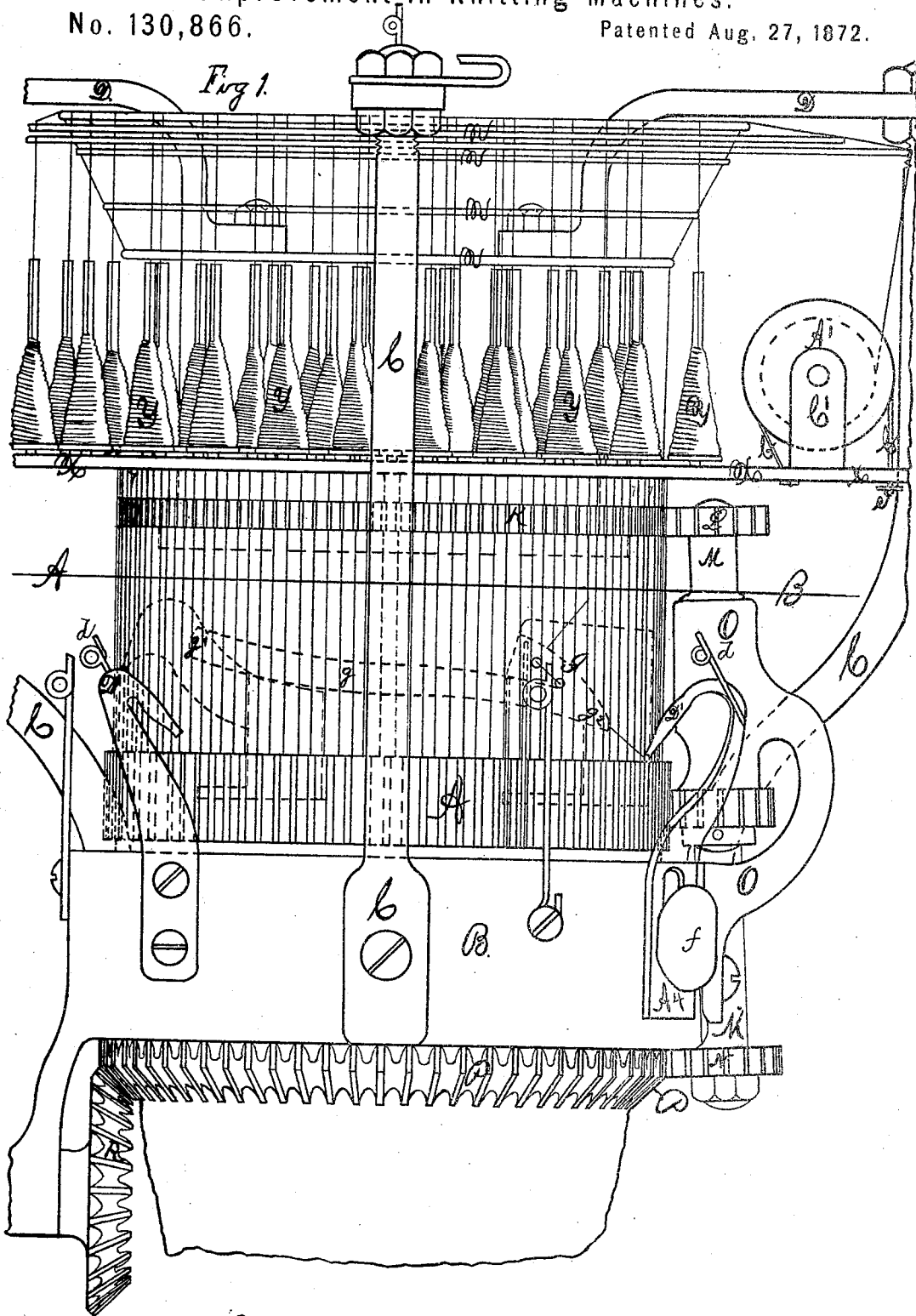


W. H. RAMSDELL.

Improvement in Knitting-Machines.

No. 130,866.

Patented Aug. 27, 1872.



Alvin Lawrence,
William R. Crane.

