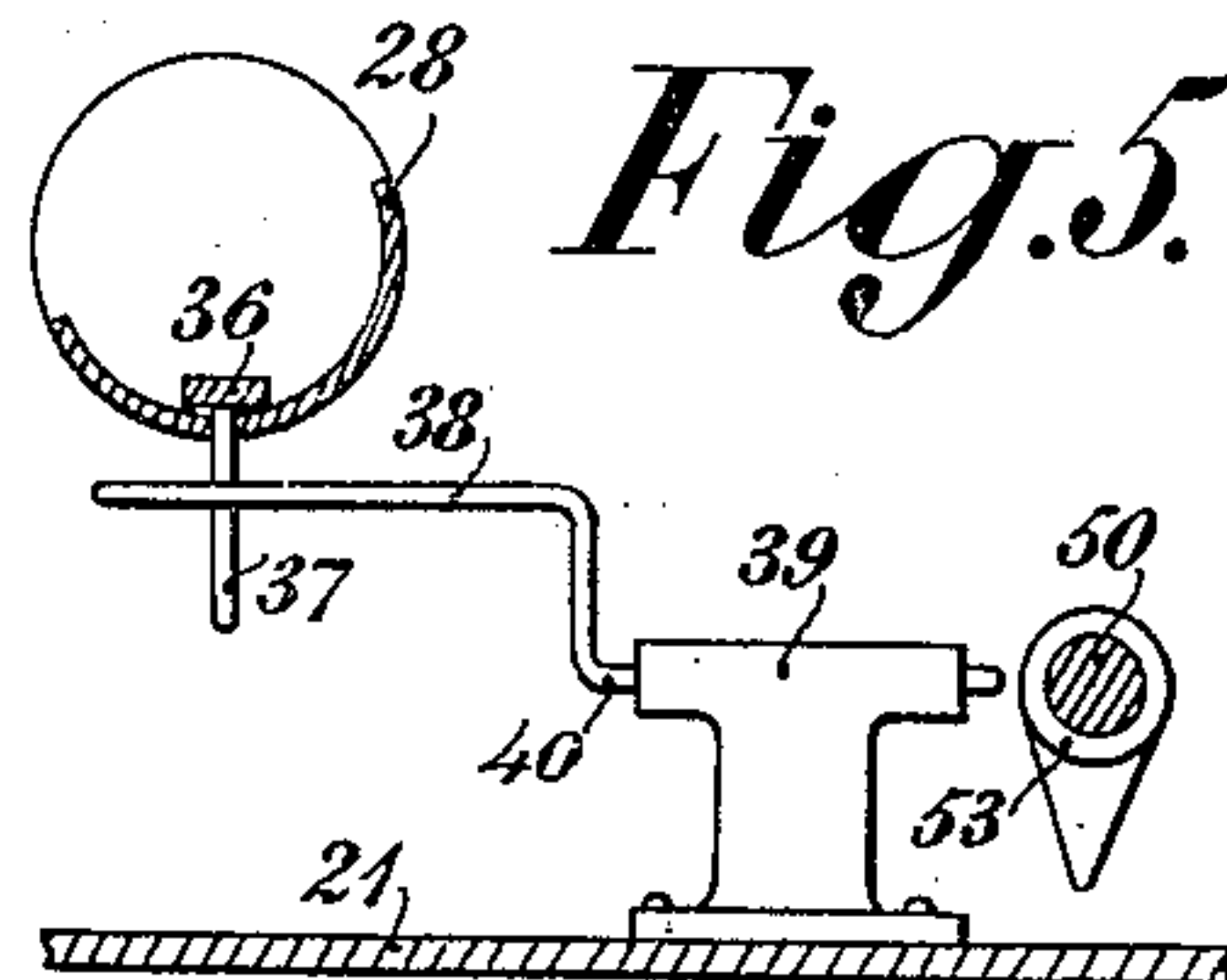
*Fig. 3.*



*Fig. 4.*



*Fig. 5.*



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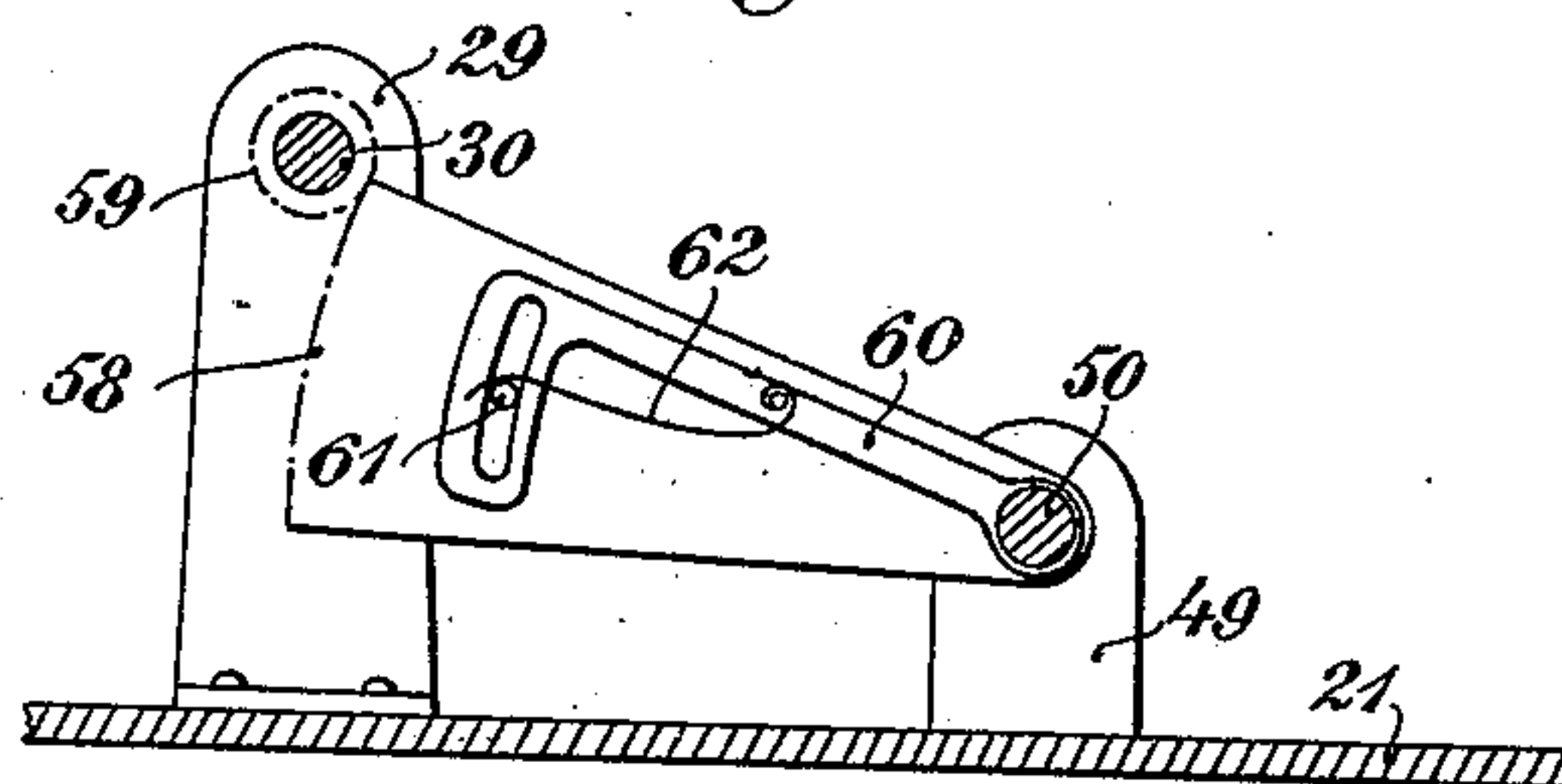
