Sheet 1-3 Sheets.

J. Nesmith.

Knitting Mach.

No. 15,435. Patented Jul. 29, 1856.

Fig. 1.

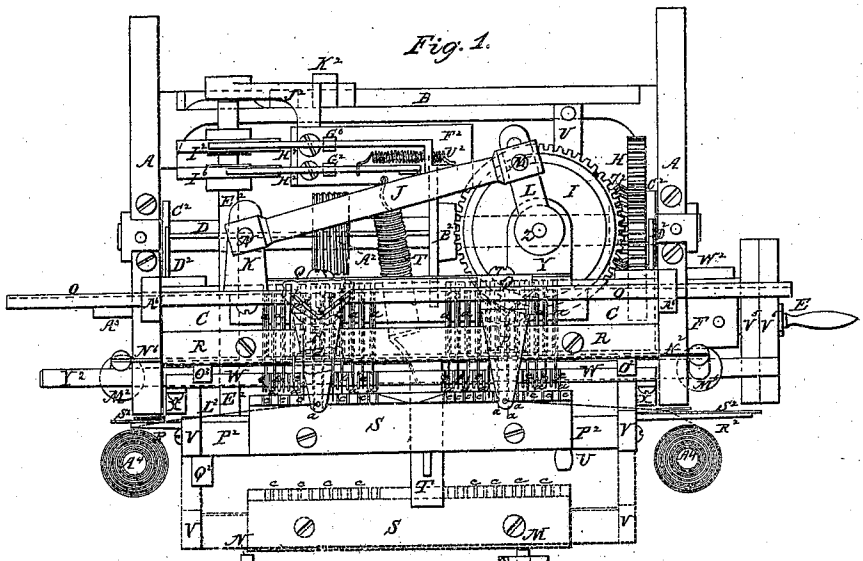
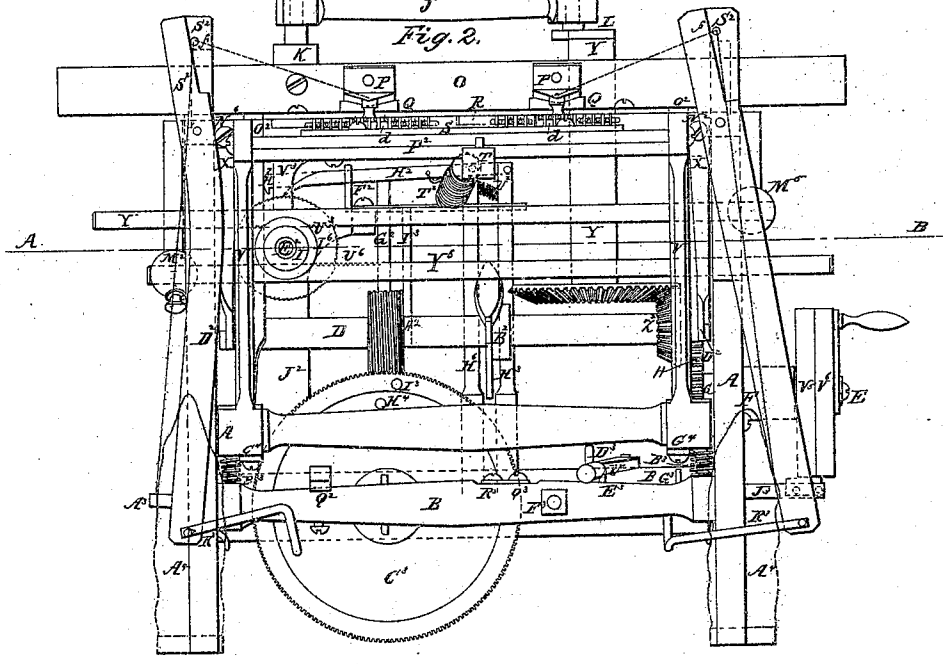


Fig. 2.