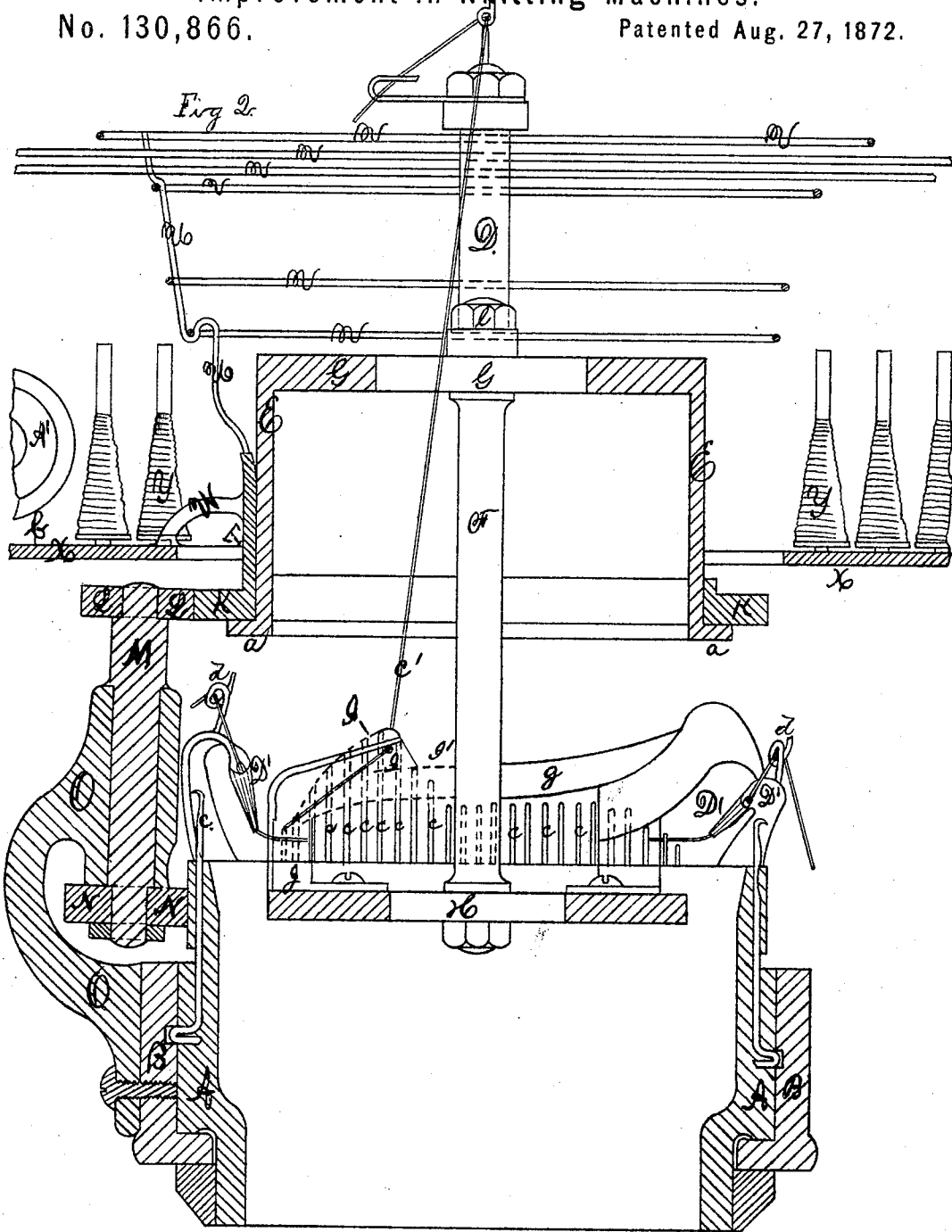
William H. Ramsdell

W. H. RAMSDELL.

Improvement in Knitting-Machines.

No. 130,866.

Patented Aug. 27, 1872.



Alvin Laurence
William R. Lovane.

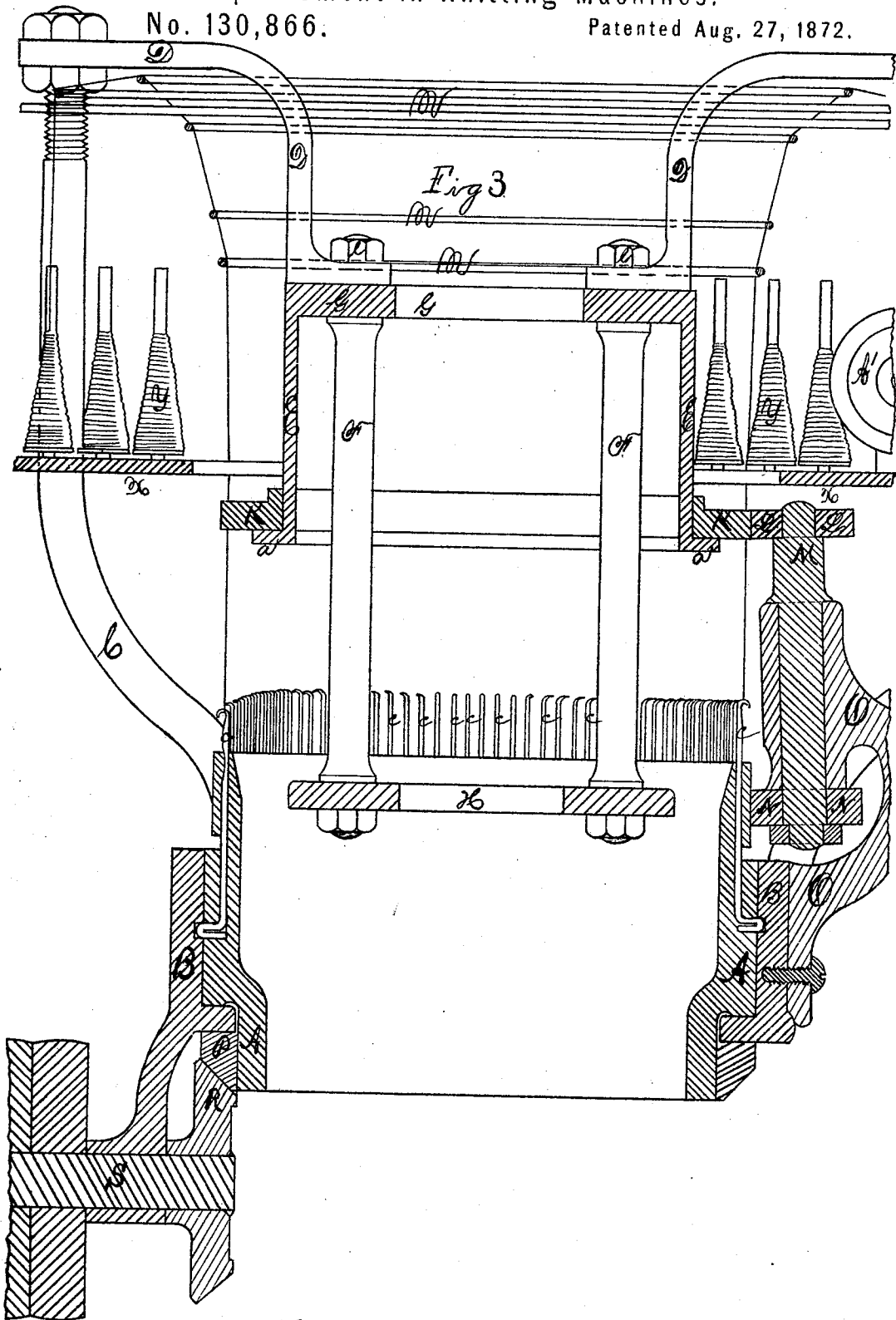
William H. Ramsdell

W. H. RAMSDELL.

Improvement in Knitting-Machines.

No. 130,866.

Patented Aug. 27, 1872.



Alvin Laurence,
William R. Crane.

