(No Model.) 3 Sheets—Sheet 1.

E. MAERTENS.

LET-OFF AND TAKE-UP MECHANISM FOR LOOMS.

No. 467,036. Patented Jan. 12, 1892.

FIG. 2.

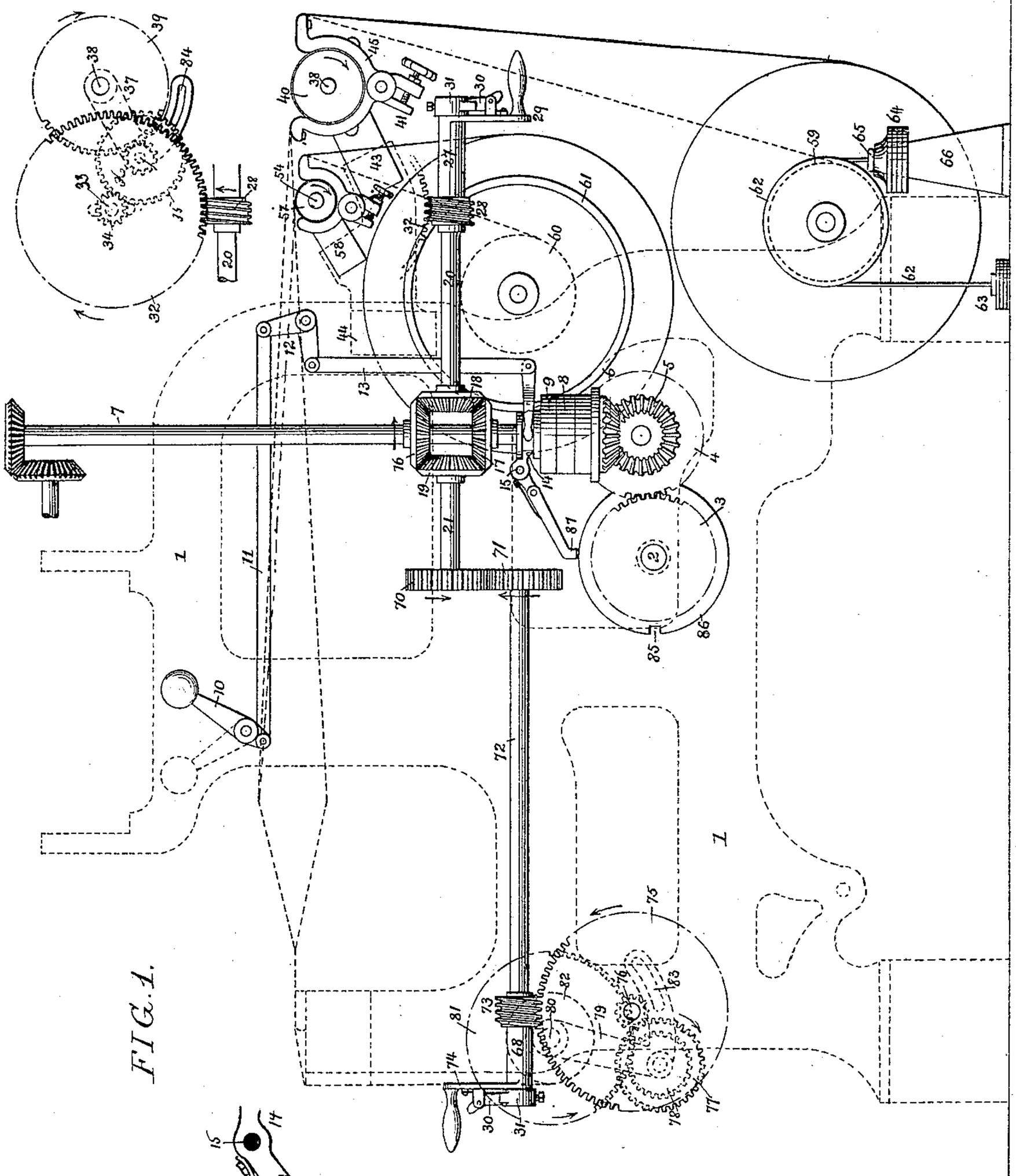

FIG. 1.

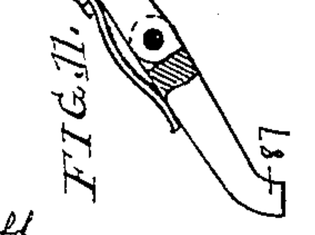

FIG. 4.

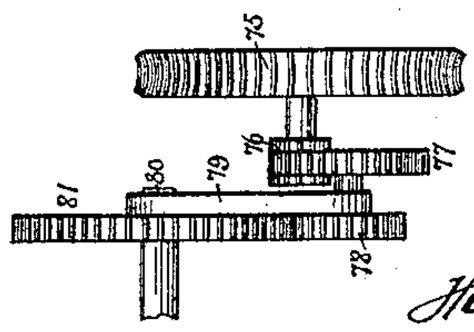

FIG. 5.

