F. M. CLARK.

NEEDLE LOOM.

APPLICATION FILED AUG. 14, 1907.

1,009,472.

Patented Nov. 21, 1911.

6 SHEETS—SHEET 1.

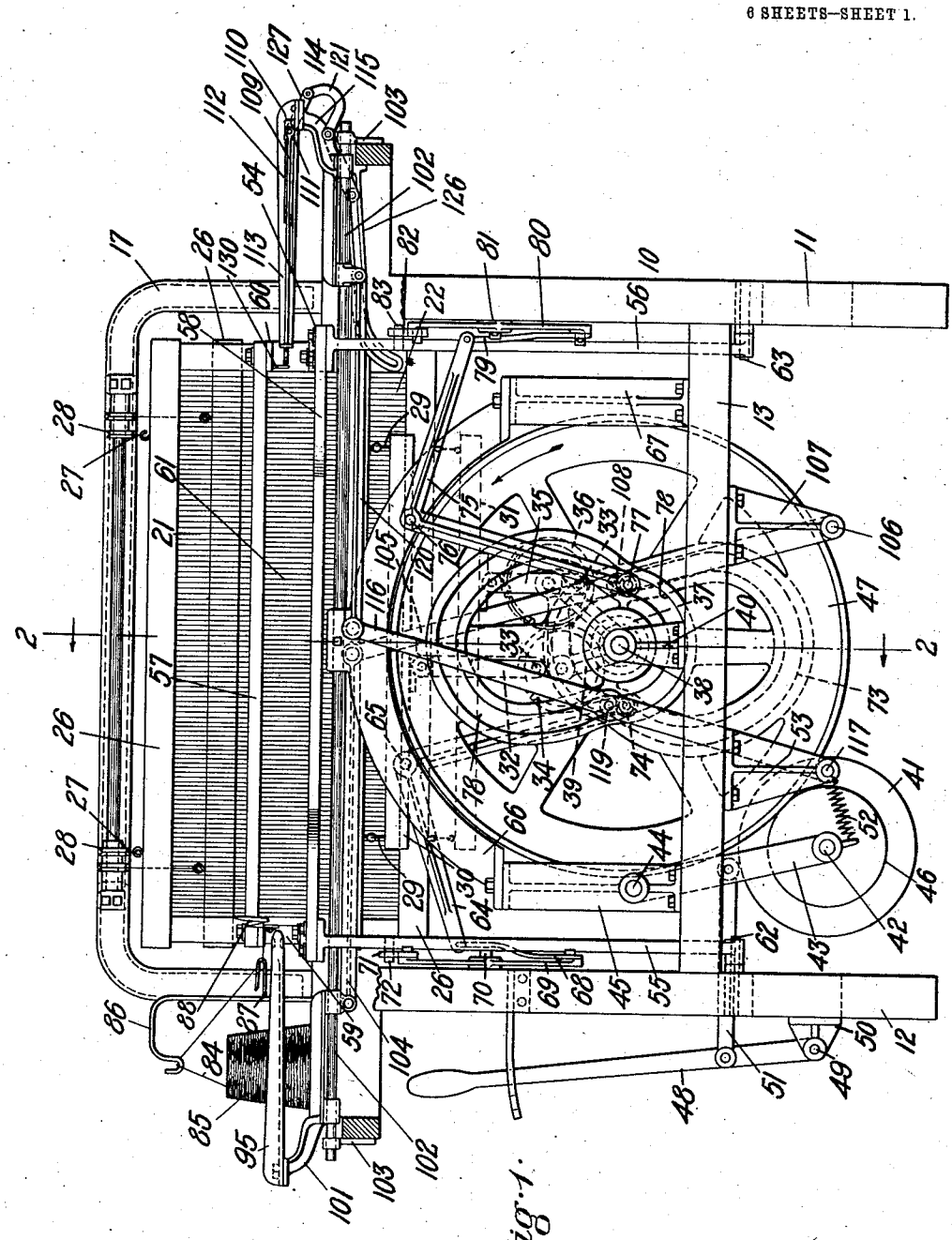

Fig. 1.

