No. 747,988. PATENTED DEC. 29, 1903.

G. A. LEIGHTON.

KNITTING MACHINE.

APPLICATION FILED OCT. 1, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

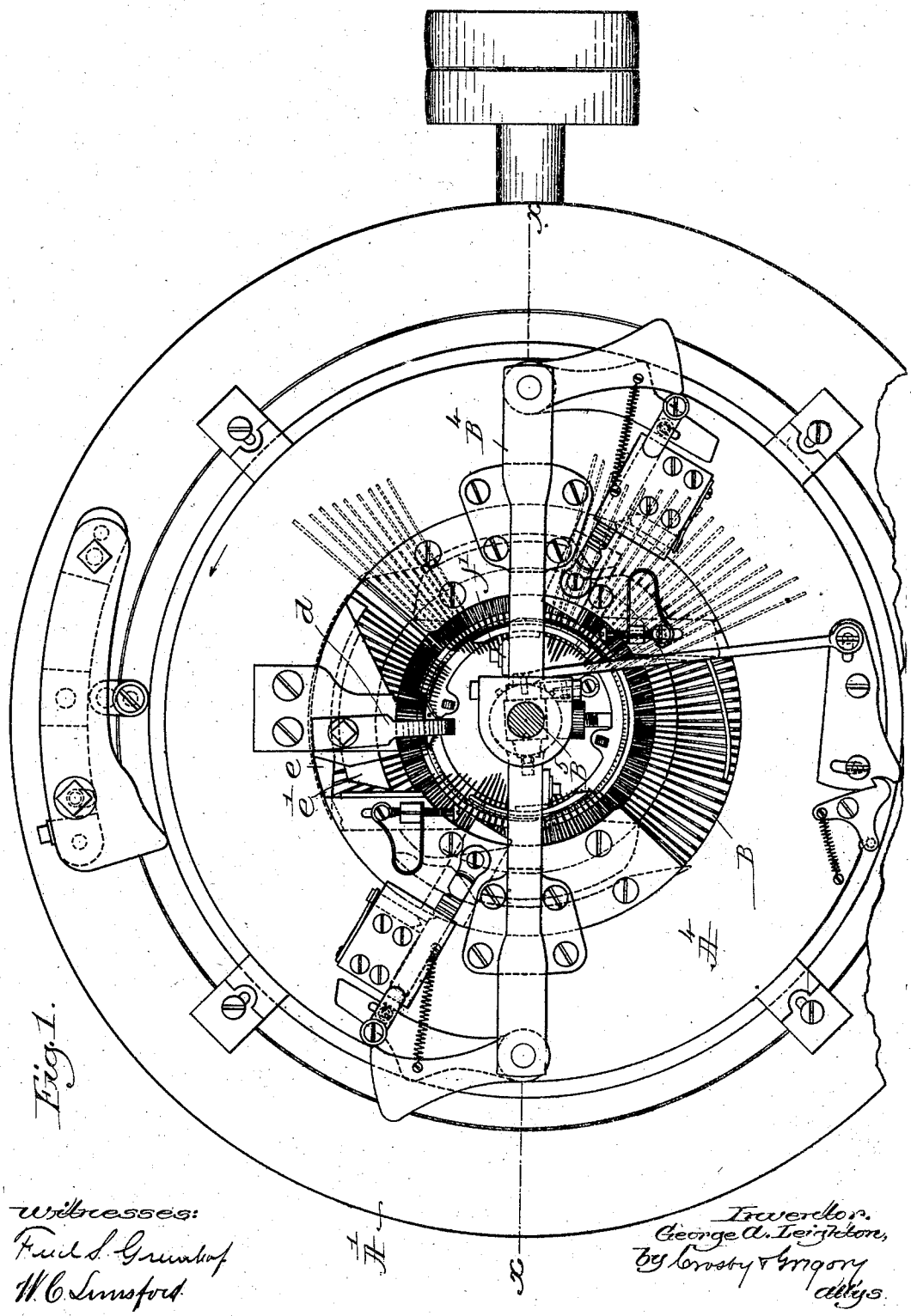

Fig. 1.