William H. Ramsdell

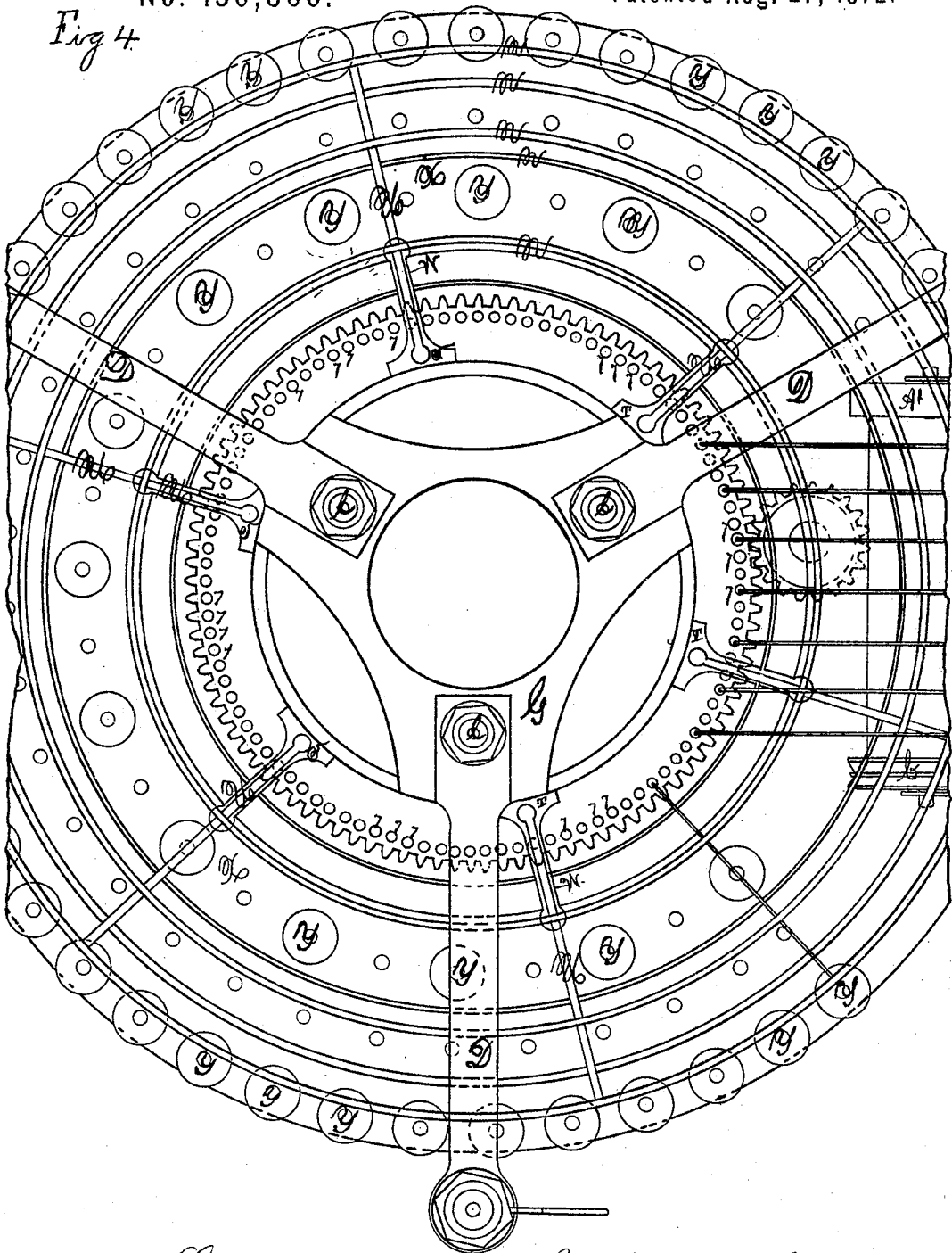
W. H. RAMSDELL.

Improvement in Knitting-Machines.

No. 130,866.

Patented Aug. 27, 1872.

Fig 4.



Alvin Laurence
William R. Corvane.