Witnesses:
Ernest A. Hefler
Franklin E. Low

Inventor:
Frank M. Clark
by his attorney, Charles D. Gooding

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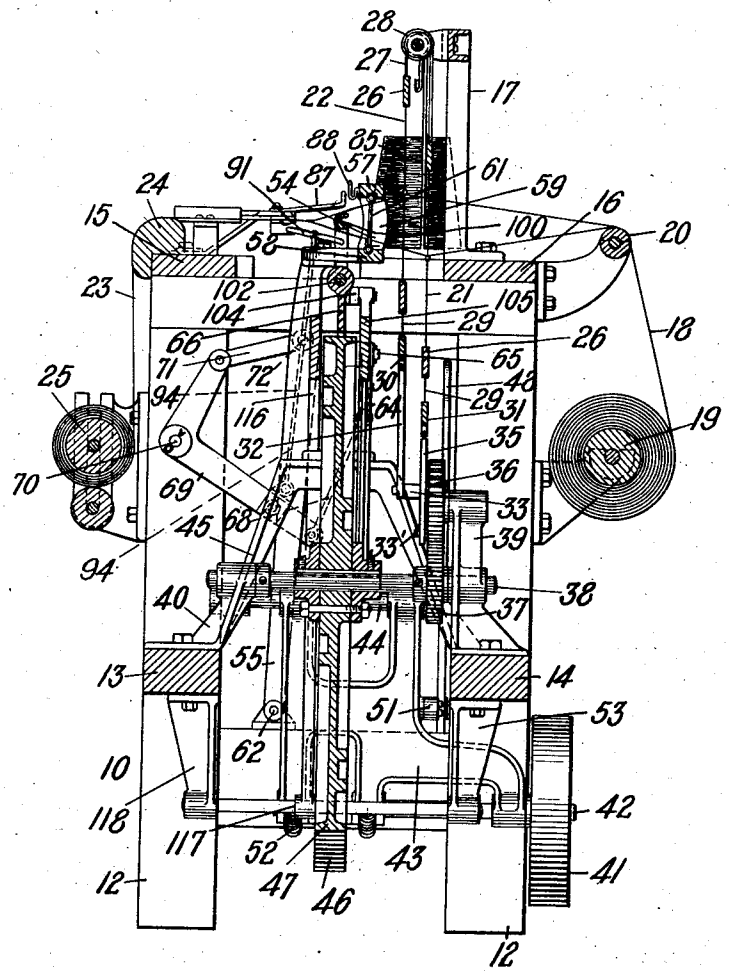

Fig. 2.

Witnesses:
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6 SHEETS—SHEET 3.

Fig. 3.

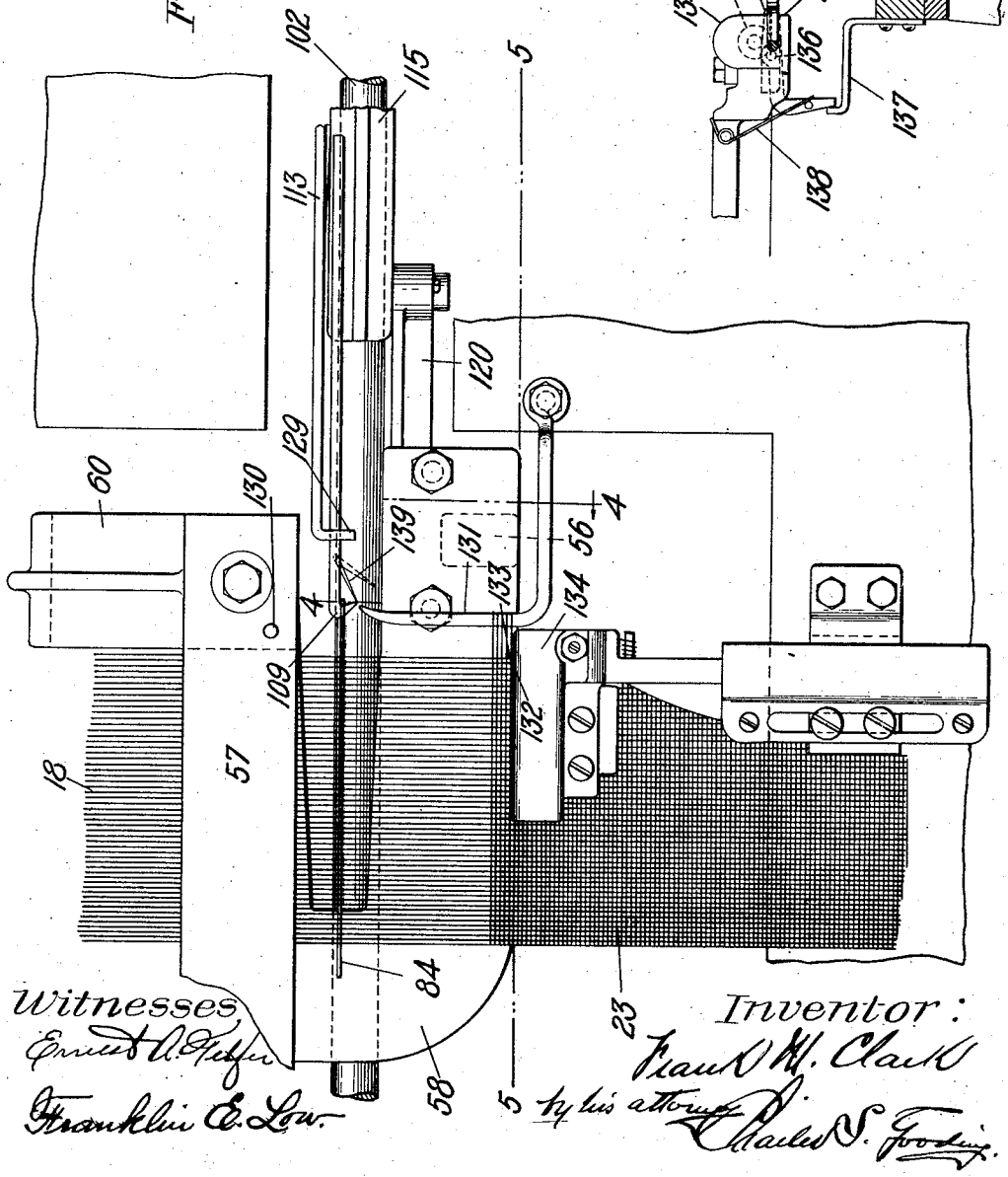
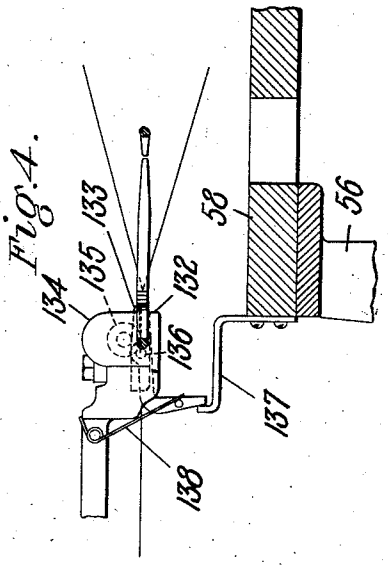


Fig. 4.