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NO MODEL. 3 SHEETS—SHEET 2.

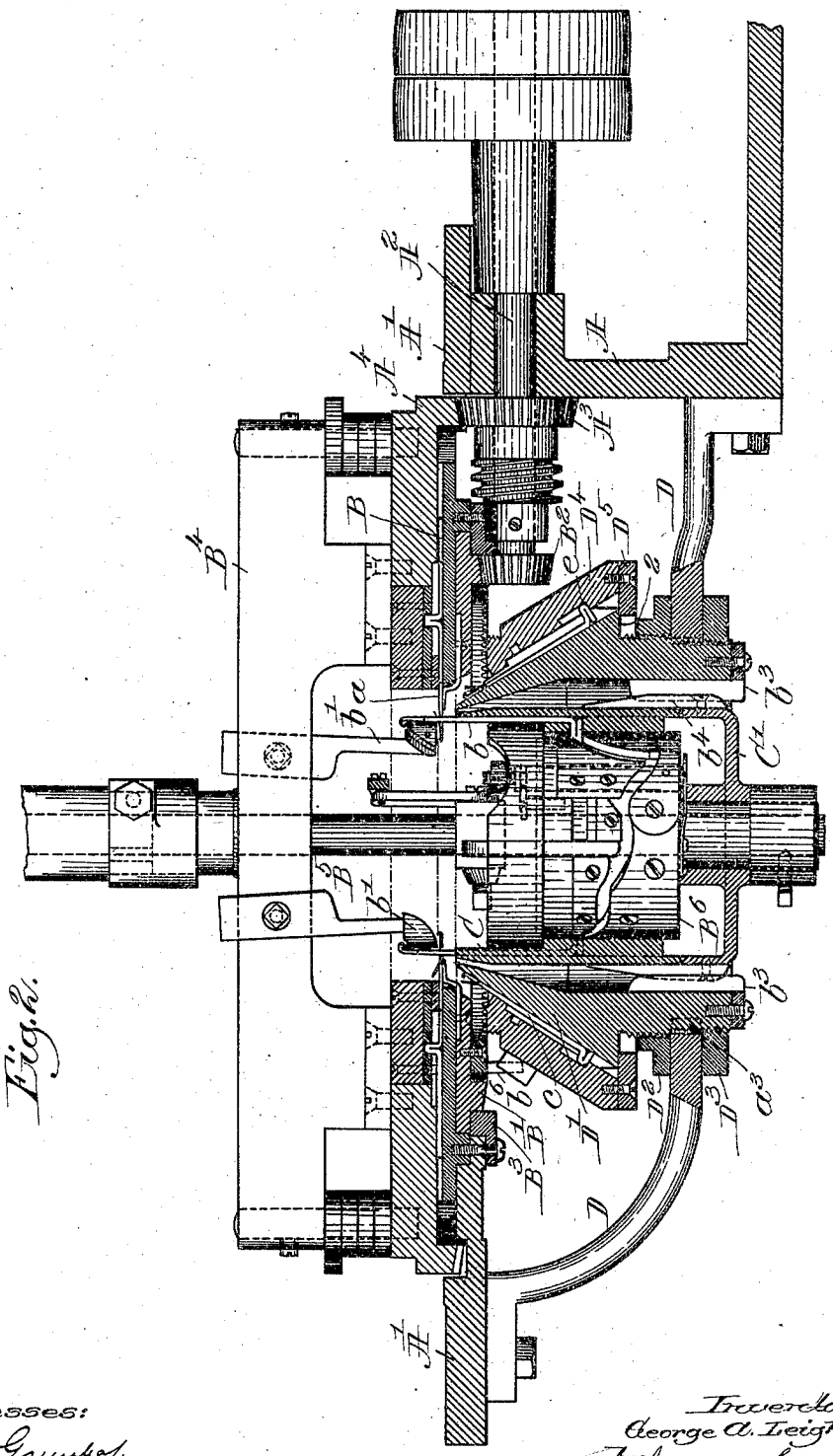

Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 3.