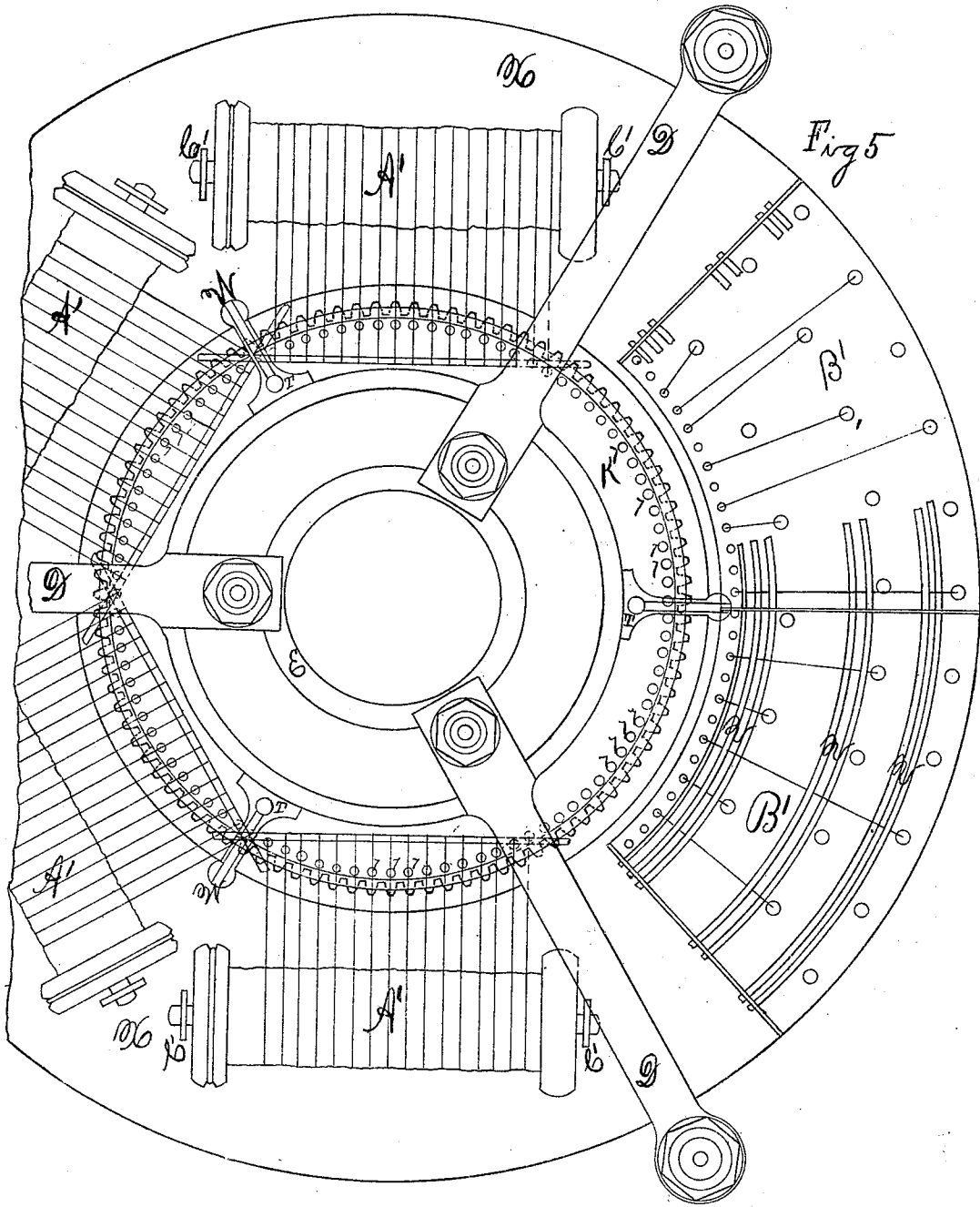
William H. Ramsdell

W. H. RAMSDELL.

Improvement in Knitting-Machines.

No. 130,866.

Patented Aug. 27, 1872.



Oliver Lawrence,
William R. Crane.

William H. Ramsdell

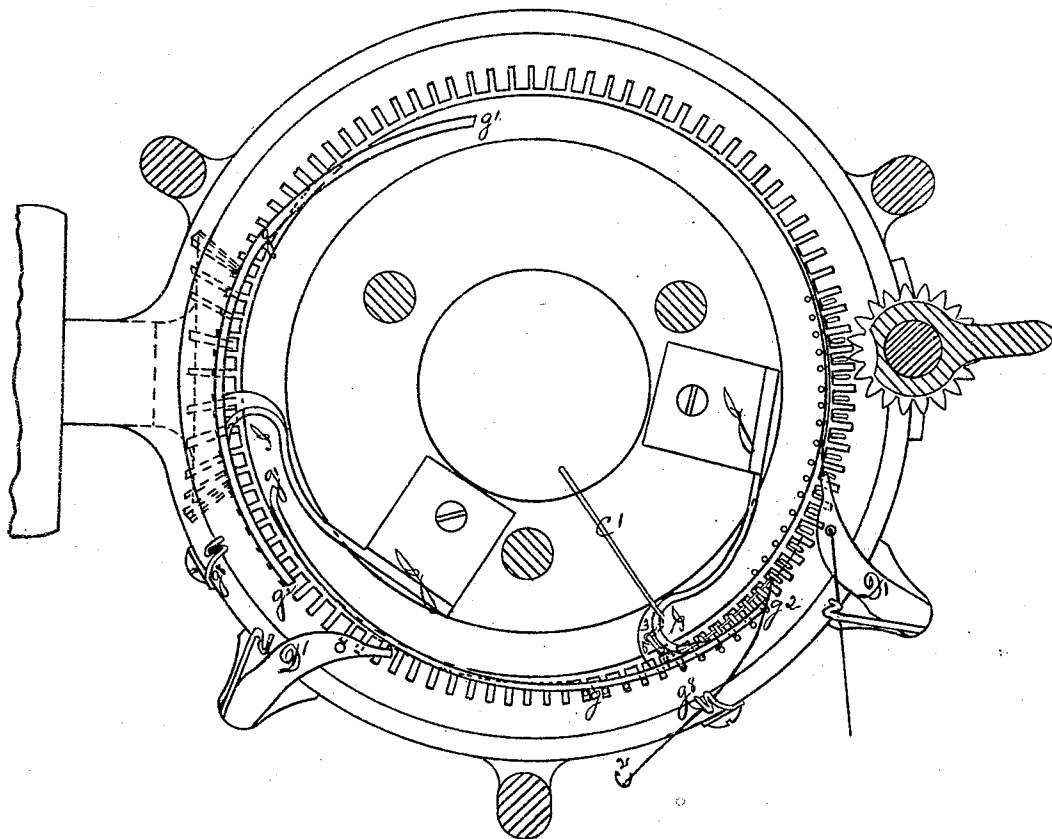
W. H. RAMSDELL.

Improvement in Knitting-Machines.

No. 130,866.

Patented Aug. 27, 1872.

Fig 7.