J. Nesmith.
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Fig. 3

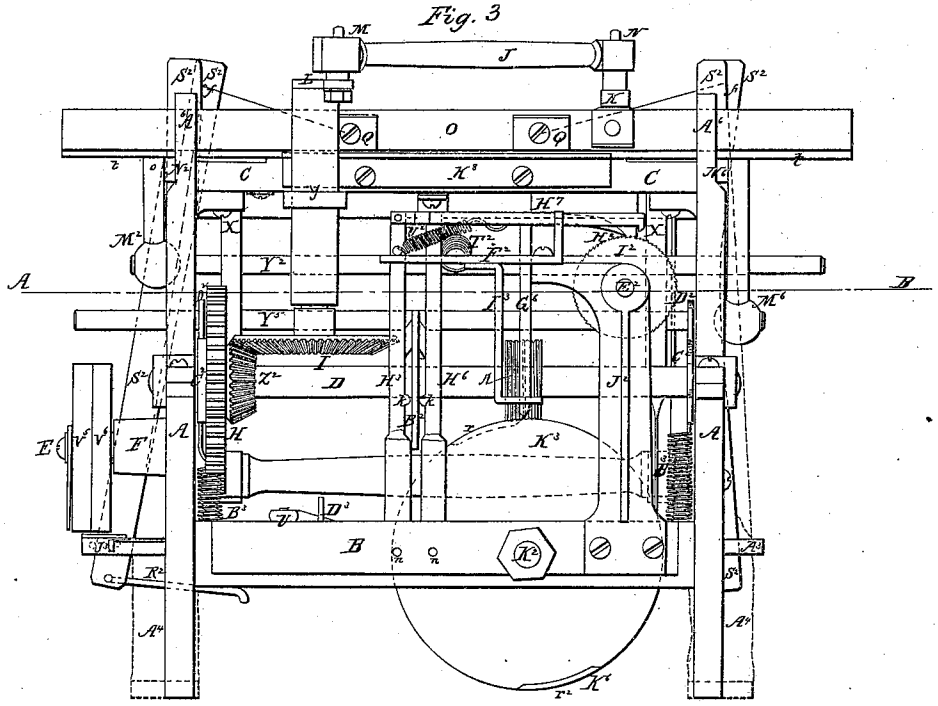


Fig. 4.

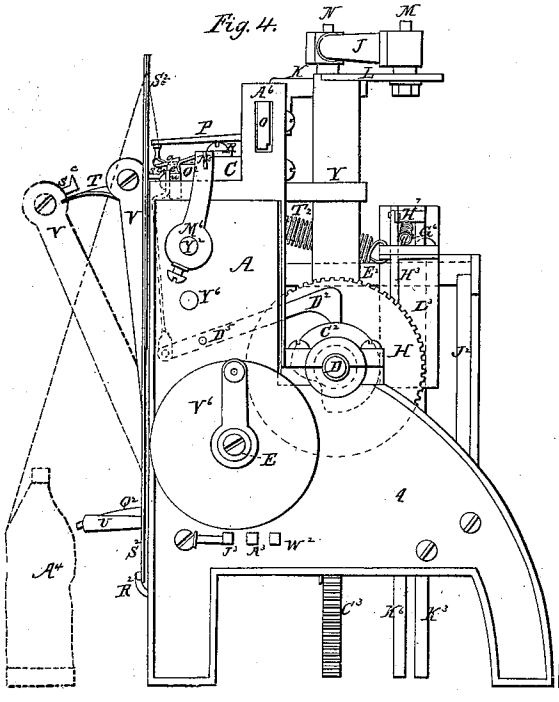
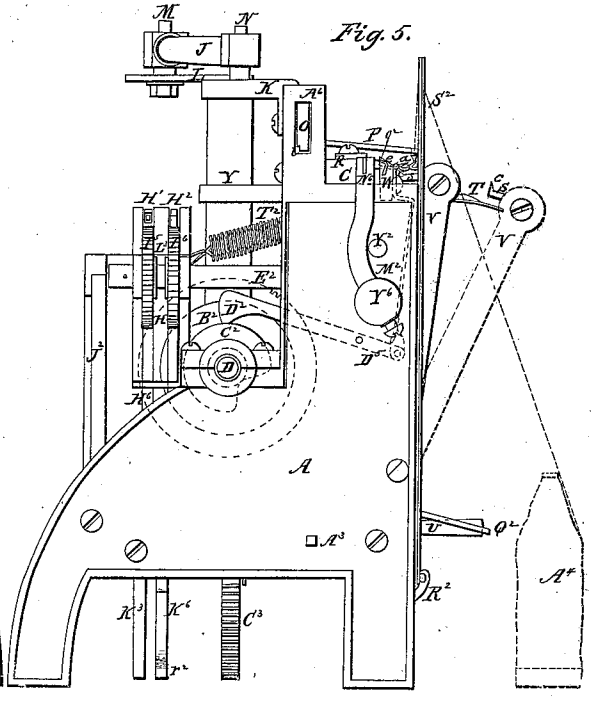


Fig. 5.



J. Nesmith.
Knitting Mach.

No. 15,435. Patented Jul. 29, 1856.

Fig. 6.