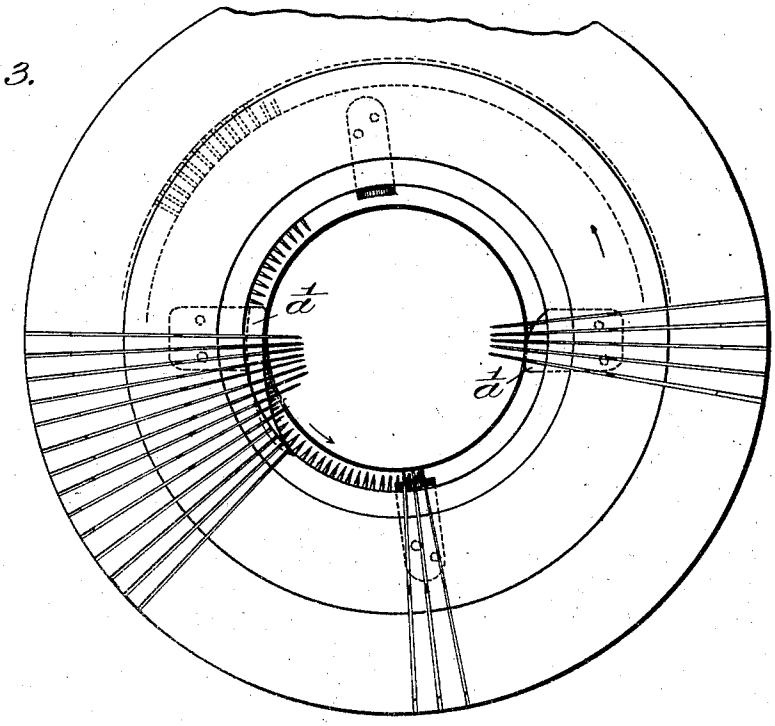
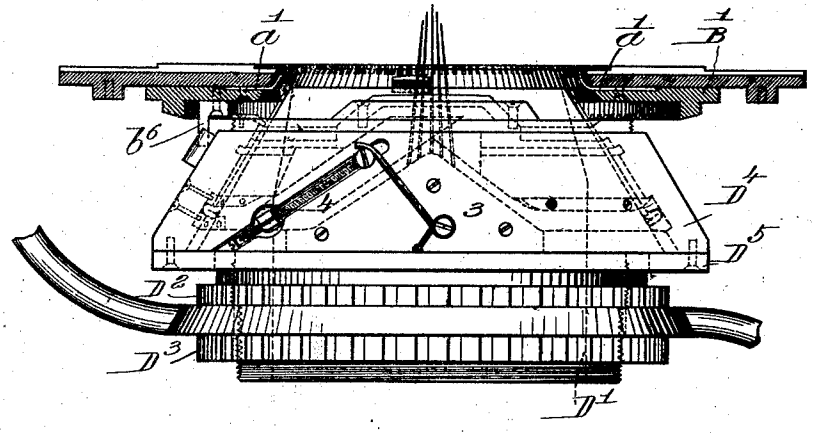


Fig. 4.



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No. 747,988. Patented December 29, 1903.

UNITED STATES PATENT OFFICE.

GEORGE A. LEIGHTON, OF MANCHESTER, NEW HAMPSHIRE, ASSIGNOR TO LEIGHTON MACHINE COMPANY, OF MANCHESTER, NEW HAMPSHIRE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 747,988, dated December 29, 1903.