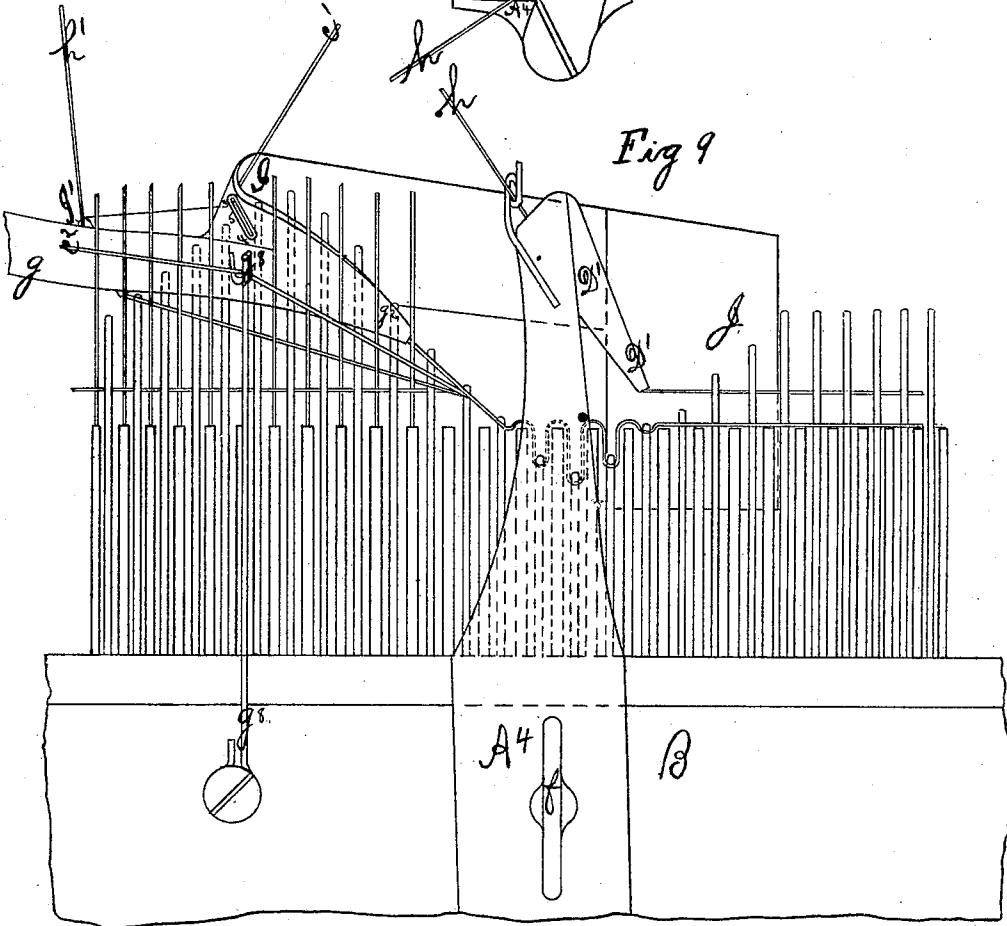
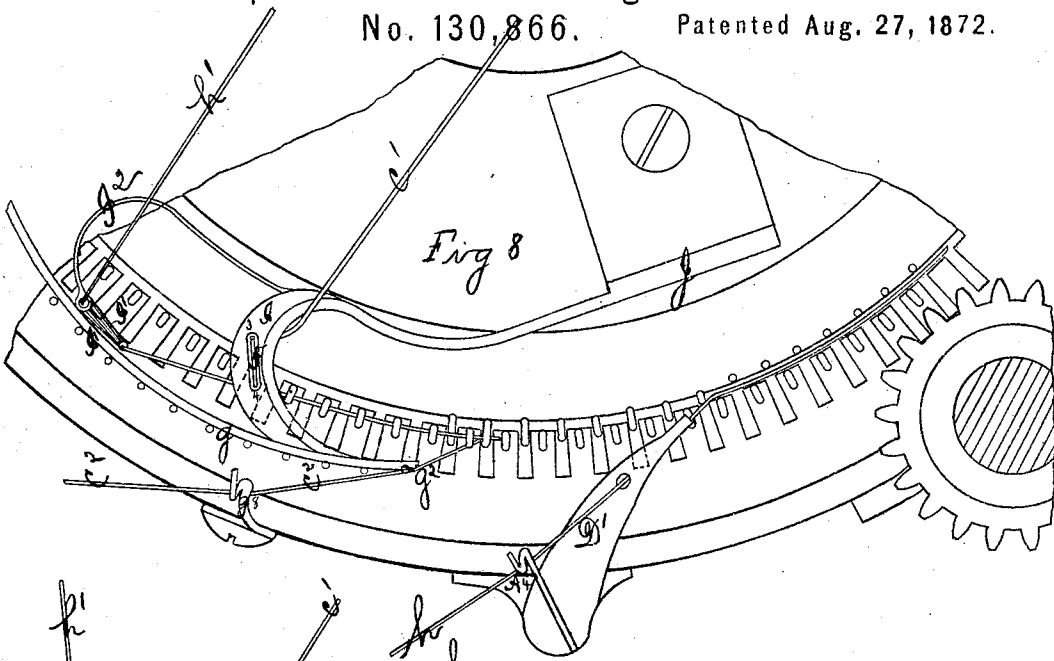
Alexis Laurence
William R. Lovane.

William H. Ramsdell

W. H. RAMSDELL.
Improvement in Knitting-Machines.

No. 130,866.

Patented Aug. 27, 1872.



Alvin Laurence
William R. Ivance.

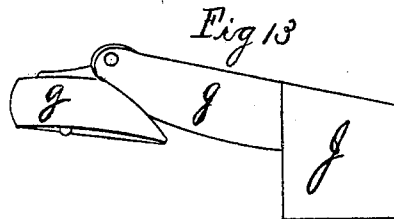
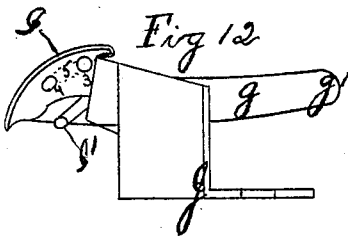
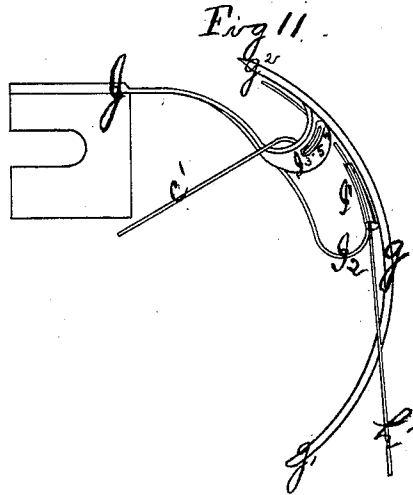
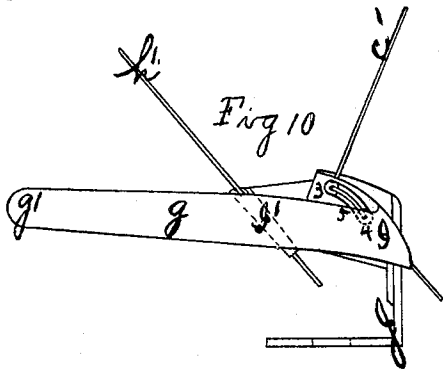
William H. Ramsdell

W. H. RAMSDELL.

Improvement in Knitting-Machines.