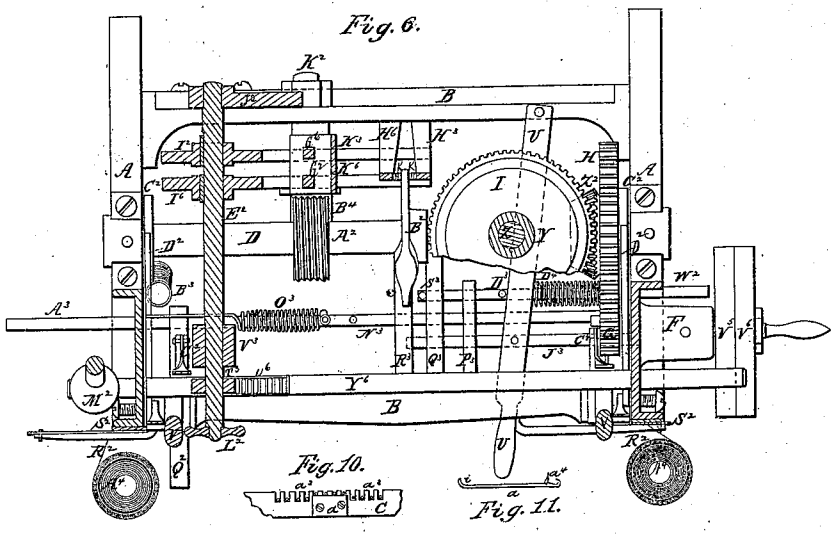


Fig. 10.

Fig. 11.

Fig. 9.

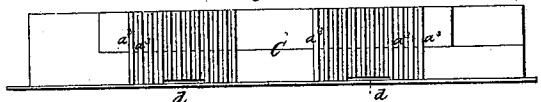


Fig. 8.

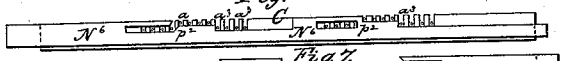


Fig. 7.

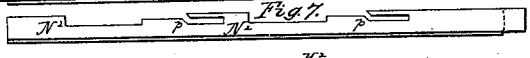


Fig. 12.

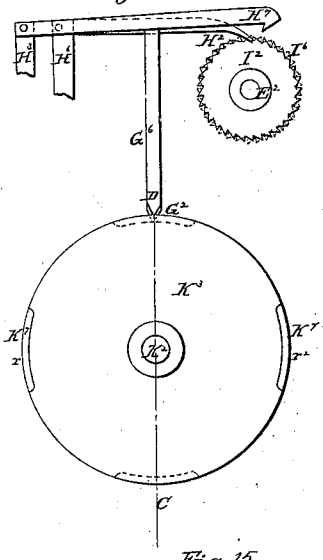


Fig. 13.

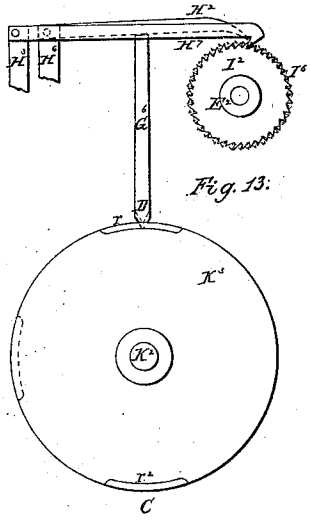


Fig. 14.

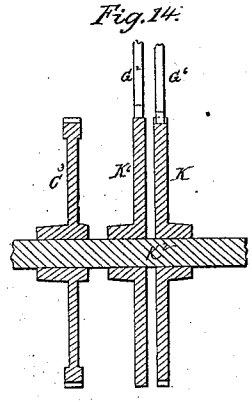


Fig. 15.

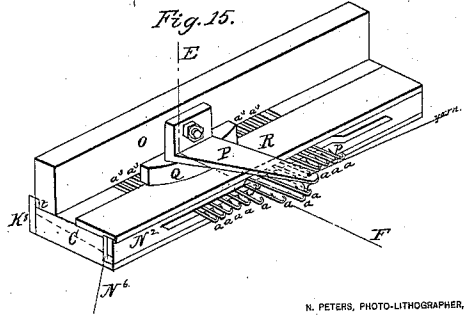
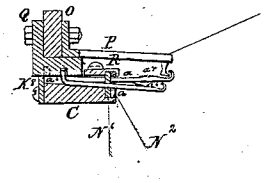


Fig. 16.



UNITED STATES PATENT OFFICE.

JOHN NESMITH, OF LOWELL, MASSACHUSETTS.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **15,435**, dated July 29, 1856.

To all whom it may concern:

Be it known that I, JOHN NESMITH, of Lowell, in the county of Middlesex and Commonwealth of Massachusetts, have invented a novel and useful Improvement in Knitting-Machines, consisting in adapting them for narrowing and widening knit goods to any desired pattern; and I hereby declare that the following specification, in connection with the accompanying drawings and references thereon, constitute a lucid, clear, and exact description of the construction and use of the same.