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Howson & Howson

(No Model.) 3 Sheets—Sheet 2.

E. MAERTENS.

LET-OFF AND TAKE-UP MECHANISM FOR LOOMS.

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FIG. 7.

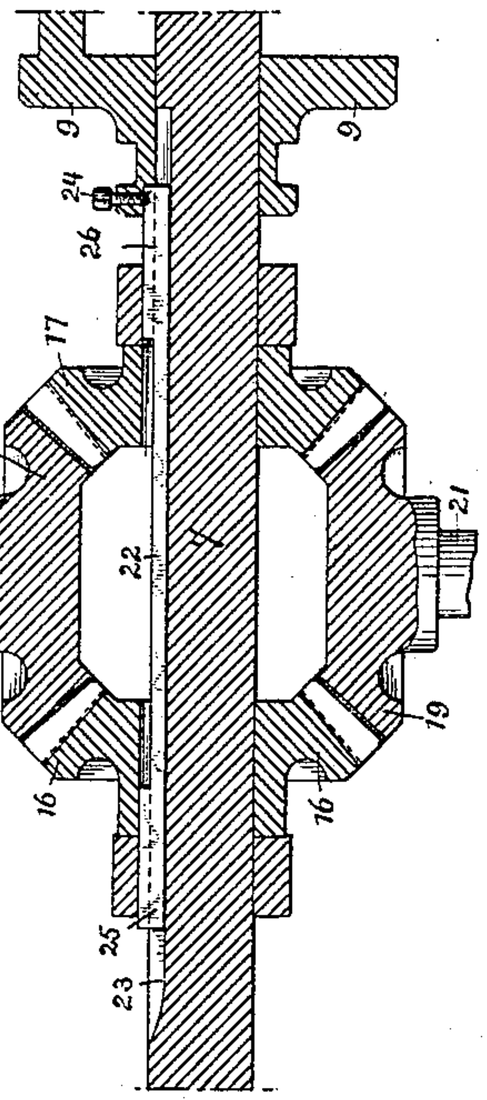


FIG. 3