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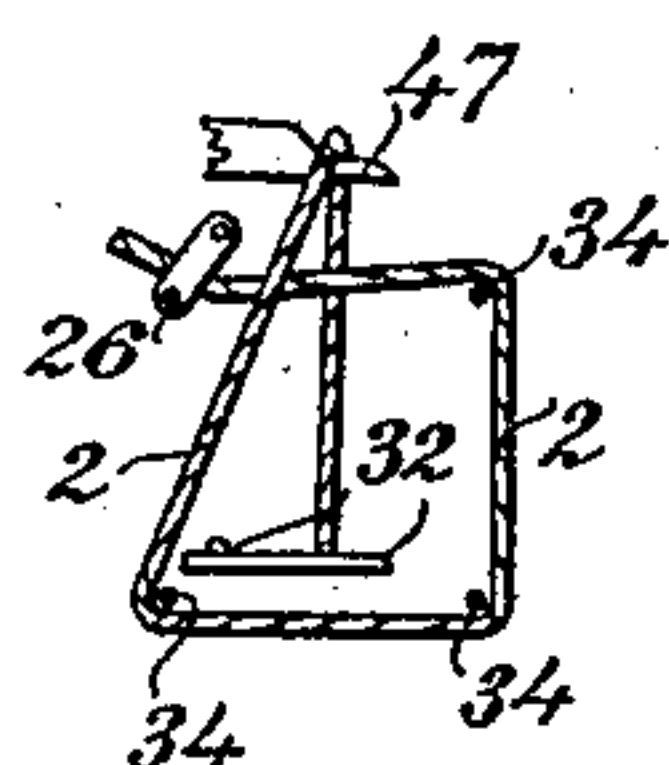
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 3 SHEETS—SHEET 3.