Witnesses,

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Inventor:

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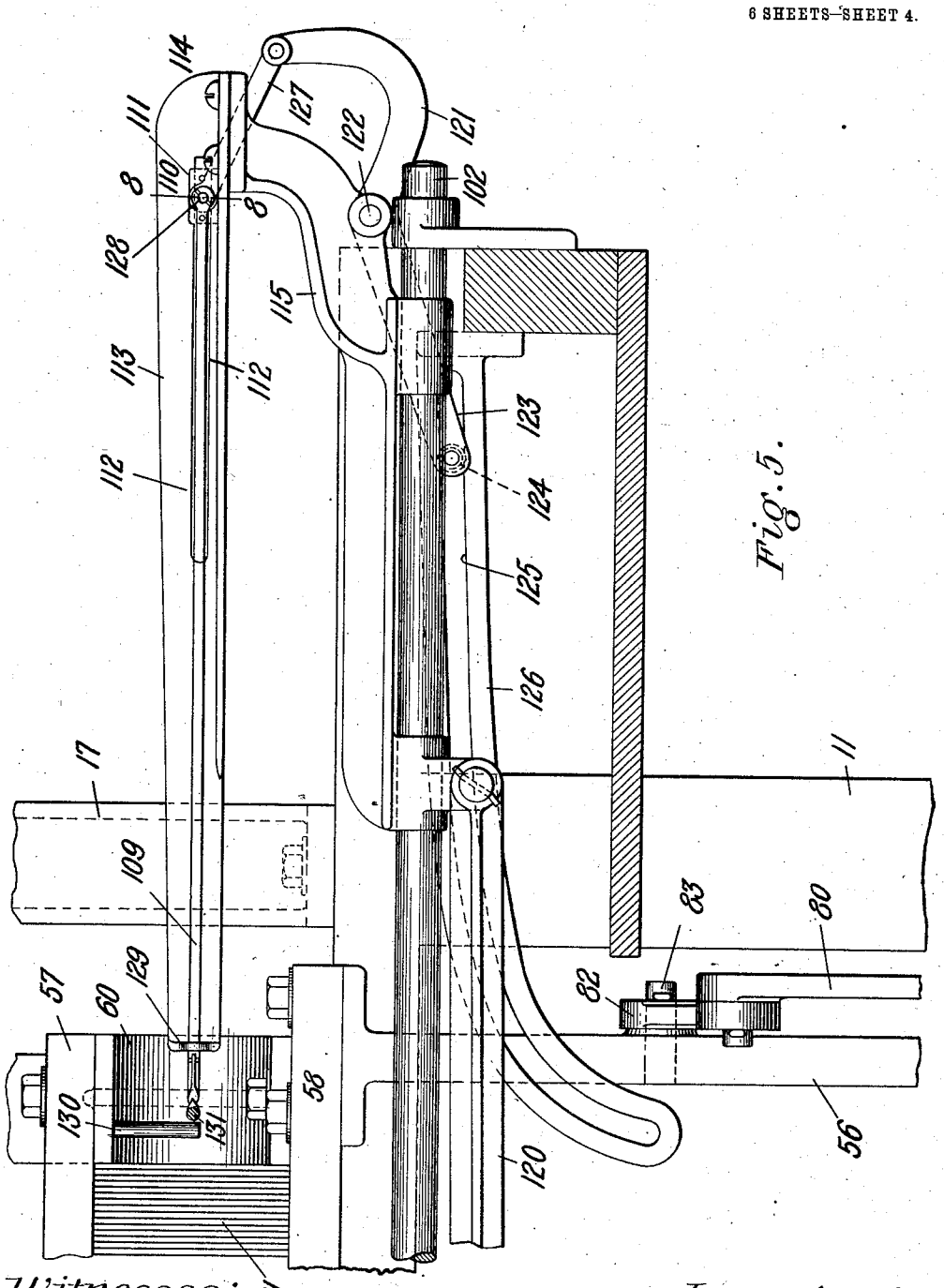

Fig. 5.

Witnesses;
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6 SHEETS—SHEET 6.