Application filed October 1, 1902. Serial No. 125,465. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. LEIGHTON, a citizen of the United States, residing at Manchester, in the county of Hillsboro and State of New Hampshire, have invented an Improvement in Knitting-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention in knitting-machines has for its object the production of a knitting-machine by which to knit the novel knitted-rib pile fabric described in United States Patent No. 693,409, granted to me February 18, 1902. The fabric described and shown in said patent is composed of different threads, some of which are manipulated or interknitted to form a rib fabric, while another thread or threads are interknitted with the rib fabric to present a series of knitted wales at one side thereof, lying between the knitted wales of the ribbed fabric. To produce this fabric in one good way, I have taken a circular-knitting machine having a series of cylinder-needles and a series of dial-needles and have applied thereto between the dial-needle bed and the cylinder-needle bed a conical needle-bed containing a third series of needles, shown as of the latched variety, and a conical shell having suitable cams to actuate said third series of needles. The third series of latch-needles are for interknitting the pile-thread into the rib-knitted fabric, and they cross diagonally the paths of movement of both the dial and cylinder needles and take thread from a thread-guide located within the space bounded by the cylinder-needles, interknitting said thread with the rib-knitted fabric made by the dial and cylinder needles, leaving the pile-thread on one side of the ribbed fabric in the form of loops arranged in wales between the wales of the rib-knitted fabric.

Prior to this invention a pile fabric has been knitted on a knitting-machine containing cylinder and dial needles of the latched variety having coöperating with them a series of hooks arranged and movable wholly outside the cylinder-needles, said hooks, actuated by a proper cam, taking an extra thread from a thread-guide located wholly outside the circle of cylinder-needles, drawing said thread over the dial-needles back of their latches, and interlacing said thread with alternate wales of the fabric being knitted on the cylinder and dial needles, said thread not being interlooped with itself or interknitted in the rib-knitted fabric, but only lying in and between loops knitted on the cylinder and dial needles, as in United States Patent No. 603,164. So, also, a pile fabric has been knitted on cylinder and dial needles, and a series of loopers or jacks have pushed the pile-thread outside the path of movement of the cylinder-needles, so that said pile-thread is caught over some of said cylinder-needles and is incorporated with the rib-knitted fabric, said pile-thread being laid in a substantially straight line at one side said rib-knitted fabric and being held thereto between loops of the rib-knitted wales, as in United States Patent No. 561,558, dated June 9, 1896.

In the machine to be herein described the pile-thread is interknitted as a web and incorporated with one side of the rib-knitted fabric, and consequently the thread to constitute the pile when being teazled is not drawn out of the rib-knitted fabric, but is retained therein, due chiefly to the fact of said pile-thread being interknitted with itself and with the rib-knitted fabric.

It will be understood that my invention may be incorporated with any machine having cylinder and dial needles; but I have chosen herein to illustrate my invention as added to a rib-knitting machine such as described in United States Patent No. 720,514, February 10, 1903, application Serial No. 38,603, Avery B. Dodge and John H. Rice.

Figure 1, in plan view, illustrates a sufficient portion of the knitting-machine described in said application with my improvements added to enable my invention to be understood. Fig. 2 is a vertical section in the line *x*, Fig. 1. Fig. 3 is a plan view of the dial-needle bed and the shell and conical bed for the third series of needles, said parts being removed from the machine. Fig. 4 is a side elevation of the parts shown in Fig. 3, the cams of the shell being represented by dotted lines.

The head A, the circular bed-plate A', the

driving-shaft A^2, having a bevel-pinion A^3 engaging teeth at the under side of the dial-needle cam-plate A^4, having usual cams by which to actuate the dial-needles a sustained in a dial-needle bed B, mounted on the circular bed-plate, the ring B', carrying the so-called "knock-over" steels a' (shown best in Figs. 3 and 4) for knocking the loops over the heads of the dial-needles, the bevel-gear B^2, engaging bevel-teeth of said ring B', the holding-ring B^3, attached to the bed-plate by suitable screws and sustaining said ring B', the yoke B^4, carried by the dial-needle cam-plate and sustaining the spindle B^5, on which is fixed the cylinder-needle cam-hub B^6, having suitable cams for actuating the cylinder-needles b, the cylinder-needle bed C, suitably grooved to receive the cylinder-needles, the supporting-ring C' for sustaining said needle-cylinder, and the two thread-guides b' for supplying thread to the cylinder and dial needles for knitting a rib fabric are and may be all as fully described in connection with the machine illustrated in said application. Fig. 1 of the present drawings shows some parts common to said application and fully described therein for the production automatically at the desired points in the circular web being knitted of welt and tuck stitches, said figure also showing means instrumental in controlling automatically the length of stitch of the cylinder-needles. I will now describe specifically the parts invented by me and applied to this well-known type of rib-knitting machine.