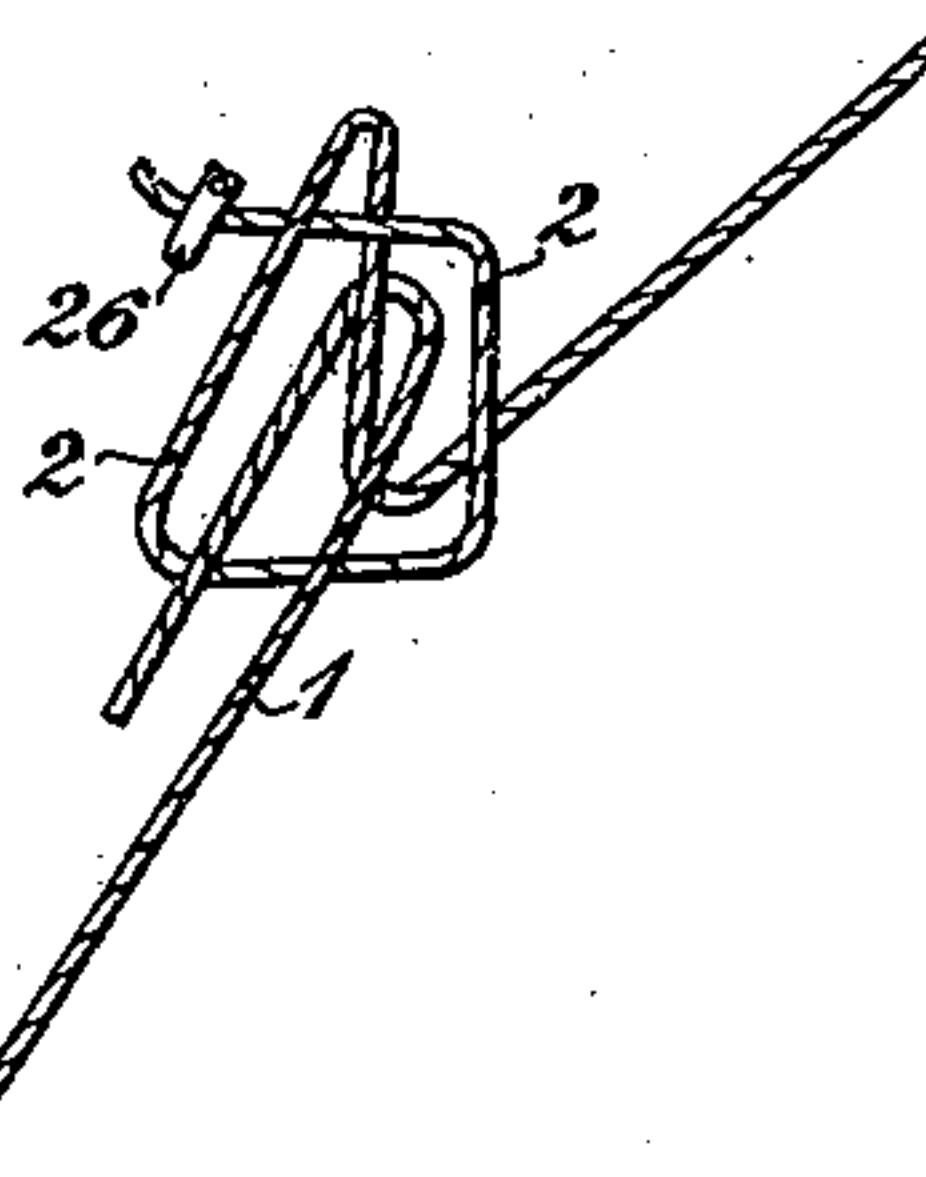
*Fig. 6.*



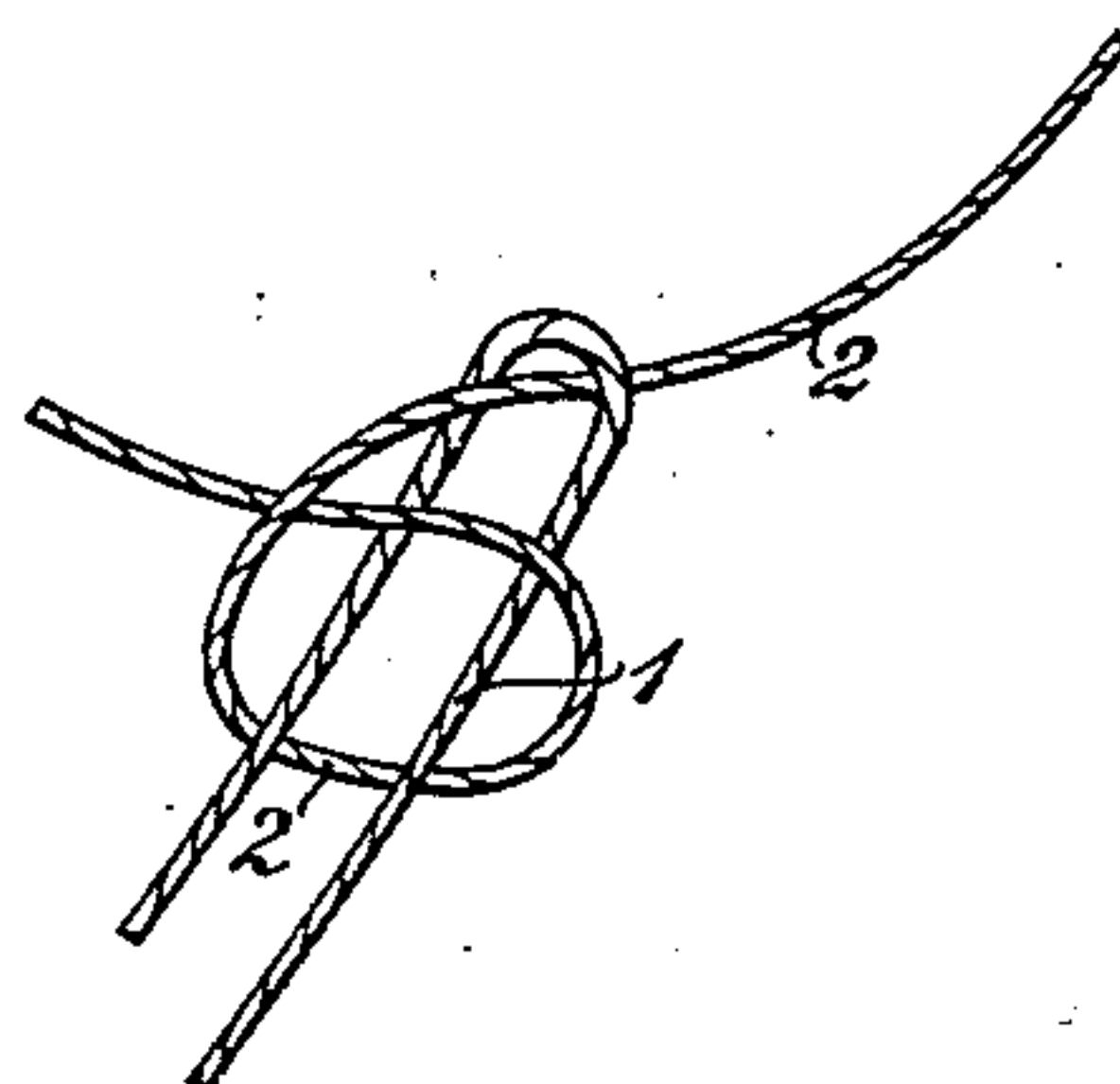
*Fig. 7.*



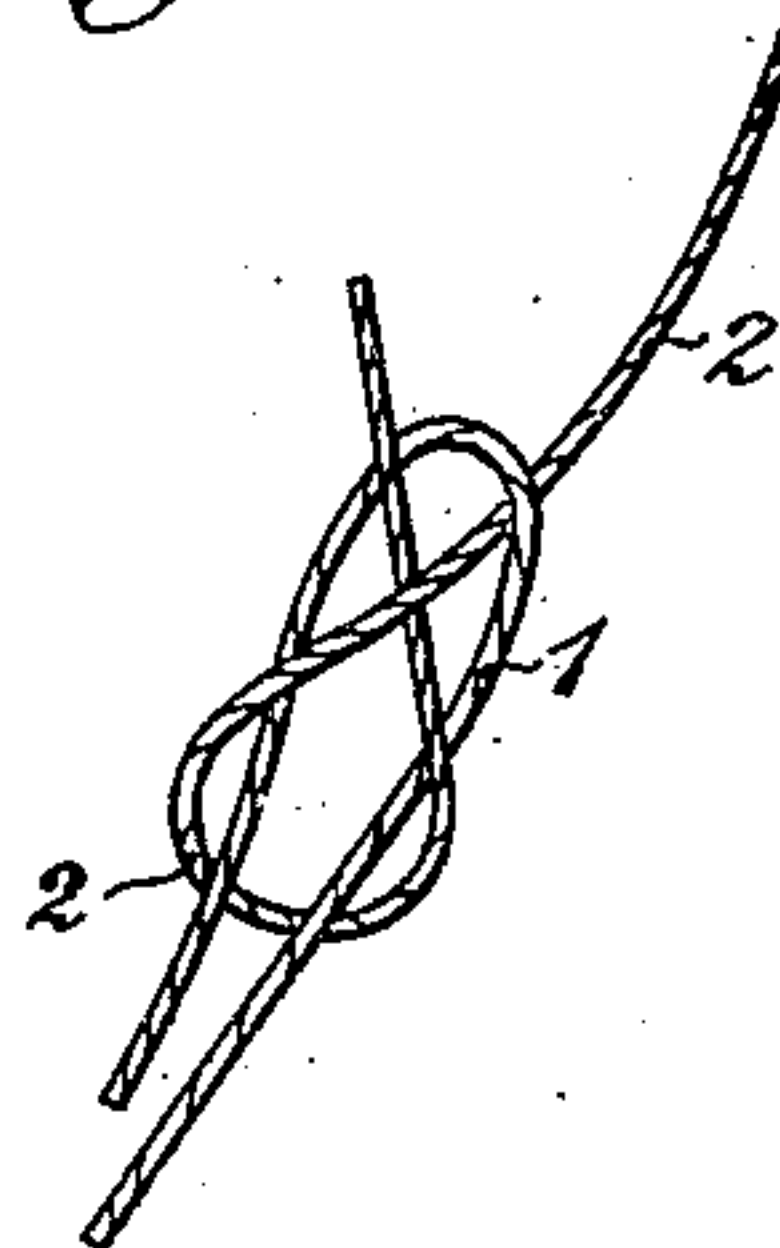
*Fig. 8.*



*Fig. 9.*



*Fig. 10.*



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# UNITED STATES PATENT OFFICE.

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## WARP-UNITING MECHANISM.

954,862.

Specification of Letters Patent. Patented Apr. 12, 1910.

Application filed February 18, 1909. Serial No. 478,527.

*To all whom it may concern:*

Be it known that we, HANS ADOLF HANSEN, of No. 6 Thorvaldsensvej, Frederiksberg, worksmaster, and MARIUS EMIL PETERSEN, of No. 11 Skydebanegade, Copenhagen, Denmark, engineer, both of the Kingdom of Denmark, have invented new and useful Improvements in Warp-Uniting Mechanism, of which the following is a specification.

The object of this invention is to provide an apparatus by means of which, that is to say, by the to and fro movement of a lever therein the ends of two threads suitably fixed in the apparatus can be knotted together in weaver knot fashion. After having made the knot the ends projecting therefrom are cut off.

A form of construction of the invention is shown on the accompanying drawings in which:

Figure 1 is a plan of the apparatus, Fig. 2 a cross section on line A—B of Fig. 1. Fig. 3 a cross section on line C—D of Fig. 1. Fig. 4 a cross section on line E—F of Fig. 1. Fig. 5 a cross section on line G—H of Fig. 1. Fig. 6 a cross section on line K—L of Fig. 1. Figs. 7-9 show the various stages of the knot during its formation, and Fig. 10 the knot finished.