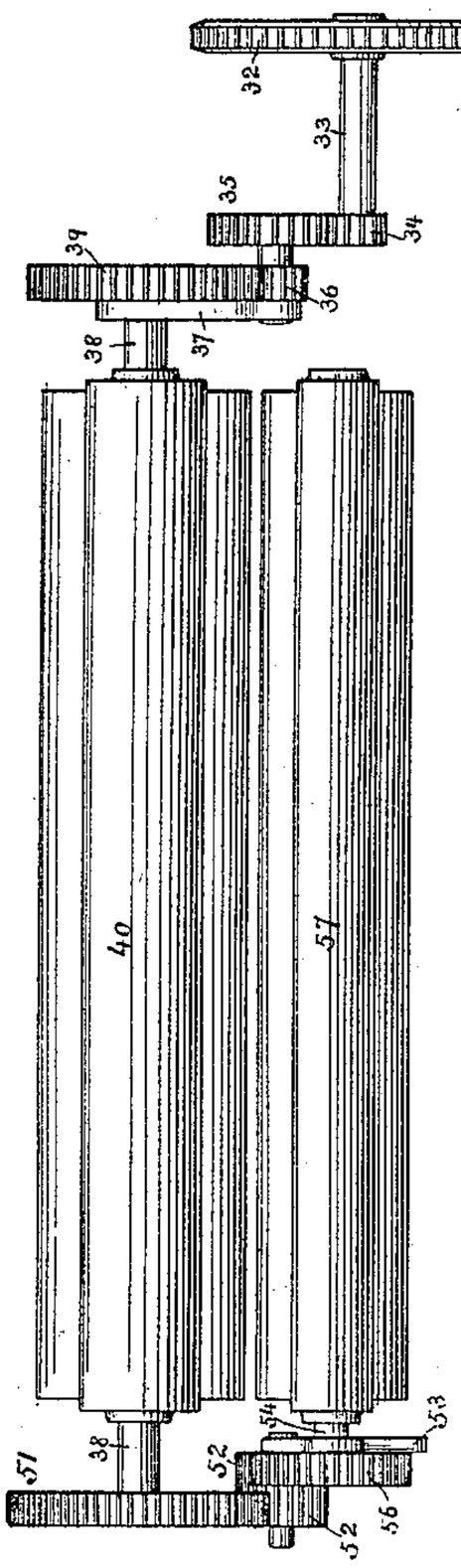


FIG. 6

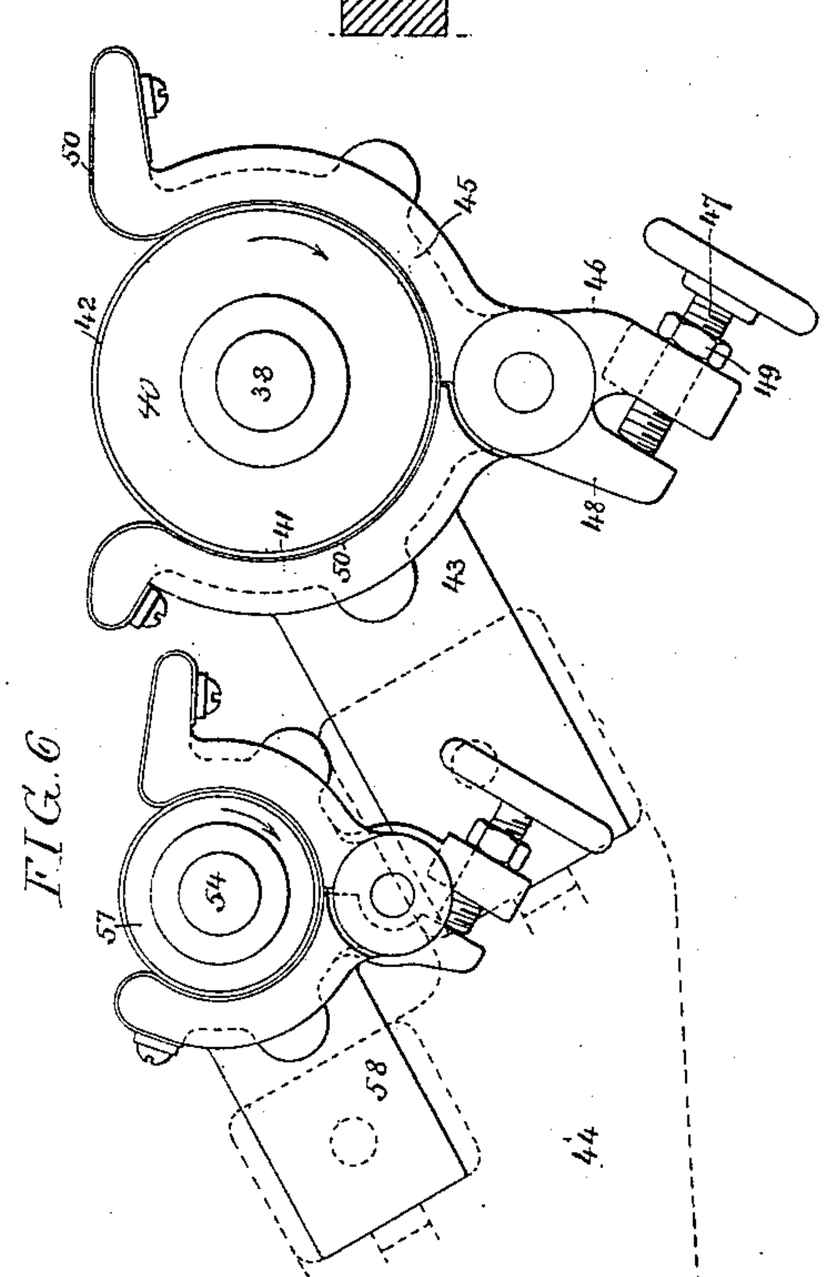
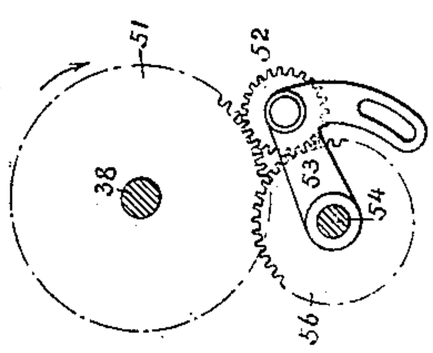


FIG. 4.



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(No Model.) 3 Sheets—Sheet 3.

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FIG. 9.