I have attached to the under side of the bed-plate A' and the head a suitable support D, that receives the base of the conical needle-bed D', said base being shown as threaded to receive adjusting devices D^2 D^3, shown as threaded rings, whereby said bed may be adjusted vertically as required and be held in adjusted position for knitting, means, as a key a^3, Fig. 2, being employed to prevent any turning of said needle-bed in its support. The inner side of the bed D' has lugs b^3, that coöperate with usual lugs b^4, secured to the exterior of the needle-cylinder C, so that the rotation of said needle-cylinder is prevented and yet the work being knitted is free to pass between said lugs in usual manner and be carried from the machine by any usual take-up. The conical bed D is grooved for the reception of a third series of latched needles c, and said needles are actuated by cams carried by a conical shell D^4, the interior of which contacts with the exterior of said conical bed, said shell being maintained in working position by a ring D^5, suitably attached to the lower end of said bed and engaging a shoulder 2 thereof. (See Fig. 2.) To rotate the shell D^4, I have provided the same with a lug b^5, that is engaged by a projection b^6, extended downwardly from the ring-gear B', rotated in unison with the dial-needle cam-plate.

Referring to Fig. 4, 3 represents the lifting-cam for the third series of needles, and 4 the drawing-down cam, it having usual provision for adjustment to provide for any desired length of stitch.

To provide the third series of needles c with the pile-thread to be interknitted as described and applied to the rib-knitted fabric formed by the cylinder and dial needles, I have added a thread-guide d. The thread-guides referred to will be supplied with threads of suitable character in usual manner.

Assuming that the guides b' have suitable threads to supply the cylinder and dial needles for knitting rib fabric with two feeds and that the guide d has a third thread for use in the formation of a pile, the machine may be started to knit. The cylinder-needles are started upward by the usual needle-elevating cam, and as they are raised in the loops surrounding them said loops turn back the latches, and the needles finally rise far enough in the rotation of the cam-cylinder to cause their open hooks to engage a thread at one of the thread-guides b', and thereafter said needles are drawn down by the cylinder-needle-drawing-down cam. As the cylinder-needles are drawn down they draw the thread engaged by them over the dial-needles and across their open latches. After the cylinder-needles in their descent have drawn the thread engaged by them over the open latches of the dial-needles the latter needles, held forward at such time, are drawn back, and the loops on the dial-needles back of said open latches act to turn said latches and close them on the hooks, so that the threads laid across said open latches are engaged by the hooks of the dial-needles and drawn through the loops then on said dial-needles, and, finally, for rib-knitting the dial-needles are drawn back far enough to enable the knocking-off steels to knock off from said needles the loops thereon of a previous course. This operation is the usual one of rib-knitting. To interknit into the rib-knitted fabric the pile or other thread taken from the guide d, the cams of the shell D^4 act on the butts of the series of needles c and lift them as said needles approach the guide d, said guide being distant from a thread-guide b', say, about ninety degrees, more or less. When the series of pile-knitting needles are elevated to take the pile-thread, the cylinder-needles next them are drawn down, and the dial-needles occupy such position as to enable the needles c after they have taken the thread to be drawn down between the dial-needles and lay the pile-thread across said needles in the form of loops, and, finally, said needles c as they are fully drawn down have their latches closed by loops thereon deposited at a previous course of knitting, so that said needles c act to interknit the pile-thread with itself and leave knitted wales lying in rows at one face of the rib-knitted fabric, said wales appearing between adjacent usual knitted wales of the