No. 130,866.

Patented Aug. 27, 1872.



Alvin Lawrence,
William R. Crane.

William H Ramsdell

W. H. RAMSDELL.

Improvement in Knitting-Machines.

No. 130,866.

Patented Aug. 27, 1872.

Fig 14

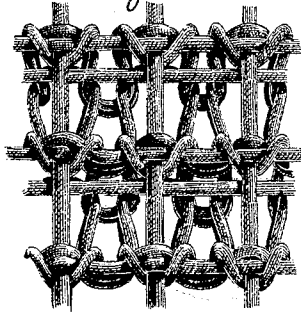


Fig 15

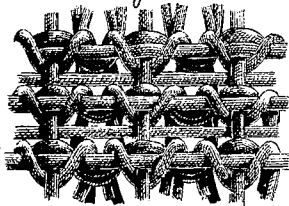
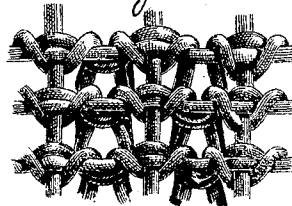


Fig 16



Alvin Lawrence

William H. Ramsdell

William R. Crane

UNITED STATES PATENT OFFICE.

WILLIAM H. RAMSDALL, OF LOWELL, MASSACHUSETTS, ASSIGNOR TO
HIMSELF AND JOHN E. CRANE, OF SAME PLACE.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. 130,866, dated August 27, 1872.

To all whom it may concern:

Be it known that I, WILLIAM H. RAMSDALL, of Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1 represents a side elevation of a common circular latch-needle knitting-machine having my improvements applied thereto. Figs. 2 and 3 represent opposite central vertical sections. Fig. 4 represents a plan or top view. Fig. 5 shows also a top view with certain modifications. Fig. 6 represents a horizontal section on the line A B of Fig. 1; and in this Fig. 6 I have shown appropriate guides and other devices or mechanisms for introducing both the knitting-threads and the filling-threads inside of the warp and outside of the warp, and also the means for introducing filling-threads inside of the warp and outside of the needles on alternate feeds or on all the feeds, and in connection therewith of the means for introducing filling thread or threads outside of the warp and inside of the needles simultaneously with the introduction of filling-threads inside of the warp and outside of the needles, and either on alternate feeds or on all the feeds, as hereinafter described, some of the filling-thread guides being combined with the knitting-thread guides and the warp-pressing cams, and other of the filling-thread guides being separate devices, each provided with a warp-pressing cam and a guide for leading the filling outside of the needles and inside of the warp, guided or pressed out by the cams. Fig. 7 represents also a horizontal section, similar to that shown in Fig. 6, showing only the inside and outside knitting-thread guides and the outside filling-thread guides and warp-pressing cams, omitting the guides which lead the filling outside of the needles and inside of the warp pressed out by the cams. Certain of the driving mechanisms are also shown in Fig. 7 which could not well be shown in Fig. 6. Fig. 8 represents also a horizontal section of a portion of the machine containing one set or series of feeds or yarn-feeding devices, the parts being enlarged to about twice

the size of the same parts shown in Fig. 6. Fig. 9 represents a side elevation of the principal parts shown in Fig. 8. Figs. 10, 11, 12, and 13 represent different elevations of the combined inside knitting and filling thread guides and a warp-pressing cam, shown in most of the other figures. Figs. 14, 15, and 16 represent the different kinds of fabric made on this machine by the co-operation of a portion or of all the operating elements.

This invention relates to circular latch-needle knitting-machines which carry a warp, and which introduce weft or filling thread or threads inside of the warp and outside of the needles, or outside of the warp and inside of the needles, on alternate feeds or on all the feeds, or both of the filling-threads simultaneously, and either on alternate feeds or on all the feeds, thereby forming or producing two, three, or more kinds of fabric, each readily distinguishable from the other or others, as clearly shown in the drawing.

In producing or forming either kind of the said fabrics the two knitting-threads may be introduced at and from alternate feeds, or simultaneously at each feed, one of the knitting-threads inside of the warp-threads and one of them outside of the warp-threads, and both of them brought together under the hooks of the same needles, and the loops or stitches formed of the two threads together. Said knitting-threads inclose the warp-threads, and both together inclose the filling when the loops are knocked over the ends of the needles, thus forming a superior fabric, which will be strong and durable when made of good material.

To construct, apply, and operate my said improvements, I take an ordinary circular-knitting machine, provided with vertically-reciprocating latch-needles, which may be arranged in slides having operating butts, or made of wire, with the butts formed on the shanks of the needles.

In the drawing, A represents the grooved cylinder, which carries the circular series of needles; and B, the outside cylinder, which contains the usual cam-groove for operating the needles *c*. To the outside of the cylinder B, or to some suitable frame-work or support for the cylinder, I apply certain rods C, which rise above the top of the machine. Conver-

ing arms or braces D are secured to the tops of the rods C, and either straight or curved. From the inner ends of said arms a tubular shell or case, E, is suspended on rods F, which are shouldered against the under side of the top flange G, and secured by a nut, *l*, on the top of each arm. These depending rods F extend downward below the top of the cylinder A, and their lower ends hold a circular plate, H, inside of the cylinder. This circular plate H supports the inner knitting and filling thread-guides I and I¹, each by a stand, J, secured to the plate. Each thread-guide I and I¹ is constructed and curved, as clearly shown in the drawing, and upon its outer extremity is formed or fastened a curved warp-guide or warp-guiding cam, *g*, one end, *g*¹, of which is bent inward to insure the revolving warp-threads passing this end of the cam, which gradually rises or is carried outward to its opposite end *g*², which overhangs or lies beyond the needles. This warp-guiding cam carries the threads of the revolving warp outside of all the needles, and this allows the introduction of the inside knitting-thread inside of the warp, but outside of the needles and under their hooks, and this is accomplished by the thread-guide I, provided, near its junction with the warp-cam, with two guiding-eyes, 3 and 4, and a guiding-groove, 5, between them. The inner knitting-thread *c*¹ passes downward inside of the guide I, through the eye 3, and along in the groove 5, through the eye 4, directly in the range of and a little below the tops of the fully-raised needles, which, when they recede, hook onto this knitting-thread and draw it downward before the warp threads pass the end *g*² of the cam.