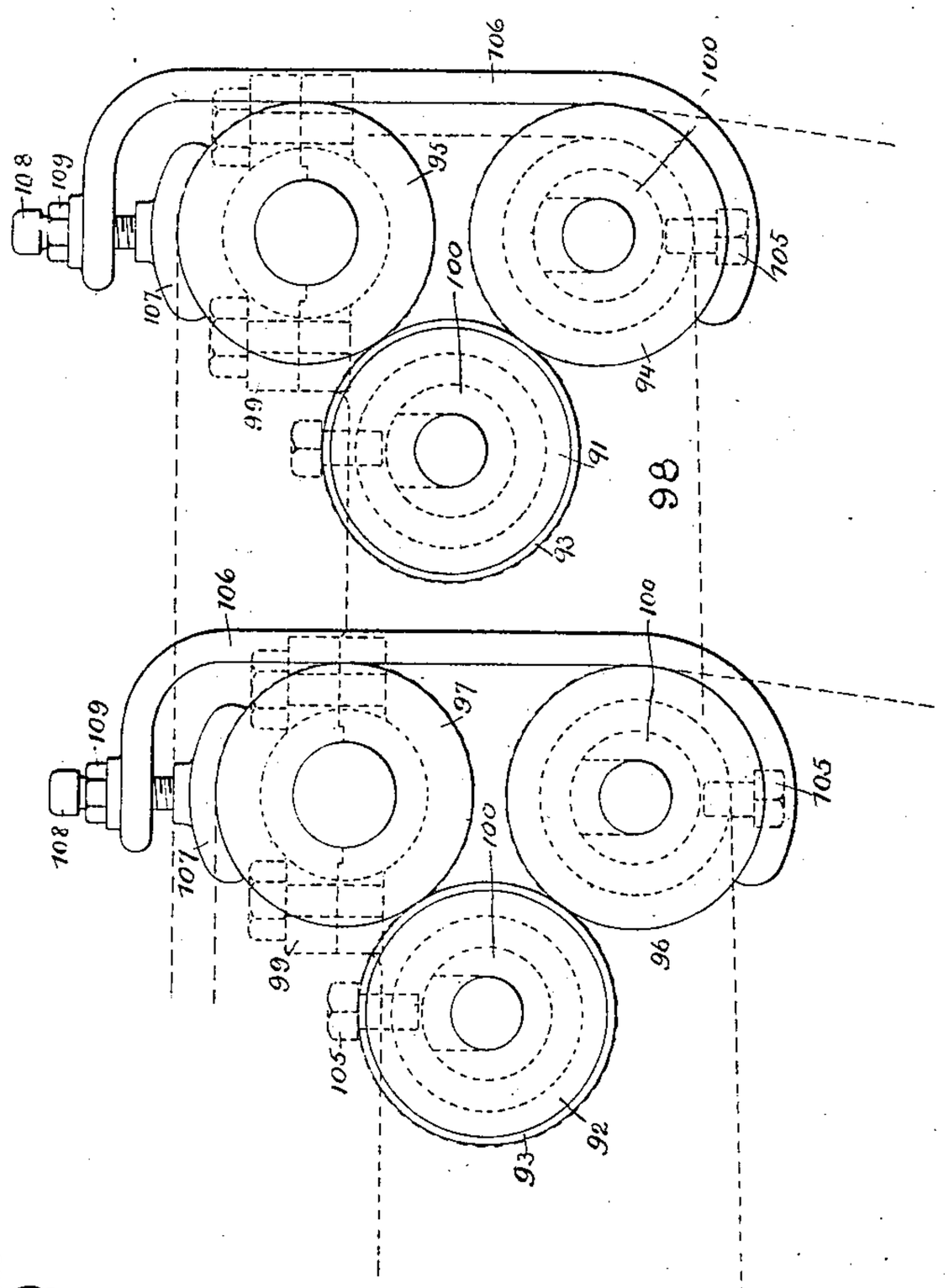


FIG. 8.

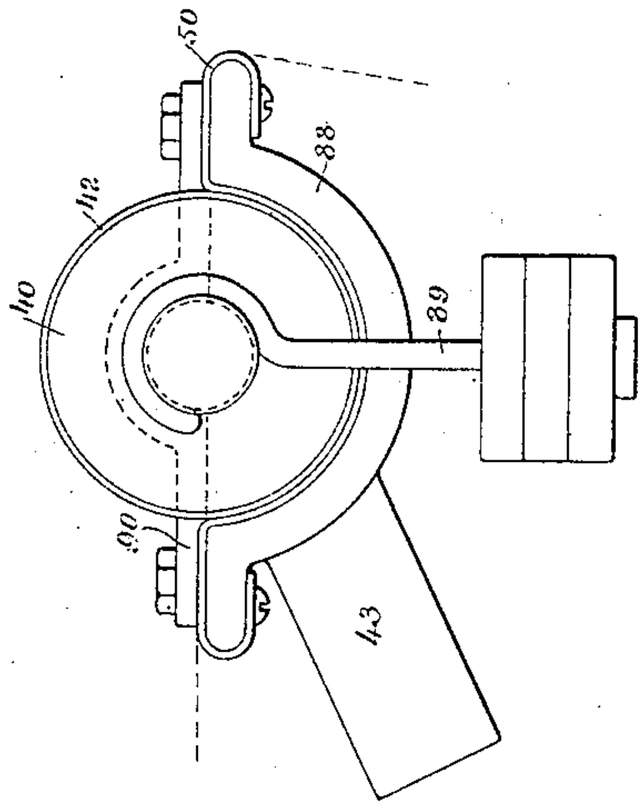
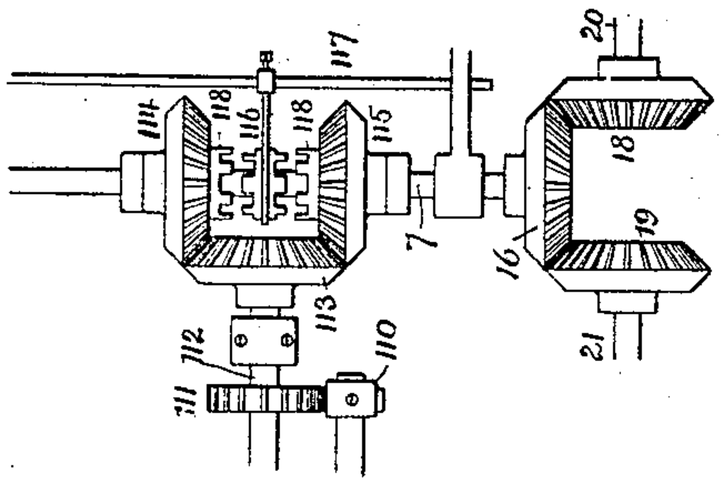


FIG. 10.