According to our invention and referring to Fig. 10, a weaver's knot is formed by causing the bend of one end of a thread 1 to engage in the loop of that of another thread 2. The free end of the thread 1 which is to form the said bend is secured in a spring clip or gripper 3, Fig. 1, arranged on the shuttle 4, while the thread itself is secured in a clip 5 arranged on a lever 7 fulcrumed to the stud 6. The stud 6 is carried by a slide 8, adapted to move to and fro on the table 21 guided in the slot 9 of the latter. The slide 8 is moved by means of a lever 11 fulcrumed to the stud 10, the said lever having a slot 12 in which engages a stud 13 on the slide 8. The slide 8 is furnished with a fork-like piece, the prongs 14 of which are slightly pointed and between which the shuttle 4 is employed and retained in position by means of two pawls 17 and 18 fulcrumed to the studs 15 and 16. Each of these pawls has an inclined tooth and these teeth are by means of springs 19 bearing against the pawls pressed into re-

cesses in the side of the shuttle. As will be seen from the drawing the shuttle is in the form of a parallelogram. When the shuttle with its front edge is moved against a vertically positioned thread, the latter slides along the said front edge between the shuttle and one of the fork prongs and presses the pawl 17 sidewise. When the shuttle afterward moves in the opposite direction owing to the incline at the back of the shuttle, the thread will slide toward the other fork prong and pass between the latter and the shuttle, the pawl 18 being pressed sidewise. To render this possible the teeth on the two pawls 17 and 18 incline correspondingly. The manipulation just described takes place when one of the thread ends is to be bent around the other thread.

The lever 7 which as previously mentioned carries the thread 1 the end of which is secure in the clip 5, is turned in the direction of the arrow 101 by means of the spring 20. When the slide 8 is moved to the right, the lever 7 abuts against a stud 22 on the table 21 which turns the lever in a direction opposite to the arrow 101, and at the same time a stud 23 on the lever 7 abuts against a spring hook 24, which catches the lever 7 so that when the slide moves back the lever 7 is retained in that position. When the slide 8 returns into the position shown in Fig. 1, the arm of the hook 24 abuts against a stud 25 on the table 21 which releases the lever 7 again. The thread 2 which is to form the loop for the weaver's knot with its free end is secured in the clip 26, Figs. 1 and 3, arranged on the end flange 31 of a cylinder 28 mounted in a bearing 27 having a pivot 30 rotatable in the bearing 29. The thread itself is secured in a clip 32 arranged on the arm 33. The cylinder 28 has a portion cut away, Fig. 5, and upon the end flange 31 are also three studs 34 upon which the thread 2 can be wound when the cylinder is rotated. Upon the studs 34 is placed a semi-circular ring 35 which when moved forward strips the loops of thread formed on the stud 34 off the same. The ring 35 has an arm 36, Fig. 5, which projects into the cylinder 28 and has a stud 37 projecting outwardly through a slot in the cylinder. This stud is embraced by the prong 38 of a fork having a crank-



like shaft 40 turnable in the bearing 39 and a rearwardly bent end 41 Fig. 1. When the shaft 40 is turned for the fork prongs 38 to move forward, the arm 36 with the ring 35 is also moved forward. The fork 38 permits the studs 37 to freely follow the cylinder 28 when rotating it. This cylinder can be retained in a predetermined position, by means of a lever 43 (Fig. 4) fulcrumed to a bearing 42 and having a tooth 44 entering an aperture in the wall of the said cylinder.

At the side of the bearing 27 of the cylinder 28, a lever 46 is arranged bent over the cylinder and over its middle furnished with a beak 47. The lever 46 has an arm 48, which similar to the levers 43 and 41 extend over a shaft 50 rotatable in bearings 49 and parallel with the axis of the cylinder, which latter is also parallel with the direction in which the slide 8 moves. The shaft 50 has cams 51, 52 and 53 adapted to actuate the arm 48, the lever 43 and the arm 41 respectively. The shaft 50 passes through a cylinder 55 having a quick screw-thread 54, the shaft 50 participating in the rotation of the said cylinder when longitudinally displaced therein. In the slide 8 a nut 56 is employed for the screw-thread 54.

When the nut 56 with the slide is moved to the right (Fig. 1) the shaft 50 is turned in the direction indicated by the arrow 57. Upon the shaft 50 is loosely mounted a segmental wheel 58, Figs. 1 and 6, in gear with a pinion 59 secured upon the pivot 30 of the cylinder 28. When the shaft 50 turns, the segmental wheel is engaged by means of a carrier arm 60 which has a slot through which passes a stud 61 on the segmental wheel, against which presses a spring 62. When the shaft 50 begins to rotate, the cam 52 only actuates the respective lever 43, the other two cams 51 and 53 not actuating their levers 48 and 41 until the shaft 50 has been displaced to the left a certain distance, Fig. 1. This displacement as already stated effected independently of the cylinder 55, takes place when the inclined projection 63 on the shaft 50 abuts against a corresponding incline 64 on the bearing 49 while a spring 66 inserted between the bearing 49 and head 65 moves the shaft 50 to the right. The cylinder 28 is so arranged that the fork 14 with the shuttle 4 can be moved into it when the slide 8 is moved to the right.