In referring to said drawings, Figure 1 denotes a plan or top view; Fig. 2, a front elevation of the same; Fig. 3, a back elevation of it; Fig. 4, an end elevation; Fig. 5, an opposite end view. Fig. 6 denotes a section on line A B, Figs. 2 and 3. Fig. 7 is a view of the front slide N^2 disconnected from the machine. Fig. 8 is a side view of the back slide N^6 with a portion of the plate C disconnected from the machine. Fig. 9 is a plan of the same. Fig. 10 is a view of one of the guards *d* and a part of the plate C, to which it is connected. Fig. 11 is a view of one of the needles. Fig. 12 is an elevation of the cams K^3 and K^7, governors G^2 and G^6, dogs H^2 and H^7, with portions of the levers H^3 and H^6. Fig. 14 is a vertical section on line C D, Figs. 12 and 13. Fig. 15 is a perspective view of the plate C with the needles *a* therein. Fig. 16 is a transverse and vertical section on line E F, Fig. 15.

The nature of my invention consists in narrowing the knitting work by lowering one or more of the needles at each passage of the yarn-carrier, so that the yarn will continue to pass through only the remaining loops of the raised needles until the narrowest part of the fabric is made or arrived at, and then widening this fabric as the knitting progresses by raising the needles one at a time to an equal level with the other needles, so that the yarn may pass through their loops in common with those not lowered, and thus widen the fabric as much as the distance from needle to needle when each of them is raised on the knitting-line, so that the yarn will pass through their loops. The desired number of needles are lowered to allow the remaining ones only to knit, which constitutes the narrowing by means of slides having a lower slot to carry the needles when lowered and an upper slot or plane to carry the needles when raised, these slots being continued or connected together by an angular slot down which the needles are caused to travel to lower them and up which they are caused to travel to raise them by moving along the slides as much and as often as desired by a registering apparatus or measuring apparatus, which is so connected to these slides and driven by the turning of the main shaft of the machine, as to move the slides in either direction, which cause the needles to be lowered for narrowing and raised for widening by their traveling up or down the inclined part of the slots in the slides.

To enable persons skilled in the art to which my invention appertains to construct and carry out the same, I will describe it as follows:

I construct an iron frame, (seen at A, Figs. 1, 2, 3, 4, 5, and 6,) which is held together by the girts B and the top plate C. To this frame A, I suspend a main shaft D, so as to revolve freely in good substantial bearings. I also fit a drive-shaft (seen at E, Figs. 1, 2, 3, and 4) to the stand F, Figs. 1, 2, 3, and 6, which is projected from the frame A.

On the outer end of the drive-shaft E, Figs. 1, 2, 3, and 4, I fit a tight pulley V^5 and a loose pulley V^6 for applying a driving-belt for propelling the machine, as will be readily understood. On the inner end of this shaft I fit and fasten the gear G, Figs. 2 and 6, which gears into and drives another gear of twice its diameter, (seen at H, Figs. 1, 2, 3, 4, 5, and 6,) fixed on the main shaft D. (Seen in the same figures.)

The needle-plate C is grooved transversely, as seen at a^3, Figs. 8, 9, and 10, to receive the knitting-needles *a*, as seen at Figs. 1, 8, and 10, so that they will slide freely back and forth. These needles are made with a swinging finger a^4, Fig. 11, which operates in the hook end, and their back ends are bent at a right angle upward, as seen at *i*, Fig. 1, and at Fig. 11.

Above the plate C, Figs. 1, 3, 4, and 5, I place the bar O, Figs. 1, 2, 3, 4, and 5, so fitted as to slide freely through portions of the frame A, (designated as A^6, Figs. 1, 3, 4, and 5,) to which is fastened the stand K, which is connected to the crank L, Figs. 1, 2, 3, 4, and 5,

by the connecting-rod J (seen at the same figures) and the stands or studs N and M, by which the bar O is operated or slid back and forth by the revolving of the crank L. The crank-shaft Z, Figs. 1 and 6, turns in the stand Y, Figs. 1, 2, 3, 4, 5, and 6, which is secured to the plate C, and on the lower end of this shaft I fit a bevel-gear, (seen at I, Figs. 1, 2, 3, and 6,) which gears into and is driven by a bevel-pinion one-half of its size. (Seen at Z^2, Figs. 1, 2, 3, and 6.) This gear Z^2 is fixed to the main shaft D, Figs. 1, 2, 3, 4, 5, and 6, and by this means motion is communicated to the bar O, as will be readily seen.

To the bar O, Figs. 1, 2, 3, 4, and 5, I secure two cams, (seen at Q, Figs. 1, 2, and 3,) which are grooved in their under sides at an angle of about forty-five degrees with the face and from opposite points of the bar O, so as to take the needles and then drive them back and forth, as seen in Fig. 1, a portion of one of the cams being broken out to show the needle-grooves. These grooves receive the upward projection *i* of the heel of the needle, Fig. 11, at the back end of the needles *a*, Figs. 1 and 11, by means of which projections and the cams Q the needles are slid transversely back and forth to knit and narrow or widen the desired goods, said cams being carried by the movement of the bar O.