Witnesses:
Hamilton D. Turner
Alex. Barkoff

Inventor:
Emile Maertens
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UNITED STATES PATENT OFFICE.

EMILE MAERTENS, OF PROVIDENCE, RHODE ISLAND.

LET-OFF AND TAKE-UP MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 467,036, dated January 12, 1892.

Application filed February 19, 1889. Serial No. 300,472. (No model.) Patented in England June 28, 1888, No. 9,407; in France March 16, 1889, No. 196,749; in Germany March 16, 1889, No. 51,318, and in Belgium March 30, 1889, No. 85,414.

To all whom it may concern:

Be it known that I, EMILE MAERTENS, a citizen of the United States, and a resident of Providence, Rhode Island, have invented certain Improvements in Let-Off and Take-Up Mechanism for Looms, of which the following is a specification.

My invention relates to that class of let-off and take-up mechanism for looms in which the two mechanisms are positively connected, my present invention forming the subject of British Patent No. 9,407, dated June 28, 1888; French Patent No. 196,749, dated March 16, 1889; Belgian Patent No. 85,414, dated March 30, 1889, and German Patent No. 51,318, dated March 16, 1889; and the objects of my invention are to insure absolute accuracy in the relative movements of the take-up and let-off and to render the movements of the same in picking out defective wefts the exact reverse of their movements in weaving the defective portion of the fabric.

With these objects in view my invention comprises certain constructions and combinations of parts, as fully set forth and specifically claimed hereinafter.

In the accompanying drawings, Figure 1 is an elevation of my improved mechanism applied to the well-known Knowles loom, as shown and described in United States Patent No. 134,992, of January 21, 1873. Fig. 2 is a side view of the gearing for driving one of the let-off rolls. Fig. 3 is a plan view of the pair of friction let-off rolls and clamps shown in Fig. 1, with the gearing for driving the same. Fig. 4 is a side view of the gearing by which the secondary let-off roll is driven from the primary let-off roll. Fig. 5 is an end elevation of the gearing for driving the take-up roll. Fig. 6 is an enlarged side view of the friction rolls and clamps of the let-off mechanism. Fig. 7 is a sectional view of the clutching and reversing mechanism connecting the let-off and take-up mechanism with the head-motion shaft of the loom. Figs. 8 and 9 show other forms of the let-off mechanism. Fig. 10 shows a modified form of clutch and reverse gearing between the let-off and take-up mechanism and the head-motion shaft of the loom. Fig. 11 is a detached view, on an enlarged scale, illustrating a detail of construction in one of the parts of the loom.

Referring to Fig. 1, the loom-frame 1 is represented by dotted lines, 2 being the bottom shaft, and 3 and 4 even spur-gears, and 5 and 6 miter-gears, through which motion is communicated to the head-motion shaft 7 by means of the clutch-hub 8, which, when lifted, releases the gear 6 from the shaft 7. The lifting of the clutch is effected by swinging an arm 10, as indicated by dotted lines in Fig. 1, said arm being connected by means of a link 11, bell-crank lever 12, and link 13 to the clutch-operating lever 14, pivoted at 15 on the loom side and carrying a pin which engages the groove in the hub 9 of the clutch. The bevel-gears 16 and 17 are loose upon the shaft 7 and gear into bevel-pinions 18 and 19, carried, respectively, by horizontal shafts 20 and 21, adapted to turn in suitable bearings on the frame of the loom. The shaft 7 is grooved through the bevel-gears 16 and 17, the groove extending down within the grooved hub 9 of the clutch, and a feather 22 is fitted to slide freely in the groove, as shown in Fig. 7, one end of the said feather being fastened to the grooved hub of the clutch at 24, so that the feather slides in the groove when the hub 9 is raised or lowered. The hubs of the gears 16 and 17 are respectively grooved to receive projecting fins 25 and 26 of the feather 22, which is of such length that when the fin 25 is in engagement with the hub of the gear 16 the fin 26 clears the hub of the gear 17, as shown in Fig. 7, so that the pinions 18 and 19 will be driven from the shaft 7 by the pinion 16, pinion 17 turning loosely on the shaft in the other direction. The motion of the grooved hub 9 necessary to disengage it from the clutch-hub 8 is such that when it is lifted the fin 25 of the feather clears the hub of gear 16, while the fin 26 engages the hub of gear 17, in which position the pinions 18 and 19 will be driven through gear 17, the gear 16 running loosely in the opposite direction.

Upon the outer end of the shaft 20 is a sleeve 27, loose on said shaft and having a worm 28 and crank-arm 29. Pivoted to the crank-arm is a spring-actuated catch 30, which is normally in engagement with a recess in a collar

31, secured upon the end of the shaft 20, the catch projecting to within a convenient distance of the crank-handle, so that it may be readily operated by a finger of the hand which turns the crank and caused to clear the recess of collar 31, whereupon the crank-arm and worm may be turned independently of the shaft 20.