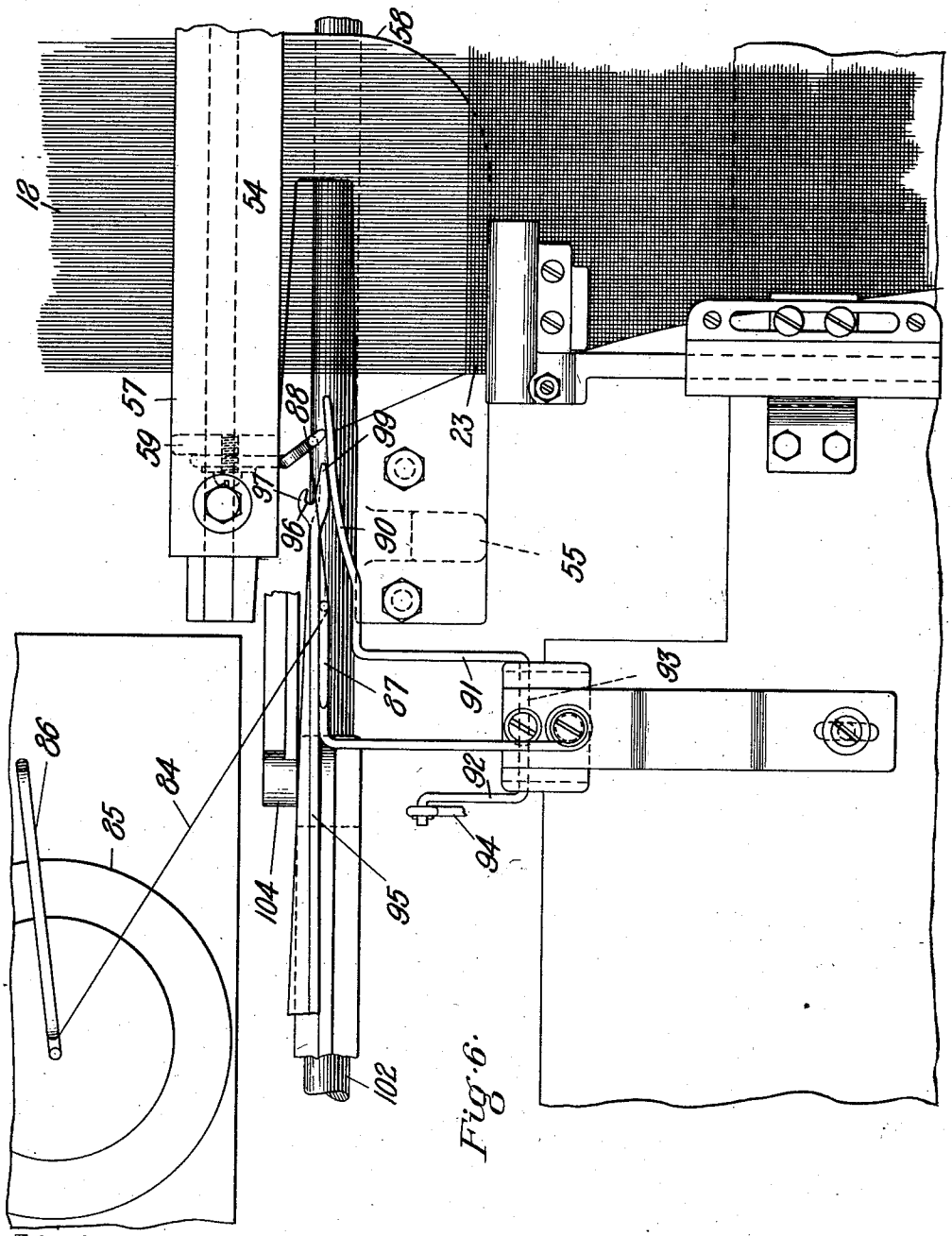

Fig. 6.

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6 SHEETS—SHEET 6.

Fig. 8.

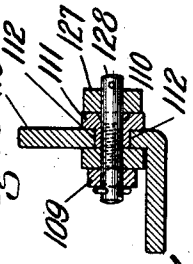

Fig. 7.