As previously stated, the thread 2 is secured in a clip 32 on the arm 33. The latter is employed upon the arm 67 of a lever 67, 68, Fig. 2, fulcrumed to the stud 69. This stud is secured to the arm 71 fulcrumed to the stud 70, secured to the fixed plate 72. The arm 68 carries a stud 73 capable of sliding in a slot 74 concentric with the stud 70 and having a bend 75. To the stud 70 is also

fulcrumed a segmental wheel 76 in gear with a rack 77 connected with a rod 78; this rod carries a rack 80 in gear with a segmental wheel 79, Fig. 1. The latter is rigidly connected with the lever 11 and the rod 78 is thus displaced when the arm 11 is moved. The segmental wheel 76 is provided with a carrier arm 81 to operate in connection with the arm 71, the latter carrying a back pawl 82, under the influence of a spring engaging in a recess 83 of the arm 81. The rear end of the pawl 82 is slightly bent and carries a stud 84 adapted to slide in a slot 85 having a bend 86.

The apparatus operates as follows:—After having secured the threads 1 and 2 in the clips as previously stated, the lever 11 is moved to the right, Fig. 1, until it has reached the position 11' indicated in dotted lines. This movement turns the shaft 50 and the cam 52 actuates the lever 43 in such a manner, that the cylinder 28 is released, afterward the carrier arm 60 engages the segmental wheel 58 and the cylinder 28 is thus caused to revolve during which period the thread 2 is wound upon the studs 34, Fig. 7. In the meantime the segmental wheel 79 has set the rod 78 in motion and the rack 77 and the back pawl 82 has turned the arm 71. During the movement of this arm, the stud 73 sliding in the slot 74 has actuated the lever 67, 68 and the clip 32 which grips the thread 2 and lies in the vertical plane of the cylinder axis, is thereby moved over the cylinder. The movement of the clip is so regulated that the thread 2 which is carried from the clip 26 through a slot 87 in the cylinder bearing 27, Fig. 3, and at the latter carried by the beak 47, is always kept in tension. When the stud 73 reaches the bend 75 it rises therein which moves the arm 67 with the arm 33 and the clip 32 downward, and the clip will then be situated in the hollow of the cylinder 28, the thread 2 being by means of the beak 47 directed straight down behind the loop formed, Fig. 7. When the clip 32 takes up this position, the stud 84 hitherto sliding in the slot 85 has reached the bend 86 and is drawn into it by its spring which breaks the connection between the pawl 82 and the carrier arm 81 and the latter can thus turn again freely.

The fork 14 with the shuttle 4 is timed to enter the cylinder the moment the vertical part of the thread 2 slides along the shuttle as previously described. Shortly before the shuttle has completely entered the cylinder the inclined projection 63 on the shaft 50 has reached the inclined projection 64 on the bearing 49 which has displaced the shaft 50 a short distance to the left, that is to say, to such an extent as to permit the two cams 51 and 53 actuating the shafts 48 and 41 respectively when the shaft 50 is turned in the opposite direction, while the



segmental wheel 58 is brought out of register with the pinion 59. In displacing the shaft 50 the lever 88 fulcrumed at its other end to a stud 89 has been moved and the shaft having reached its terminal position, the said lever is caught by a hook 90 under the influence of a spring so that the shaft for the time being cannot move back. The lever 11 is then moved to the left and thus the shaft 50 brought into a position opposite to its previous one.

At the beginning of the movement of the slide 8 to the left, the shuttle 4 is drawn out of the cylinder and the vertical part of the thread 2 passes as previously described, the shuttle so that the bend of the thread 1 then passes around the loop formed by the thread 2, Fig. 8. When the shuttle has left the cylinder the cam 51 meets and raises the arm 48 whereby the beak 47 is withdrawn. In the meantime the cam 53 raises the arm 41 which causes the fork 38 to move forward the stud 37 on the arm 36 and the ring 35 then sliding over the studs 34 removes therefrom the knot thus formed. During the further movement of the slide 8 the knot is drawn together owing to the two free ends being retained in the clips 3 and 26 and when the slide moves back a little, the same are cut off by two knives 91 and 92 arranged as follows:—The knives 91 and 92 are employed upon the arm 93 of the lever 93, 95 fulcrumed to the fixed stud 94, the arm 95 of which is acted upon by the stud 96 on the rod 78. The arm 93 carries a sector 97 which, when the stud 96 takes up its right terminal position is caught by a pawl 98 under the influence of a spring and actuated by a stud 99 on the rod 78, when the knot during the movement of the slide 8 and the rod 78 to the left is positioned between the knives 91 and 92, which causes the pawl 98 to release the sector 97 so that the knives 91 and 92 by the aid of a spring 100 are projected downward against the two thread ends of the knot. The end flange 31 of the cylinder 28 has a slot which corresponds with the slot 86 in the bearing 27 so that the knot can readily leave the cylinder. When the slide 8 has returned to its initial position it contacts with the pawl 90 which causes the lever 88 to be released, so that the spring 66 can return the shaft 50 to its initial position. At the same time the pawl 24 contacts with the stud 25 which releases the lever 7, so as to permit this one of being returned by the spring 20 to the position shown in Fig. 1. The spring 20 also causes the arms 41, 43 and 48 to move back into their initial positions. When the carrier arm 81 moves back, Fig. 2 an inclined plane on the edge thereof abuts against the pawl 82, whereby the stud 84 is moved out of the bend 86 and the arm 71 brought in engagement with the carrier arm in such a