Any other known form of clutch may be employed as a means of connecting the worm 28 to or permitting it to be operated independently of the shaft 20.

Meshing with the worm 28 is a worm-wheel 32, secured to one end of a shaft 33, Fig. 2, said shaft being fitted to turn freely in a slotted bearing on the loom side, and secured to the hub of the worm-wheel 32 is a spur-pinion 34, Figs. 2 and 3, which meshes with a spur-gear 35, on the hub of which is a spur-pinion 36, the hub turning loosely on a stud fast in an arm 37, pivoted on the shaft 38 of the let-off roll 40. The pinion 36 meshes with a spur-gear 39, secured to the shaft 38 of the let-off roll 40, the latter resting in a friction-shell which partially embraces the roll 40, both the roll and shell being a little longer than the width of the warp desired to be woven. The roll 40 is covered uniformly with felt or analogous substance 42, providing a frictional hold for the warp, and the friction-shell is composed of two leaves 41 and 45, the leaf 41 being supported by ears 43, bolted to a standard 44 on the loom side, as shown in Fig. 6, and the other leaf 45 being hinged to the leaf 41 underneath the roll 40, the hinges being placed sufficiently near to each other to insure rigidity in the shell.

Placed at suitable intervals on the leaf 45 are ears 46, tapped to receive the binding-screws 47, the points of which bear upon corresponding ears 48 on the leaf 41, so that by manipulating the screws 47 the friction between the clamp and the roll may be regulated, the binding-screws 47 being held in position by locking-nuts 49. The leaves of the friction-rolls are finished smoothly on the inner sides or are lined with composition 50—such as brass, bronze, or other substance, which will offer no material resistance to the movement of the warp—and said leaves are made to conform closely to the size and cylindrical form of the roll 40.

Upon the end of the roll-shaft 38 opposite that which carries the gearing shown in Fig. 2 is secured a spur-gear 51, Figs. 3 and 4, which meshes with a spur-pinion 52, loose on a stud which projects from an arm 53, pivoted on a shaft 54, which is geared to the pinion 52 by a spur-wheel 56 on the shaft 54 and carries a second let-off roll 57, the latter, with its encompassing shell, being similar to the roll 40 and its shell and being supported in the same way by ears 58 on one leaf of the shell bolted to the standard 44.

The warp-beams 59 and 60 are of the usual form and are supported in the usual way in stands on the loom-frame, the beam-heads being provided with friction-drums 61, to which are fitted friction-bands 62, (shown only on the beam 59,) the band passing one or more times around the grooved head of the drum and having at its opposite ends weights 63 and 64, that on the rearward side of the drum being heavier than that on the forward side. The band 62 passes through a bearing 65 on a standard 66, and when the beam is turned so as to deliver the warp the weight 64 is raised until it strikes the bearing 65, as shown in Fig. 1, whereupon its further movement is stopped and both weights serve to load the band 62 and cause it to maintain a frictional hold upon the head of the drum. On backing off the warp, however, by reversing the movement of the let-off rolls, the preponderant weight 64 descends, so as to turn back the beam and rewind the warp.

The shaft 21 is connected by even spur-gears 70 and 71 to a shaft 72, adapted to suitable bearings on the loom side and having a sleeve 68, carrying a worm 73, with crank-arm 74, having clutch 30, the construction being similar to that used in connection with the let-off worm. The worm 73 meshes with a worm-wheel 75, secured to the hub of a spur-pinion 76, loose on a stud secured to the side of the loom, the pinion meshing with a spur-wheel 77, secured to the hub of a spur-pinion 78, which is loose on a stud carried by an arm 79, hung to the shaft 80 of the take-up roll 82, the latter extending across the loom and being similar to the ordinary take-up roll of a loom; or it may consist of a felt-covered roll with smooth clamping-shells similar to those of the let-off mechanism, the roll being driven by a spur-wheel 81, which meshes with the pinion 78.

In placing the warp in the loom the threads are led from the beams over the back lips of the shells of the respective friction let-off rolls, thence passing between the shells and the rolls and out over the forward lips of the shells to be drawn into the harness and carried onto the apron or heading, which passes around the take-up roll and onto the cloth-beam. The pressure of the shells on the friction let-off rolls is adjusted by means of the screws 47, so as to press the warp-threads firmly upon the covering of the rolls, to the comparatively rough and fuzzy surfaces of which the threads adhere, while slipping freely over the smooth surfaces of the shells, only a slight pressure by the shells being required to insure the firm holding and positive carrying of the warp-threads by the rolls. In starting a cut the warp-threads, after being clamped into the let-off and attached to the apron or heading, are adjusted to the proper tension by throwing out the clutch that connects the shaft 72 to the worm-sleeve 68 and turning the take-up by hand independently; or the tension may be adjusted by turning back the let-off independently. During the process of

weaving the direction of motion imparted to shafts 20 and 72 by the bevel-gears 16, 18, and 19 and from said shafts by the gearing-trains to the let-off and take-up rolls is such as to take up the cloth at the proper rate and to draw off the warps from the beams at a rate proportionately greater, depending upon the character of the fabric, as before set forth.