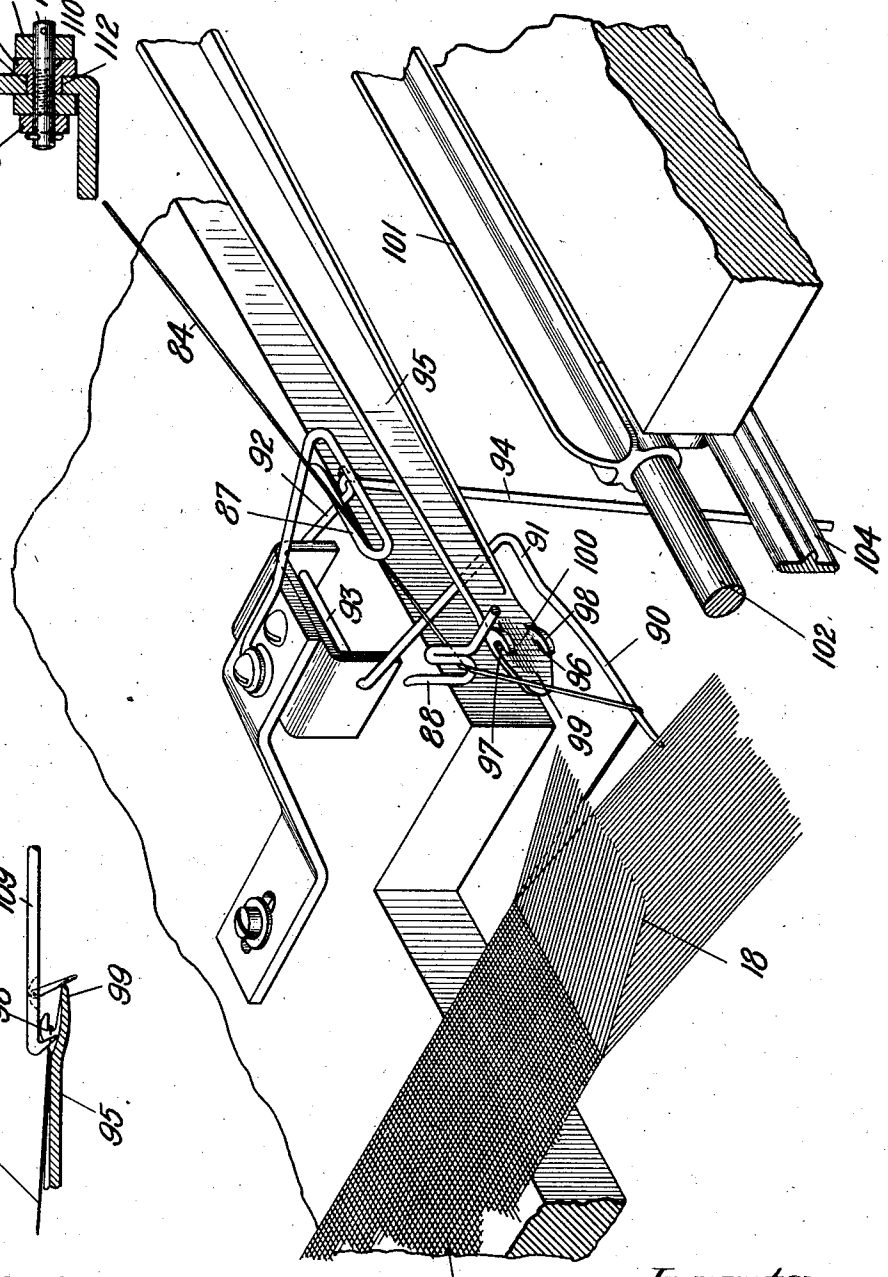

Fig. 9.

Witnesses:

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Franklin E. Low.

Inventor:

Frank M. Clark

by his attorney Charles N. Fooding.

UNITED STATES PATENT OFFICE.

FRANK M. CLARK, OF TILTON, NEW HAMPSHIRE, ASSIGNOR TO CLARK MECHANICAL CO., A CORPORATION OF NEW HAMPSHIRE.

NEEDLE-LOOM.

1,009,472. Specification of Letters Patent. Patented Nov. 21, 1911.

Application filed August 14, 1907. Serial No. 388,450.

To all whom it may concern:

Be it known that I, FRANK M. CLARK, a citizen of the United States, residing at Tilton, in the county of Belknap and State of New Hampshire, have invented new and useful Improvements in Needle-Looms, of which the following is a specification.

This invention relates to improvements in looms, the object of the invention being primarily to eliminate the shuttle, picker and picker stick commonly used in looms, and employing in lieu thereof a yarn feeding finger or pusher adapted to carry the filling or weft thread partly across the warp threads of the fabric and a needle adapted to take said filling thread from said feeding finger and carry the same across the remaining width of the fabric.

In my improved loom the general principle of changing the warp threads is accomplished by means of a harness and the beating up of the filling thread by means of a lay in the usual manner, although the specific mechanism for operating the harness and for actuating the rocking movement of the lay I believe to be new and original.

In the present form of my invention a U or loop shape is given to the filling thread at one side of the shed by means of a looper and the loop thus formed is carried across between the warp threads by a needle, thus forming a double filling thread in the form of a loop extending entirely across the warp and between the warp-threads. The filling thread is then removed from the needle and beaten up by the lay, the closed end of the loop being first carried by the lay or by a projecting piece thereon to a holder upon which it is landed to be subsequently cut, finally leaving a double filling thread in the fabric for each pick.

The advantages obtained by my improved loom consist in eliminating the shuttle, picker stick and picker, which are a source of great expense in the present loom on account of their constantly becoming worn and broken, and also in reducing the extent to which it is necessary to open the shed in order to pass the filling thread therethrough, and further still in producing a quiet running easily operated machine which takes comparatively little power.

To these different ends my invention consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings: Figure 1 is a front elevation of my improved loom, the frame being partly broken away and portions thereof shown in section for the sake of clearness in illustration. Fig. 2 is a sectional elevation taken on line 2—2 of Fig. 1 looking in the direction of the arrow on said line. Fig. 3 is an enlarged plan of the needle, the holder for the filling loop, the temple and connecting mechanism, with portions of the frame and lay being shown in their respective positions and broken away to save space in the drawings. Fig. 4 is a right hand side elevation, partly in section, on line 4—4 of Fig. 3, looking toward the left in said figure and illustrating the temple and mechanism for cutting the filling thread. Fig. 5 is a sectional elevation enlarged and taken along the line 5—5, Fig. 3, as viewed from the front of the machine, illustrating the needle, a portion of the lay (a portion of the loom frame being shown in section) and a portion of the mechanism by which the needle is given its reciprocatory motion transversely of the shed between the warp threads. Fig. 6 is a plan view of the looper, thread guides, a portion of the lay and of the frame, illustrating the direction of the thread relatively to the different thread guides at the left of the machine before it is taken by the looper to be carried across the shed between the warp threads. Fig. 7 is a perspective view illustrating the looper, thread guides and measuring finger as said looper is about to take the thread and form a loop therein to be carried between the warp threads transversely of the shed. Fig. 8 is a sectional elevation of the needle holder and a portion of the carrier taken on line 8—8 of Fig. 5. Fig. 9 is a detail view illustrating the needle in its relative location to the looper just as it is about to take the filling thread from said looper.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 10 is the frame of the loom consisting of two side frames 11, 12 connected together by cross-bars 13, 14, 15