To the front of the bar O, Figs. 1, 2, 3, 4, and 5, I connect two yarn-carriers, (seen at P, Figs. 1, 2, 4, and 5,) which carry the yarn (which is seen in red lines) from the spool A^4, Figs. 1, 2, 3, 4, 5, and 6, first through the hole *f*, Figs. 2 and 3, in the shears S^2, Figs. 1, 2, 3, 4, 5, and 6, and then through the loops or hooks of the needles, when they are moved forward, so that the stitch may be formed, when the needles are drawn back by the closing down of the swinging finger a^4, Fig. 11. The bar O, Figs. 1, 2, 3, 4, and 5, is grooved at its back and lower corner, as seen at *t*, Figs. 3, 4, and 5. The upturned portion *i* of the needles *a*, Fig. 11, remain in this groove *t*, Figs. 3, 4, and 5, excepting when the cams Q, Figs. 1, 2, and 3, move them forward to form the stitch. The parts heretofore described are well known and do not form part of my invention. The following description relates to my improvements, as will be hereinafter seen. On the top of the plate C, Figs. 1, 3, 4, and 5, I fasten a secondary plate (seen at R, Figs. 1, 2, 4, and 5) to prevent the needles from flying out of their working position, and for an upper guide for the slides N^2 and N^6, Figs. 1, 2, 3, 4, and 5, to move in, while the plate C forms the lower guide for the slides N^2 and N^6 to move in, and at the back edge of the plate C, Figs. 1, 3, 4, and 5, I secure a guard-plate (seen at K^8, Fig. 3) to prevent the needles from flying back beyond their working position.

I place a guard-plate (seen at *d*, Figs. 1, 2, 9, and 10) in each of the two sections of the plate C at the central portion of the needles to keep a number of them constantly raised, while the others are raised or lowered for widening or narrowing, thus increasing the extent that may be widened or narrowed from one-half to two-thirds the width of the web, when rigid slides are used, as seen at N^2 and N^6, Figs. 1, 2, 3, and 4. I then construct two sliding plates, (seen at N^2 and N^6, Figs. 7 and 8,) having slots and inclined planes formed through them, to carry or raise and lower the needles, as may be desired, which slides N^2 and N^6 are fitted so as to slide in a groove formed in the plate R, Figs. 1, 2, 4, and 5, and plate C, Figs. 1, 3, 4, 5, and 9. The slides N^2 and N^6, Figs. 1, 2, 3, 4, and 5, are fastened at one end to the arms M^2 and M^6, Figs. 1, 2, 3, 4, 5, and 6, these arms being secured to the ends of the sliding rods Y^2 and Y^6 at Figs. 1, 2, 3, 4, 5, and 6, which are moved to throw the desired number of needles into or out of the work by the racks U^3 and U^6, cut on the rods Y^2 and Y^6, and the pinion T^3, (shown in section at Fig. 6,) which gears into both these racks to operate both of them at the same time, and which is secured to the shaft E^2, Figs. 1, 2, 3, 4, 5, and 6.

The shaft E^2 is suspended so as to turn freely in the stands J^2 and V^3, Figs. 1, 2, 3, 4, 5, and 6. Near the back end of it are placed and fastened two ratchet-gears I^2 and I^6, their teeth standing in opposite directions, so as to be operated either way by the dogs H^2 and H^7, Figs. 1, 2, 3, 4, and 5, as seen in the drawings—that is, so that one dog may turn the pinion T^3, Fig. 6, in one direction and the other dog may turn it in an opposite direction, which moves the slides N^2 and N^6 so as to lower the needles out of the work or so as to elevate them into work, as may be desired for narrowing or widening.

It will be seen that to narrow the needles must be lowered out of the work, so that the yarn in the carrier will not pass through the loops, or the needles already out must be elevated, so that the carrier P, Figs 1, 2, 4, and 5, may conduct the yarn through the loops, and thereby widen the work as much as may be desired, and this is effected by moving the slides N^2 and N^6 so that the inclined planes (seen at *p*, Fig. 7, and p^2, Fig. 8) will elevate the needles to widen, or so that these same inclined planes will move in opposite directions to lower the needles out of the work to narrow it by the inclined planes *p* and p^2, which will come in contact by their movement with the needles and elevate or depress them, which will be readily understood.