When it is desired to pick out or unweave on a Knowles loom, such as shown in Fig. 1, the lever 10 is thrown over, as shown by dotted lines, so as to disconnect the shaft 7, which drives the harness-motion, from the rest of the loom. By a well-known device the direction of motion of the Knowles pattern-chain is reversed, while the direction of motion of the shaft 7 is unchanged, so that turning the head-motion by hand to open the sheds in the reverse order to that in which they were operated when the cloth was being made turns the shaft 7 in the same direction as when the loom was running in the regular weaving operation.

In order to take back the cloth and warp in picking out, the direction of motion of shafts 20 and 72 must, however, be reversed, and this is accomplished by the same movement of the lever 10 that disconnected shaft 7, for such movement lifted the feather 22, so as to carry its fin 25 out of engagement with the groove of the bevel-gear 16 and bring the fin 26 into engagement with the groove of the wheel 17, it being necessary to bring the grooves in the two gears 16 and 17 into line before the lever 10 can be moved. This is done when the loom is stopped to pick out by bringing a notch 85 in a flange 86, which is secured to the bottom shaft 2, into engagement with a hook 87 on an arm of the clutch-operating lever 14, the flange being secured to the bottom shaft in such position with reference to the notch and hook as to bring the lay and other parts of the loom into a desirable position for picking out when the hook is in engagement with the notch. The arm carrying the hook 87 has a rigid bearing against the lever 14 as regards downward movement of said arm, (see Fig. 11,) so that when said lever 14 is in the position shown in Fig. 1 the hook cannot engage with the notch in the flange 86; but when the lever 14 is moved so as to shift the clutch such downward movement of the arm carrying the hook 87 is possible as will permit said hook to enter the notch, the spring at the back of the arm permitting the same to yield in case the notch 85 is not in line with the hook 87 when the lever 14 is moved to shift the clutch. The take-up and let-off trains being reversed, the warp is taken back by the let-off rolls precisely as fast as it is delivered by the cloth, the weights 64 acting to wind the warp back onto the beams as it is delivered by the let-off rolls. In case it is ever necessary to back off more warp than a warp-beam will take up on one drop of the weight 64 said weight may be lifted by hand, so as to slack up the friction-band 62 and permit the light weight 63 to fall, the band taking a fresh hold when the weight 64 is released, so as to impart further forward movement to the warp-beam.

In turning the head-motion by hand on the Knowles loom the operator can, if he chooses, use the handle 74 on the take-up worm-sleeve 68, which is in rather a more convenient position than the handle provided on the head-motion itself and not shown in the drawings. In any event, owing to the connection of the let-off and take-up mechanism with the head-motion shaft, the action of said take-up and let-off motion must necessarily bear the same relation to the heddle-movement in removing picks that they did in the weaving operation, whereby such picks were inserted. In other words, in the reverse movement of the loom for the removal of a certain number of picks the order of operation of the heddles and the operation of the let-off and take-up are the exact reverse of the operations made by these parts during the operation of weaving the picks which are being removed. Moreover, as the let-off and take-up are never thrown out of adjustment with each other and as there is no slackening up of the warp to pick out, the tension on the warp is always constant, so that an absolutely uniform fabric must be produced, and, furthermore, there can be no light or heavy places in the work, such as in some friction let-offs are caused by a lessening or increase of tension due to the slackening or tightening of the friction-band on the let-off roll by reason of variations in the temperature or humidity of the atmosphere in the weave-room, the grip of my improved friction let-off device being entirely independent of these conditions.

I have in Figs. 1, 3, and 6 shown the improved friction let-off mechanism as applied to a double-beam loom; but of course the mechanism is applicable to looms having any number of beams by simply restricting the mechanism to one roll or extending it to more than two rolls. The form of clamp shown in Fig. 6 is adapted to the heaviest class of work, and in making light goods a simple semicircular trough or socket receiving the roll may be used in place of clamping-shells. This form of let-off device I have shown in Fig. 8, in which 88 represents the roll-socket; 40, the friction-roll; 42, the covering of the same; 50, the shell-lining; 43, the arm, by which the socket is supported to the loom-frame, and 89 a hanger suspended from the roll-shaft and serving as a means of applying weights in addition to the weight of the roll when necessary. Caps 90 are fitted to the journals of the roll and secured to the socket, so as to prevent any tendency of the roll to rise from its seat under the influence of the driving-gears, which are applied in the same way as in the clamp form of socket.