manner that the arm 71 and the lever 67, 68 are also brought back into their initial positions, the clip 32 being moved in the opposite direction to that of the clip 5, so that the knot is drawn tightly together.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In a warp-uniting mechanism, the combination of a rotatable means, means for rotating the same, means for holding the thread upon the rotatable means while the rotatable means is rotated, whereby a loop is formed, means for placing a portion of the thread behind said loop, a shuttle having oppositely beveled ends and carrying a second thread, and means for reciprocating said shuttle through said loop and past said portion, said beveled ends being adapted to be engaged and guided by said portion whereby said shuttle is passed entirely around said portion during a complete cycle of reciprocation.

2. In a warp-uniting mechanism, the combination of means for forming a loop in the free end of one thread, means for directing the thread to the first-named means and for placing the adjacent unlooped intermediate part of the thread behind said loop, means for passing the free end of the other thread through said loop from the front side thereof, around said unlooped intermediate portion, and back through said loop to the front thereof, means for removing the loop from said first-named means, and means for cutting off the free ends of the threads.

3. In a warp-uniting mechanism, the combination of rotatable means carrying projections, means for holding the free end of one thread on said rotatable means, means for rotating said rotatable means whereby the thread is wound around said projections to form a loop, means to direct the thread to the projections and to place the adjacent portion of the thread behind the loop after it is formed, and means to direct the free end of the other thread through said loop from the front side thereof, around said intermediate portion to form the knot and back out of said loop until the knot is tightened.

4. In a warp-uniting mechanism, the combination of rotatable means carrying projections, means for holding the free end of one thread on said rotatable means, means for rotating said rotatable means whereby the thread is wound around said projections to form a loop, means to direct the thread to the projections and to place the adjacent portion of the thread behind the loop after it is formed, means to direct the free end of the other thread through said loop from the front side thereof, around said intermediate portion to form the knot and back out of



said loop until the knot is tightened, and means to remove the loop from said projections.

5 In a warp-uniting mechanism, the combination of rotatable means carrying projections, means for holding the free end of one thread on said rotatable means, means for rotating said rotatable means whereby the thread is wound around said projections to  
10 form a loop, means to direct the thread to the projections and to place the adjacent portion of the thread behind the loop after it is formed, means to direct the free end of the other thread through said loop from the  
15 front side thereof, around said intermedial portion to form the knot and back out of said loop until the knot is tightened, means to remove the loop from said projections, and means for cutting off the free ends of  
20 the threads after the knot is formed.

6. In a warp-uniting mechanism, the combination of a rotating cylinder having projections, means on said cylinder for holding the free end of one thread, means for rotating  
25 said cylinder to wind the thread around the projections to form a loop, means to

direct the thread to said loop and to place the adjacent intermedial portion behind the loop after it is formed, a shuttle carrying the free end of the second thread and having  
30 oppositely beveled ends, a shuttle-carrier for moving said shuttle into and out of said cylinder for its beveled ends to contact said intermediate portion of the first thread  
35 whereby said shuttle and the second thread will be passed around said intermediate portion to form the knot, said carrier continuing to move backwardly until the knot is drawn tight, a ring in said cylinder adapted  
40 to be moved to remove the loop from said projections after the knot is formed, and cutters for removing the free ends of the threads after the knot is tightened.

In testimony, that we claim the foregoing as our invention, we have signed our names  
45 in presence of two subscribing witnesses.

HANS ADOLF HANSEN.  
MARIUS EMIL PETERSEN.

Witnesses:

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ERNEST BOUTARD.