On the main shaft D, Figs. 1, 2, 3, 4, 5, and 6, I place a cam, (seen at B^2, Figs. 1, 2, 3, 5, and 6,) which comes in contact with projections *k*, Fig. 3, formed on the levers H^3 and H^6, which are to operate these levers and dogs H^2 and H^7, which are connected to and swing in their upper ends. These dogs alternately connect with and operate the ratchet-gears I^2 and I^6, Figs. 1, 2, 3, 5, and 6, which, through the pinion T^3, Fig. 6, move the slides N^2 and

N^6, Figs. 1, 2, 3, 4, and 5, to elevate or depress the needles, as may be desired. The levers H^3 and H^6 are moved by the cam B^2, Figs. 1, 2, 3, 4, and 6. Fig. 12 shows how the dog H^7 is raised so as not to operate its ratchet I^2 to move the slides N^2 and N^6 to widen the stocking and the dog H^2 lowered to operate its ratchet I^6 by the governor G^2 dropping into the recess r of the cam K^7 to so operate the slides N^2 and N^6 as to narrow the stocking by lowering a needle at each vibration of the bar O. Fig. 13 is a view of the same parts as shown in Fig. 12, with the position reversed, so that the dog H^7 is operating its ratchet I^2 to widen and the dog H^2 raised above its ratchet I^6, so as not to operate it to narrow the stocking. Fig. 15 is a perspective view of the plate C with the needles a therein and the slides N^2 and N^6, showing how their inclined planes p operate to elevate or lower the needles to narrow or widen the goods. The position of both lowered and raised needles is further shown at Fig. 16.

The operation of the dogs H^2 and H^7 and the movement of parts connected to them are regulated by two governors, (seen at G^2 and G^6, Figs. 1, 2, 3, 4, and 6,) which move in the stands F^2 and L^3, Figs. 1, 2, and 3, and governing-cams K^3 and K^6, which have recesses formed in their peripheries (seen at r and r^2) for letting down the governors G^2 and G^6 and dogs H^2 and H^7, so that one of these dogs will operate its ratchet-gear I^2 in the right direction to widen or narrow, while the other dog H^7 is kept above its ratchet-gear by the governor G^6, operating by one of the governing-cams K^3 or K^6 until the cams K^3 and K^6 move or turn sufficiently to change the position of the dogs H^2 and H^7—*i. e.*, to throw out the one heretofore operating its ratchet and lowering the other dog H^2, so as to operate its ratchet, as will be readily seen and understood.

The governing-cams K^3 and K^6 are secured to the quill B^4, Fig. 6, on which the gear C^3 is also secured. All these three turn on the stud K^2, Figs. 1, 3, and 6, which is made fast to the back girt B, Figs. 1, 2, 3, and 6. The gear C^3, Figs. 2, 4, and 5, receives motion from the worm A^2, Figs. 1, 2, 3, and 6, which is fixed to and turns with the main shaft D, Figs. 1, 2, 3, 4, 5, and 6, and this motion is communicated to the governing-cams K^3 and K^6, Figs. 3, 4, 5, and 6, by their being connected to the quill B^4, Fig. 6, of the gear C^3, Figs. 2, 4, and 5.

It will be seen that the needles a are let down out of the work one at a time on each extreme as fast as the narrowing is desired to be effected until the narrowest part of the goods is arrived at, when the cam K^3, Figs. 3, 4, 5, and 6, which governs the narrowing-dog, raises it, so as to disconnect it from its ratchet I^2, Figs. 1, 2, 3, 5, and 6, and at the required time, so that the widening and governing cams K^3 and K^6, Figs. 3, 4, 5, and 6, turn in the right position to allow the widening-dog to drop into and operate its ratchet I^2, Figs. 1, 3, 5, and 6, so as to cause the slides N^2 and N^6, Figs. 1, 2, 3, 4, and 5, to move so as gradually to raise the needles into their work, which effects the widening, as will be seen.

It will be observed that the back ends of the needles remain connected with the grooved slide K^8, Fig. 3, so that the needle after it is out of the way of receiving the thread continues to move backward and forward, and is by this movement freed or discharged from the thread which was in it before it was taken out of the work.

The gear C^3, Figs. 2, 4, and 5, quill B^4, Fig. 6, cams K^3 and K^6, Figs. 3, 4, 5, and 6, levers H^3 and H^6, Figs. 2, 3, 4, and 5, dogs H^2 and H^7, and governors G^2 and G^6, Figs. 1, 2, 3, and 6, together with the two ratchets I^2 and I^6, Figs. 1, 2, 3, 5, and 6, their shaft E^2, Figs. 1, 2, 3, 4, 5, and 6, the pinion T^3, Fig. 6, racks U^3 and U^6, Figs. 2 and 6, bars Y^2 and Y^6, Figs. 1, 2, 3, 4, 5, and 6, arms M^2 and M^6, Figs. 1, 2, 3, 4, 5, and 6, and slides N^2 and N^6, Figs. 1, 2, 3, 4, and 5, also the yarn-severing shears S^2, Figs. 1, 2, 3, 4, 5, and 6, which are operated by the pin H^4 in the gear C^3, Fig. 2, through the agency of the shipper A^3, Figs. 1, 2, 3, 4, 5, and 6, thereby stopping the machine at the right time or when it is in the right position to receive the new work, constitute the registering or measuring apparatus for widening or narrowing, as will readily be seen.