and 16 and by an arch 17. The warp threads 18 pass in the usual manner from the warp beam 19 over the whip roll 20 through the heddles 21, 22 to the cloth 23 which passes over the breast-beam 24 in the usual manner to the cloth roll 25. The harnesses 26 are connected by straps 27 to the rolls 28, said rolls being rotatably supported upon the brackets fast to the arch 17. The lower harnesses 26 are connected by wires 29 to bars 30 and 31. The bar 30 is connected by a link 32 to a crank-pin 33 fast to a gear 34 while the bar 31 is connected by a link 35 to a crank-pin 33′ fast to the gear 36. The gear 34 meshes into the gear 36 and the gear 34 meshes into the gear 37 fast to the main shaft 38, said shaft 38 extending longitudinally of the warp threads. Said gears 34 and 36 rotate upon studs fast to a bracket 39 which, in turn, is fastened to the cross-bar 14 of the frame. The shaft 38 rotates in bearings formed in the bracket 39 and in another bracket 40 fast to the cross-bar 13. A rotary motion is imparted to the shaft 38 by a pulley 41 which may be driven by a suitable belt. Said pulley 41 is fastened to a shaft 42 which is journaled to rotate in bearings formed in a rocker frame 43 fast to a rock-shaft 44 which is journaled to rock in a bracket 45 fast to the frame of the machine. A friction pulley 46 is fast to the shaft 42 and is adapted to bear against the periphery of a cam 47 which constitutes, in effect, a species of fly wheel. Said cam 47 is fastened to the main shaft 38. The friction pulley 46 is brought into and out of contact with the periphery of the cam 47 by rocking the rocker frame 43, this being done by means of a lever 48 pivoted at 49 to a bracket 50 fast to the frame of the machine, said lever being connected by a link 51 to the rocker frame 43. A spring 52 connected at one end thereof to the rocker frame 43 and at the other end to a bracket 53 holds the friction pulley 46 normally in contact with the periphery of the cam wheel 47. Thus, when the cam wheel 47 is rotated it will be seen that the shaft 38 will rotate, thus rotating the gear 37, and by means of the gear 37 the gear 34 will be rotated, which rotates the gear 36, said gears 34 and 36 rotating their respective crank-pins 33 and 33′, and thus imparting a reciprocatory motion to the harnesses, which operate to change the warp threads of the shed in the usual manner.

The lay 54 is of the usual construction and consists of the lay swords 55, 56 which are fastened together by the cross-pieces 57 and 58, said cross-pieces being fastened together by brackets 59, 60 and forming a support for the reed 61. A rocking motion is imparted to the lay by two similar sets of mechanism, one of which is connected to the lay sword 55 and the other to the lay sword 56. The lay swords 55 and 56 are pivoted at 62 and 63, respectively, to brackets fast to the frame of the loom. A rocking motion is imparted to the lay by the lever 64 pivoted at 65 to the arched cross frame 66 which is supported upon the brackets 45 and 67 (Fig. 1). The lever 64 is connected by a link 68 to a lever 69 which is pivoted at 70 to the frame and connected by a link 71 at its upper end to the lay sword 55 by a pin 72. A rocking motion is imparted to the lever 64 by a cam groove 73 formed in the cam wheel 47 and containing a cam roll 74 which is rotatably mounted upon the lever 64. A rocking motion is imparted to the lay sword 56 by a similar mechanism to that just described, consisting of a lever 75 which is pivoted at 76 to the arched cross-piece 66 and has a cam roll 77 thereon which projects into a cam groove 78 formed in the front side of the cam wheel 47. The cam grooves 73 and 78 are substantially of the same contour and are located diametrically opposite each other. The lever 75 is connected by a link 79 to a lever 80 pivoted at 81 to the frame of the machine and connected by another link 82 at its upper end to a pin 83 fast to the lay sword 56.

It will be evident that when the cam wheel 47 is rotated, as hereinbefore described, a rocking motion will be imparted to the levers 64 and 75, thus imparting through the links 68 and 79 a rocking motion to the levers 69 and 80 which, through the links 71 and 82, impart a rocking movement, respectively, to the lay swords 55 and 56.

The filling thread 84 is led from a spool 58 to a tension device and guide 86, thence to a guide 87 supported upon the frame of the machine and from the guide 87 said filling thread passes to a guide 88 which is fastened to the lay. From the guide 88 the filling thread passes to the cloth 23 (see Figs. 6 and 7). A measuring finger 90 extends across the filling thread intermediate the cloth and the guide 88, said measuring finger being bent to form two arms 91 and 92 connected by a cross-piece 93 which is supported to rock upon a bracket on the frame of the machine. The measuring finger 90 constitutes, in effect, a movable thread guide for the filling thread and the arms 92 and 91 constitute cranks, the crank-arm 92 being connected by a link 94 to the lever 69.