It will be understood that the end *g*² of the cam *g*, which carries the warp beyond the needles, must be opposite the receding needles, or those which are being carried downward for looping, so that each needle, after passing the end of the cam and while receding, shall have hooked onto both the inner and the outer knitting-threads *c*¹ and *c*², and so that each of such passing and receding needles shall have its latch closed upon the knitting-threads before the warp-threads pass the end *g*² of the cam, and this prevents any liability of the needles hooking onto the filling-threads, as they otherwise might do, and draw them into loops.

A short distance back of the inside knitting-thread guide I, and to the inside of the warp-guiding cam *g*, I apply an inside filling-thread-guide, I¹, and generally a curved brace, I², to support the warp-guiding cam at that point. This inside filling-thread guide must be arranged opposite the rising needles, or where they rise to carry their latches above the old loops, so that the inside filling-thread shall pass below the latches of the fully-raised needles, and outside of such needles and inside of the warp pressed out by the cam. *h* represents the said inside filling thread or

threads, as clearly shown in Figs. 6, 8, 9, 10, and 11. This inside filling-thread guide I¹ is not necessarily applied to the warp-guiding cam, in connection with the inside knitting-thread guide, as in Figs. 8 and 9; but such inside filling-thread guide may be made a separate device and carry its warp-guiding cam *g*³, and be supported by a curved brace, I³, projecting from a stand or bracket, J³, as clearly shown in Fig. 6; and this separate inside filling-guide must be arranged opposite the rising needles so as to guide the filling below the latches outside of the needles and inside of the warp pressed out by the cam, said cam acting as a latch-guard. This inside filling-thread passes down through the center or inside of the machine, thence to the guide I¹, and through this to the outside of the needles, as before described. The form of the inner thread-guides I and I¹, with the guiding-eyes and groove, and the warp-guiding cam, and inside-filling guide, are clearly shown in Figs. 1, 2, 6, 7, 8, 9 to 12, inclusive; so also the position and the terminating point or end *g*² of the warp-guiding cam relatively with the passing and receding needles. The lower end of the shell E has an outwardly-projecting flange, *a*, which supports a toothed ring, K, or gear, which revolves freely on the shell. This gear K is intersected by a pinion, L, on the top end of a vertical shaft, M, arranged in the stand O, secured to one side of the cylinder B. On the lower end of the shaft M is a second pinion, N, which may intersect with the grooved cylinder A; or the vertical shaft may extend downward below the cylinder, and its lower pinion intersect with the usual driven gear P, which receives its motion from the pinion R on the driving-shaft S; but, in this case, the gear P, which is generally a bevel-gear, may be a spur-gear also, as shown in Fig. 1. Both the gear K and the spur-gear P may contain the same number of teeth, and the two pinions L and N each the same as the other, so that the upper part of the machine shall revolve at the same velocity as the needle-carrying cylinder. Stands or posts T rise from the top of the gear K at suitable distances apart to receive the rods U, which support the circular guide-wires V, arranged above the top of the machine. An arm, W, extends outwardly from each stand T, and these arms support a creel or bobbin-plate, X, provided with spindles and bobbins Y for yarn, which furnish the warp; or instead of bobbins large spools or warp-beams A¹, all of which, with the guide-wires V and the supporting devices, revolve with the gear K and the rotating cylinder of needles. The gear K is provided with warp-guiding perforations or holes 7 near the roots of its teeth, and the warp-threads pass from the bobbins or beams upward and around one or more guide-wires, V, thence downward and through the holes 7 in the gear K, and from there to the top of the work or fabric a little inside of the needles. The guide-wires V are

intended to raise sufficient friction or tension on the yarn leading from the bobbins to keep the warp-threads straight while the machine is operated; and to further insure the tension on the yarn from the bobbins and to guide each warp-thread from its bobbin more directly to the guide-wires, I apply a perforated tension-guide plate, *B'*, above the bobbins, or between them and the guide-wires *V*. This guide-plate is clearly shown in Fig. 5, with a portion of certain of the guide-wires removed to show the top of the plate.

If large spools or beams are employed for containing the warp, each of these may be provided with a friction-binder, *b*, passing around the end and held by a spring, *e*, secured to the under side of the bobbin-plate *X*, above which stands or bearings *C'* rise to support each beam, and each binder is adjusted by a screw. A little forward of each knitting-feed, and nearly over and opposite the needles, which have drawn their loops and knocked them over and are rising above the cylinder, I arrange an adjustable guide, *D'*, for the purpose of introducing weft or filling threads between the warp-threads and the needles—that is, outside of the warp-threads and inside of the rising needles, which, as they rise, inclose the filling-thread between them and the warp-threads, unaided by any other device. Passing around with the warp and the needles, and close down to the top of the cylinder, this filling-thread will lie below the latches of the raised needles, and will be inclosed between the warp and the stitches at the next succeeding knitting-feed beyond where it was introduced. The filling-thread guide or guides, one for each feed, are arranged upon the top of the stand or bracket *A*⁴, adjustably secured to the cylinder *B* generally by a thumb-screw, *f*, by which it may be adjusted at pleasure, and the nose of the thread-guide brought as near to the top of the cylinder as may be desired. An auxiliary filling-thread guide, *d*, may be arranged on the back or on some other portion of the tubular guide *D'*, and the filling *h* guided to the tube from almost any direction. The outside guide *D'*, which leads or introduces the filling outside of the warp and inside of the rising needles, may be used separately; so also the inside filling-guide *I*¹, which introduces its filling outside of the needles and inside of the warp pressed out by the cam *g*; or both of these filling-guides may deliver or introduce their filling-threads simultaneously on opposite sides of the warp and on opposite sides of the needles, on alternate feeds or on all the feeds; and when both the outside and inside filling-threads are introduced on alternate feeds and the knitting is performed by the other feed or feeds, the fabric produced will be like that shown in Fig. 14. When both the outside and inside filling-threads are introduced on all the feeds, and the knitting on the other feed or feeds, the fabric produced will be like that shown in Fig. 15. The principal difference between the fabric shown in

Fig. 15 and that shown in Fig. 14 is that the latter contains twice as much filling as the former. In the fabric shown in Fig. 15 all the loops contain filling, while in the fabric shown in Fig. 14 alternate rows of loops contain the filling and in alternate rows of loops the filling is omitted.