The enumeration of parts of the registering apparatus is referred to so that it may be known of what they consist, and the operation of this registering or measuring apparatus is as follows: The worm A^2, which is fastened to and turns with the main shaft D, is fitted to and turns the gear C^3 and quill B^4, and consequently the two governing-cams K^3 and K^6, which are fastened to this quill B^4. The cam B^2 revolves between and against the inside of the levers H^3 and H^6 to move them open, in order to impart the desired vibrating movement to the dogs H^2 and H^7, which are connected to them by joints at the top. One of these dogs (seen at H^2) is allowed or caused to operate its ratchet H^6 by the lower end of the governer G^2 dropping into the recess r of the cam K^7, (see Fig. 13,) when the movement of this dog H^2 will operate or turn the ratchet I^6, which is secured to the shaft E^2, so as to turn it and its pinion T^3, Fig. 6, and this pinion meshes into and moves the racks Y^2 and Y^6, which in turn move the slides N^2 and N^6 by and toward each other to drop the needles by causing them to slide down the inclined planes p, Figs. 7, 8, and 15, and thus narrow the work by the racks Y^2 and Y^6 being connected to the said slides by the arms M^2 and M^6. To widen the goods, the slides N^2 and N^6 are moved apart and by each other by the raising of the dog H^2 by the governor G^2 being raised to the largest surface of the cam K^7 by the continued movement of this cam and the dropping of the other vibrating dog H^7 into its ratchet I^6, which is also secured to the shaft E^2 and turns it in an opposite direction. The change from widening to narrow-

ing can commence as soon as desired after the narrowing is effected by constructing or forming the recesses r and r^2 in any desired place in the periphery of the cams K^3 and K^7. These recesses r and r^2 are formed, as seen in the drawings, to commence the widening as soon as the narrowing is completed, and both dogs H^2 and H^7 are kept raised on the largest periphery of the cams K^3 and K^7 when neither the widening nor narrowing is being done, meaning that the dogs H^2 and H^7 are kept raised when straight or parallel work is being knit by the machine.

Various modifications of this apparatus may be made with a good result; but I believe the above arrangement, or substantially the same, to be the best for the required purpose.

I construct a plate (seen at S, Figs. 1, 2, 4, and 5) with its teeth c for preventing the yarn from getting entangled with the fronts of the needles not in use and secure it to the top of a swinging frame V, Figs. 1, 2, 4, 5, and 6, which is held in its working position by the catch T, Figs. 1, 2, 4, and 5, and by lowering the catch the plate S, Figs, 1, 2, 4, and 5, can be swung forward out of the operator's way when a new piece of unfinished goods is to be hooked onto the needles for finishing by knitting, widening, and narrowing, as in footing stockings the legs of which have been made on another machine. Back of the plate S, Figs. 1, 2, 4, and 5, is placed the bar W, Figs. 1, 4, and 5, which is provided with a number of separating-fins (seen at e, Figs. 1, 4, and 5) for forming the stitch, these fins e and bar W being moved up and down by the rods X, Figs. 1, 2, and 3, and lever D^2, Figs. 1, 2, 3, 4, 5, and 6, which are operated by the cams C^2, Figs. 1, 3, 4, 5, and 6, on the main shaft D, Figs. 1, 2, 3, 4, 5, and 6, the centers of operation of these levers D^2, Figs. 1, 2, 3, 4, 5, and 6, being seen at D^5, Figs. 4 and 5. The spiral springs (seen at B^3, Figs. 2, 3, and 6) serve to press down the levers D^2 into the recess in the cams, Figs. 1, 3, 4, 5, and 6, letter C^2, as seen in dotted lines at Figs. 4 and 5.

I construct two rods O^2, Figs. 1, 2, 4, and 5, the back surfaces of which rest against the plate C, Figs. 1, 3, 4, 5, 9, and 10, and near the top of them are inclined planes formed, which are fitted to the bar W, Fig. 1, so that as these inclined planes are lowered the bar W, Fig. 1, is moved forward into its working position, in order that it may be moved upward and downward by the levers D^2, Figs. 1, 3, 4, 5, and 6, operated by the cams C^2, Figs. 1, 2, 3, 4, 5, and 6, so as to help form the stitch.

It will be seen that the front edges of the fins e, Figs. 1, 4, and 5, are so near the points of the needles that they would be very much in the way of putting or hooking on the knit goods to be narrowed or widened. To obviate this difficulty I connect each of the lower ends of the rods O^2, Figs. 1, 2, 3, 4, and 5, to the arms C^4, Fig. 2, which are secured to the lower part of the swinging frame or stand V, Figs. 1 and 2, and consequently as these stands are swung forward they raise the rods O^2, Figs. 1, 2, 3, 4, and 5, by their connection with them, thereby raising the inclined planes, so as to allow the spiral spring T^2, Figs. 1, 2, 4, and 5, to draw back the bar W, Figs. 1, 4, and 5, and its fins e, Figs. 1, 4, and 5, so that the operator can conveniently attach or hook on the next piece of goods to be narrowed, knit, and widened, as desired.