The looper 95 has a groove 96 extending vertically thereacross between the two rearwardly extending fingers 97, 98 and the guard 99 at the forward end of said looper. It will be noted that there is a space 100 between the fingers 97, 98 which constitutes, in effect, a horizontal groove. The guard 99 is separated from the fingers 97, 98 by the space or groove 96. Said guard has prefer-

ably curved upper and lower edges forming a wedge and extends forwardly beyond said fingers for the purpose hereinafter described. The looper 95 is fastened to a slide 101 which is arranged to slide upon a rod 102 extending transversely entirely across the machine and fastened at its ends to brackets 103, 103, which brackets are fastened to the frame of the machine. A reciprocatory motion is given to the slide 101 and to the looper 95 carried thereby by means of a link 104 which is connected at one end to said slide 101 and at the other end thereof to a lever 105, said lever being pivoted at 106 to a bracket 107 fast to the cross piece 13. The lever 105 has a cam roll 108 journaled thereon which projects into the cam groove 73 in the cam wheel 47, so that as said cam wheel 47 is rotated a reciprocatory motion will be imparted to the slide 101 and to the looper 95 through the lever 105 and the link 104.

The needle which takes the filling thread from the looper 95 and the mechanism by which a reciprocatory motion is given to the needle and the needle carrier is illustrated at the right of Fig. 1, in plan view enlarged in Fig. 3 and in front elevation in Fig. 5. Referring particularly then to these figures, 109 is a needle, which is preferably a latch needle similar in principle of construction and operation to the latch needle of knitting machines. Said needle 109 is fastened to a holder 110 which consists of a slide piece 111 adapted to slide in ways 112 formed upon the upper part 113 of the carrier 114. The upper part 113 of said carrier is fastened to a lower part 115, constituting a slide, which is adapted to slide upon the rod 102. A reciprocatory motion is imparted to the carrier 114 by a cam lever 116 which is pivoted at 117 to the bracket 53 fast to the cross piece 13 and has a cam roll 119 journaled to rotate thereon and projecting into the cam groove 78.

The upper end of the lever 116 is connected by a link 120 to the slide piece 115 of the carrier 114. Thus a reciprocatory motion is imparted to the carrier 114 and to the needle and its holder supported thereon. An independent reciprocatory motion of the needle and its holder relatively to the carrier 114 is obtained by means of a lever 121 which is pivoted at 122 to the slide piece 115. One arm 123 of said lever 121 has journaled thereon a cam roll 124 which projects into a slot 125 formed in a bracket 126 fast to the frame of the loom. The forward end of this slot 125 projects downwardly upon a curve, as seen in Fig. 5, and thus as the carrier 114 moves forward or toward the warp threads the roll 124 travels downwardly in the slot 125 at the forward end of its movement and rocks the lever 121 upon its pivot 122. The lever 121 is connected by a link 127 to a stud 128 which is fast to the slide holder 111, so that as said lever 121 is rocked, as hereinbefore described, the holder 111 and the needle 109 fast thereto will be given a reciprocatory motion upon the upper part 113 of the carrier 114. The front end of the needle 109 is arranged to slide in a hole provided therefor in a rib 129 extending laterally toward the front of the loom from the forward end of said part 113.

When the loop of filling thread has been drawn across the shed between the warp threads to the position illustrated in Fig. 3, it is removed from the needle 109 by suitable means consisting of a pin 130 (Fig. 3) attached to the lay, which, as said lay moves forward, pushes the loop of filling thread off of the needle and onto a holder or horn 131. This horn is fast to the frame of the machine, as seen in Fig. 3. The lay beats up the filling thread in the usual manner, except in this particular embodiment of my invention the filling thread is a double one—that is, two threads, and these filling thread loops are carried along on the holder 131 until they arrive at the position illustrated in Fig. 3 when they are cut by a pair of cutters 132 and 133. Said cutters are supported upon the temple 134 which, in turn, is supported upon the frame of the machine and which may be of any suitable construction, the operation of said temple being well known to those skilled in the art and comprising in its construction a temple roll 135 having teeth thereon which engage the fabric and hold the side thereof under suitable lateral tension.

The cutter 132 is pivoted at 136 to the temple and is rocked upon its pivot to coact with the stationary cutter 133 for the purpose of cutting the loops of filling thread at the proper time by an arm 137 fast to the lay (see Fig. 4). Said arm engages the downwardly extending end of the movable cutter lever 132 and rocks the same upon its pivot 136 until the cutting edge thereof coacts with the stationary cutter 133 to cut the loops of filling thread at the edge of the cloth. A spring 138 holds the movable cutter away from the cutting edge of the stationary cutter when the arm 137 is disengaged from said movable cutter lever. The parts referred to are illustrated in Fig. 4 in the position occupied thereby when the lay is back.