rib-knitted fabric. The dial-needles, as described, occupy a forward position (see Fig. 1) when the pile-needles *c* are being drawn down, and it will be supposed that said needles have on their open latches a loop of thread, as previously described, and held by the hooks of the cylinder-needles, and these dial-needles, also opposite the thread-guide *d*, have laid over their open latches the pile-thread, so that said dial-needles in their forward position have two loops. The dial-needles in the further movement of the machine are moved farther forward until the loops crossing their open latches are passed behind the latches, and the hooks of said dial-needles are supplied with yarn by the hooks of the descending cylinder-needles, as previously described, and the dial-needles are then fully drawn back to cast both loops thereon over the heads of said dial-needles. This action incloses the pile-thread between loops of rib-knitted fabric, and the loops of pile-thread are interknitted with each other and left in wales between wales of rib-knitted fabric, as fully described in said Patent No. 693,409. To provide for throwing the dial-needles forward that they may be in proper position to enable the pile-thread to be laid across their open latches, as stated, I have attached to the dial-needle cam-plate a cam *e*, (see Fig. 1,) that acts on the butts of the dial-needles to thrust them forward in a position that the thread laid in their hooks at the guide *b'* may act to open the latches, and to prevent said dial-needles from being moved too far I have applied a needle-guard *e'*, against the outer edge of which the butts of the dial-needles strike and by which they are held in proper position.

Believing myself to be the first to provide a machine by which to interknit pile-thread, as described, at one side of a rib-knitted fabric and having shown one practical way of doing this, I desire to say that I am free to use any form of means capable of actuating the third set of latched needles for controlling the pile-thread so long as said means interloops the pile-thread with itself and forms wales thereof at one side of said rib-knitted fabric, and consequently my invention is herein claimed broadly.

It will be understood that the third series of needles work in a path diagonal to the path of reciprocation of both the dial and cylinder needles, and said third series of needles in their reciprocation cross the paths of reciprocation of both the dial and cylinder-needles. The cylinder and dial needles take thread from thread-guide located as usual, and the third series of needles is supplied with thread from independent thread-guides *d*.

I have shown the third set of needles located at substantially forty-five degrees inclination to the horizontal needles; but it will be understood that this invention is not limited to such angle, as the angle may be changed and yet accomplish the results herein aimed at. Furthermore, it will be understood that the machine will be provided with any number of feeds and corresponding numbers of sets of cams to operate the dial and cylinder needles.

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

1. In a knitting-machine, a series of cylinder and dial needles, means to actuate the said needles to take thread and form from the same a rib-knitted fabric, and means to engage a third or pile thread and interknit the same to form a series of connected courses of wales at one face of the rib-knitted fabric, said wales lying substantially parallel with the rib-knitted wales.

2. In a knitting-machine, a series of cylinder and dial needles, means to actuate them, a thread-guide to feed said needles, a third set of needles, to actuate them in a path diagonal to the paths of reciprocation of said cylinder and dial needles, and suitable thread-guides to supply thread to said third series of needles.

3. In a knitting-machine, a series of cylinder and dial needles, means to actuate them, a third series of needles, a thread-guide for said series of needles, means to move the needles of said third series of needles in position to take thread and interknit the same and form wales of loops, means to temporarily move the dial-needles forward at about the position occupied by the thread-guide for supplying said third series of needles, that said dial-needles may cause the thread used in the production of the rib-knitted fabric to embrace between the loops of its wales the thread supplied to the hooks of said third series of needles.

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

GEORGE A. LEIGHTON.

Witnesses:

SADIE H. LAVERY,

SHERMAN E. BURROUGHS.

Correction in Letters Patent No. 747,988.

It is hereby certified that in Letters Patent No. 747,988, granted December 29, 1903, upon the application of George A. Leighton, of Manchester, New Hampshire, for an improvement in "Knitting Machines," an error appears in the printed specification requiring correction, as follows: On page 3, in line 88, before the words "to actuate" the word *means* should be inserted; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of January, A. D., 1904.

[SEAL.]

F. I. ALLEN,

Commissioner of Patents.