To form or produce the fabric shown in Fig. 16 the knitting is performed in the usual way, and all the filling *h'* is introduced from and through the inside filling-guides *I*¹ on all the feeds, and passes outside of the needles and inside of the warp, pressed or guided out by the cams *g* or latch-guards, performing double duty. This filling *h'*, like the other described, together with the warp, is inclosed and secured by the loops or stitches when they are knocked over the ends of the needles by the knitting process.

Referring to the fabric shown in Figs. 14 and 15, it will be observed that the filling-threads lie on opposite sides of the warp, which gives the fabric the appearance of regular-woven fabric, except that in this fabric there are intervening loops, some at each side, and some drawn over the filling.

Fabric similar to that shown in Fig. 16, but of a more open texture, is easily made on this machine by introducing inside filling-threads on alternate feeds instead of on all the feeds, as before described, and the difference between such fabric and that shown in Fig. 16 will be alternate rows of loops containing filling, and alternate rows of open loops or loops where the filling is omitted, and such an open fabric bears the same relation to that shown in Fig. 16 that the fabric shown in Fig. 14 does to that shown in Fig. 15.

The outside knitting-thread guides *g*⁸ may be any ordinary device which is capable of properly leading or guiding the outside knitting-thread to the needles.

I have previously referred to the gear *K* and to a proposed gear, *P*, as containing the same number of teeth; so also the two pinions *L* and *N*. This is not a necessity—it is simply a convenience, under certain circumstances. The same end may be attained by increasing the diameter of the gear *K* and the pinion *N*; or by the application of any suitable train of gears, so that both the lower and upper portions of the machine will revolve at the same velocity.

I have previously referred to the inside filling-thread guide *I*¹ as being applied to the inside of the warp-guiding cam *g*; but this inside filling-guide may be a separate device, adjustably arranged inside of the warp-guiding cam, and by such adjustment carry its filling outside of the needles and nearer to or further from the needles, and such an adjustable and separate guide will work equally as well as one applied to the cam *g*, which serves also for a latch-guard. The same may be said of the inside knitting-thread guide *I*. This may be a separate device arranged inside of the cam *g*, which presses out the warp-threads, while the con-

nected or disconnected guide leads the inside knitting-thread inside of the pressed-out warp-threads, and outside of the needles and under their hooks, with the outside knitting-thread, as before described. This machine has the capacity to receive a dividing-wheel to divide the needles, and a connected filling-guide for introducing filling between the divided needles, in connection with the warp-pressing cam *g*, and a little back of the inside filling-guide *I'*; or such a dividing-wheel and filling-thread guide may be provided with a separate cam for pressing out the warp-threads, and thereby carry a filling-thread between the needles and inside of the warp. This machine is also capable of receiving a vibrating or oscillating filling feeding mechanism for introducing filling-thread between the undivided needles and outside of the warp, which, in this machine, is always in an undivided state.

Each of the fully-filled fabrics made on this machine, and of good material, will be strong, durable, and serviceable, and the strength of the goods or fabric may be increased by using a very strong warp or filling, such as hard-twisted cotton, flax, or worsted, or other strong fibrous yarns or threads; and either of the fabrics, whether fully or partially filled, may be made considerably ornamental by employing yarns of suitable colors or shades.

I claim as my invention—

1. The combination, substantially as described, of the outside and inside filling-thread guides co-operating and introducing filling-threads simultaneously on opposite sides of the warp and on opposite sides of the rising latch-needles.

2. The combination, substantially as described, of the inside knitting-thread guide *I* and the inside filling-thread guide *I'*, connected with or arranged inside of a warp-pressing cam, *g*, and both guides introducing their threads simultaneously outside of the reciprocating latch-needles and inside of the warp-threads pressed out by the cam.

3. The combination of an outside filling-thread guide, *D'*, and an inside knitting-thread

guide, *I*, with its warp-pressing cam, co-operating and introducing their threads simultaneously on opposite sides of the reciprocating latch-needles and the warp-threads.

4. The combination of the outside filling-thread guide *D'* and the inside knitting and filling thread guides *I* and *I'*, the last two connected with or arranged inside of a warp-pressing cam, as described, and all co-operating and introducing their threads to the reciprocating latch-needles and the warp, substantially as described.

5. The combination of the outside filling-thread guide *D'*, and the outside knitting-thread guide *g*^b, and the inside knitting-thread guide *I* with its warp-pressing cam, all co-operating and introducing their threads to the reciprocating latch-needles and the warp, substantially as described.

6. The combination of the outside knitting-thread guide *g*^b and the inside knitting and filling thread guides *I* and *I'* with their warp-pressing cam, all co-operating and introducing their threads simultaneously to the reciprocating latch-needles and the warp, substantially as described.

7. The combination, substantially as described, of outside and inside knitting-thread guides *g*^b and *I*, and outside and inside filling-thread guides *D'* and *I'*, with a warp-pressing cam, as described, all co-operating with the reciprocating latch-needles and the warp, for the purpose and in the manner substantially as specified.

8. The warp-guiding cam *g*, constructed and applied as described, and which performs the double duty of guiding or pressing the warp-threads outward beyond the needles, and of acting as a latch-guard, as described.

9. As a new manufacture, warp and looped fabric, containing filling-threads introduced on opposite sides of the warp and the needles, substantially as described.

WILLIAM H. RAMSDALL.

Witnesses:

ALVIN LAWRENCE,
WILLIAM R. CRANE.