It will be seen that my within-described machine is a double one—that is, there are two sets of needles—which may knit, narrow, or widen two stockings or other pieces of goods at the same time. I construct a belt-shipper (seen at J^3, Figs. 3, 4, and 6) which is operated by the handle U, Figs. 1, 2, 3, 4, 5, and 6, bar W^2, Figs. 1, 4, and 6, and its pin D^3, Figs. 2, 3, and 6—that is, the handle U, Figs. 1, 2, 3, 4, 5, and 6, can be moved to the left, carrying the bar W^2, Figs. 1, 4, and 6, with it until the catch S^3, Figs. 6, catches under the spring Q^3, Figs. 2 and 6, and there remains until the wheel C^3 turns over to bring the pin I^3, Fig. 2, in contact with the spring Q^3, Figs. 2 and 6, on its under side, by which it is raised so as to allow the spiral spring D^4 Fig. 6, to draw back the shipper J^3, Figs. 2, 4, and 6, by the handle U, Figs. 1, 2, 3, 4, 5, and 6, and bar W^2, Figs. 1, 4, and 6, to throw the belt on the loose pulley V^6, Figs. 1, 2, 3, 4, and 6, which stops the machine. Thus the work being completed and the thread cut by the self-operating shears S^2, Figs. 1, 2, 3, 4, 5, and 6, the work will be thrown off the machine by its continued operation, and when the needles are brought into the desired position the belt is thrown off and the machine stopped ready and in the right position to receive the new piece of work without any attention of the operator who is tending the machine. This stopping of the machine at the right time is effected by the stud or pin I^3, Fig. 2, which is fixed to the gear C^3, Fig. 2, as will be readily seen. In the meantime, or when the machine is in operation, the belt can be shipped by hand independent of the spring D^4, Fig. 6, and bar W^2, Fig. 6, if desired.

At S^2, Figs. 1, 2, 3, 4, and 5, can be seen the two pairs of self-acting shears or cutters for severing the yarns from the spools A^4, Figs. 1, 2, 3, 4, 5, and 6, when the work is completed. The lower ends of these shears are connected to the rods R^2, Figs. 1, 2, 3, 4, 5, and 6, which are fastened to the shear-shipper A^3, Figs. 1, 2, 3, 4, 5, and 6. When they are to be set to sever the yarn, the handle Q^2, Figs. 1, 2, 3, 4, and 5, is moved along to the right until the pin or catch N^3, Fig. 6, passes under the spring-catch R^3, Fig. 6, which holds it until the pin H^4, Fig. 2, in the wheel C^3, Fig. 2, comes in contact with the under side of the spring R^3, Figs. 2 and 6, and raises it to allow the spiral spring O^3, Fig. 6, instantly to draw the shear-shipper A^3, Figs. 1, 2, 4, 5, and 6, back or to the left, which at once severs the yarns, after which the machine runs until it is in readi-

ness or in the right position to receive the next piece of goods to be made, when the belt-shipper is thrown off, which stops the machine, as hereinbefore shown.

The shears or yarn-cutters may be placed immediately above the carriers P, Figs. 1, 2, 4, and 5, if desired.

The proper materials for all parts of my machine will readily suggest themselves to any competent mechanic.

I claim—

1. The lowering or raising the ends of the needles which receive the threads, so that the thread will not enter the hooks of the needles when out of their working-line as the carrier passes them, while the other ends of the needles remain connected with the mechanical arrangement used for pushing them forward and drawing them back to form the stitch on their working-lines, essentially in the manner and for the purposes fully set forth.

2. The slides N^2 or their mechanical equivalents for taking the needles out of the work for narrowing the fabric and bringing them back into the work for widening the fabric, essentially as set forth.

3. The metallic rests or guards *d* or their equivalents for constantly keeping a number of the needles in their working-line, essentially in the manner as fully set forth and described.

4. The connection of a registering or measuring apparatus constructed as within described, or otherwise formed with the moving parts of my machine for the purpose of bringing into use and taking out of use the requisite needles at the proper time for shaping the fabric and for severing the thread when the work is done and stopping the machine when required, essentially in the manner as fully set forth.

5. The arrangement and movement of the fined bar W or its mechanical equivalent to aid in forming the stitch, also its movement backward to uncover the ends of the needles for putting on the new fabric, essentially in the manner and for the purposes fully set forth.

JOHN NESMITH.

Witnesses:
SAMUEL C. PRATT,
JAS. H. RAND.