Although I prefer in all cases to use the smooth shell as a means of maintaining the

warp-threads in contact with the friction-roll, I may in some cases substitute for the shell a group of rolls, as shown in Fig. 9, for instance, in which 91 and 92 are the driving-rolls, covered with felt, leather, or analogous substance 93, and corresponding to rolls 40 and 57 in the arrangement shown in Fig. 6. The shells are here replaced by binding-rolls 94 and 95, acting on roll 91, and rolls 96 and 97, acting on roll 92, the rolls 94 and 95 being understood to be spur-geared to roll 91, and the rolls 96 and 97 being likewise geared to roll 92, so that the surfaces of the three rolls of each group travel at the same rate, the rolls of one group traveling at the same rate as or faster or slower than those of the other group, as required. The rolls are supported in bearings in the stands 98, (shown by dotted lines,) which are bolted to the loom-frame, the top rolls being fitted with cap-bearings 99, and the rolls 91, 92, 94, and 96 having journals adapted to socket-bearings 100, held in place in the frame by set-screws 105, so that on reversing the bearings the rolls may be permitted to drop out. One of the rolls of the group 91, 94, 95, preferably the roll 95, is driven from the worm 28 in the same manner as the roll 40 in the arrangement shown in Fig. 6, and the rolls 95 and 97 are geared together by gears similar to gears 51 and 56, Figs. 3 and 4, the gears occupying a position just inside the bearings of the rolls. The warps are led around the rolls, as indicated by the dotted lines, Fig. 9, the grip on the warp being obtained by so regulating the diameters of the rolls and so spacing the distances between their bearings as to bring pressure to bear at the lines of contact of the rolls when the caps 99 are screwed down.

In broad looms it may sometimes be necessary to apply a clamp 106 at about the central point of the rolls to prevent the rolls springing apart in the middle, the warp-threads being separated to admit the clamp. The clamp bears upon one roll, while upon the other roll bears a shoe 107, held in place by a set-screw 108, tapped into the body of the clamp and prevented from turning by a lock-nut 109.

In the well-known "Crompton" loom, such as shown in Patent No. 264,864, dated September 26, 1882, the upright shaft, which corresponds to the shaft 7, instead of running continuously and driving the whole harness-motion, has only intermittent partial revolutions and drives only the pattern-chain, the intermittent motions being imparted, as shown in Fig. 10, by a tappet 110 on one of the shafts of the loom, this tappet engaging with the notches in a disk 111 on a short counter-shaft 112, which has a bevel-wheel 113 gearing into two bevel-pinions 114 and 115, both loose on the shaft 7. Between the two pinions is a clutch-sleeve 116, which is splined on the shaft and may be moved by a rod 117, so as to engage with a clutch-face 118 on either of the pinions 114 or 115, depending upon whether it is desired to turn the shaft 7 forward or backward. In applying my invention to this form of loom it is convenient to gear the let-off and take-up worm-shafts 20 and 21 to a pinion 16 on this intermittently-moving shaft, the gearing-trains from the worms being so proportioned that the partial revolution given to the shaft 7 will carry the take-up and let-off rolls as far as a full revolution in the case of the loom shown in Fig. 1. In general on any loom it is only necessary to connect the worm-shafts to turn a full or partial revolution at each pick and to gear them to some part or parts of the loom operative both in weaving and in unweaving or picking out, part of said gearing constituting a reversing device, so that the movement of the let-off and take-up rolls in unweaving may be contrary to the movement imparted to said rolls during the weaving operation.

It will be evident that my improved friction let-off mechanism can be used with any ordinary let-off drive-gear for the purpose of insuring delivery of warp irrespective of uneven winding of the warp threads on the beams.

In Fig. 1 the full lines running from the warp-beams to the let-off rolls represent the course of the warps when the beams are full, and the dotted lines represent the course of the warps when the beams are empty or almost empty.

I do not desire to claim the special form of clutch shown in connection with the crank-handles of the worm-shafts 20 and 72 or the special means shown for clutching the bevel-pinions 16 and 17 to and releasing them from the shaft 7; nor do I limit myself to the use of such devices in connection with that class of loom which is shown in Fig. 1 of the drawings; but

I claim as my invention and desire to secure by Letters Patent—

1. The combination, in a loom, of let-off and take-up mechanism, gearing positively connecting said let-off and take-up mechanism, a shaft or equivalent part of the loom which is operative both in weaving and unweaving, and gearing whereby the let-off and take-up mechanism are driven therefrom, one of the elements of said gearing being a reversing device, whereby in unweaving said let-off and take-up devices have a retrograde movement which is in extent the exact reverse of that imparted in weaving, substantially as specified.

2. In let-off or take-up mechanism for looms, the combination of a roll covered with felt or analogous material with a presser bearing upon the warp or fabric as the latter passes around the roll, whereby said warp or fabric is pressed directly and forcibly into contact with the roll, substantially as specified.

3. The combination, in take-up or let-off

mechanism for looms, of a roll covered with felt or analogous material with a smooth friction-shell partially embracing said roll and serving to maintain the warp or fabric in contact with the roll, substantially as specified.

4. In let-off or take-up mechanism for looms, the combination of the covered roll with a smooth friction-shell partially embracing the roll and made in parts hinged together and provided with clamping-screws, whereby said parts of the shell may be pressed upon the roll, substantially as specified.

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

EMILE MAERTENS.

Witnesses:
W. H. THURSTON,
S. J. MURPHY.