The general operation of the mechanism hereinbefore specifically described is as follows: The warp threads are moved by the harness alternately to form the shed through which the filling thread is carried by means of the mechanism hereinbefore described. When the shed is open the looper 95 is carried forward from the position illustrated in Figs. 1 and 6 to that illustrated in Fig. 7. While the looper is moving forward and

just before it takes the filling thread, said filling thread is carried downwardly below the guide finger 88 by means of the measuring finger 90, said measuring finger being rocked, in order to perform this function, by the mechanism hereinbefore described. The continued forward motion of the looper results in that portion of the filling thread 84 which lies between the guide 88 and the finger 90 being led into the groove 96 in said looper between the guard 99 and the rearwardly extending fingers 97, 98 thereon. After the looper 95 has been moved partly across the shed, from the left hand side thereof, it is met by the needle 109, which has been moved forward by the combined sliding movement of the carrier 114 and of the holder 111 and needle 109 thereon. The latch of the needle is partly opened, if not wholly, by the loop of filling thread when it is removed from the needle, as hereinbefore described, by the forward movement of the lay. If, however, said latch is not fully opened by this means it will be fully opened by engaging the guard 99 upon the looper 95, see Fig. 9. It will be understood that the needle passes toward the left beyond the guard 99 and the fingers 97 and 98 and the filling thread lying in the groove 96 between said fingers and said guard, and then retreats, the hook portion of the needle then taking the filling thread from the looper and carrying it across the remainder of the shed between the warp threads to the position illustrated in Fig. 3. The lay now moves forward, removes the loop held upon the needle 109 therefrom and carries it onto the horn or holder 131, at the same time beating up the filling thread between the warp threads in the usual manner.

The needle 109 may be used without a latch, simply forming a hook of suitable shape, but the latch 139 very much reduces any liability of the hook of the needle catching in the warp threads as it is being passed therebetween and especially upon its return movement. After the looper filling thread has been beaten up by the lay, said lay returns to its back position, causing the cutters to cut a portion of the loops on the horn, and the operation hereinbefore described is repeated, the looper meantime having returned to its position at the left of the machine and outside the warp threads in readiness to be moved forward and carry another loop between said warp threads. It is preferable in this embodiment of my invention that any of the well known means should be employed for forming a selvage upon the edge of the fabric in order to lock the filling threads in the fabric.

It will be seen that the wedge-shaped guard 99 with its upper and lower edges preferably curved prevents the warp threads from becoming caught by the looper as it is moved transversely of the shed.

Having thus described my invention, what I claim and desire by Letters Patent to secure is:

1. In a loom, a looper adapted to engage the filling thread, mechanism to impart a reciprocatory motion thereto transversely of the warp threads at one side of the shed, whereby a loop is formed by said filling thread, a needle adapted to receive said loop, a carrier for said needle, mechanism to impart a reciprocatory motion to said carrier transversely of the shed, and mechanism to impart a reciprocatory motion to said needle transversely of said shed and relatively to said carrier whereby said filling thread is carried to the opposite side of said shed.

2. In a loom, a looper located at one side of the shed, mechanism adapted to move said looper transversely of said shed, thread guides arranged to guide the filling thread, and a measuring finger adapted to engage said filling thread and lay it across the path of motion of said looper, whereby a loop is formed in said filling thread and carried by said looper in a direction transversely of said shed.

3. In a loom, a looper located at one side of the shed, mechanism adapted to move said looper transversely of said shed, thread guides arranged to guide the filling thread, a tension device for said filling thread, and a measuring finger adapted to engage said filling thread and lay it across the path of motion of said looper whereby a loop is formed in said filling thread and carried by said looper in a direction transversely of said shed.

4. In a loom, a looper located at one side of the shed, mechanism adapted to move said looper transversely of said shed between the warp threads and partly across said shed, and thread guides arranged to lead the filling thread across the path of motion of said looper, whereby a loop is formed and carried by said looper between said warp threads and partly across said shed.

5. In a loom, a looper located at one side of the shed, mechanism adapted to move said looper transversely of said shed, thread guides arranged to guide the filling thread, a measuring finger adapted to engage said filling thread, and mechanism to impart a rocking motion to said finger and lay said filling thread across the path of motion of said looper whereby a loop is formed in said filling thread and carried by said looper in a direction transversely of said shed.

6. In a loom, a lay, a looper located at one side of the shed, mechanism adapted to move said looper transversely of said shed, thread guides arranged to guide the filling thread, one of said thread-guides carried by said lay, and a measuring finger adapted to en-

gage said filling thread and lay it across the path of motion of said looper, whereby a loop is formed in said filling thread and carried by said looper in a direction transversely of said shed.

7. In a loom, a lay, a looper located at one side of the shed, mechanism adapted to move said looper transversely of said shed, thread guides arranged to guide the filling thread, one of said thread guides carried by said lay, a tension device, and a measuring finger adapted to engage said filling thread and lay it across the path of motion of said looper, whereby a loop is formed in said filling thread and carried by said looper in a direction transversely of said shed.

8. In a loom, a needle, a carrier for said needle, mechanism to impart a reciprocatory motion to said carrier transversely of the shed, and mechanism to impart a reciprocatory motion to said needle transversely of said shed and relatively to said carrier.

9. In a loom, a needle, a holder for said needle, a carrier upon which said holder is arranged to slide, mechanism to impart a reciprocatory motion to said carrier, and mechanism actuated by the movement of said carrier to impart a reciprocatory movement to said holder and needle relatively to said carrier.

10. In a loom, a needle, a holder for said needle, a carrier upon which said holder is arranged to slide, mechanism to impart a reciprocatory motion to said carrier, and a lever pivoted to said carrier and operatively connected to said holder, said lever engaging a cam groove provided in a stationary member, whereby the reciprocatory movement of said carrier rocks said lever and imparts a reciprocatory motion to said holder and needle relatively to said carrier.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANK M. CLARK.

Witnesses:
W. B. FELLOWS,
CRAVEN LAYCOCK.