

H. A. House,

3 Sheets, Sheet 1.

Knitting Mach.

No. 101,878.

Patented Apr. 12, 1870.

Fig. 1

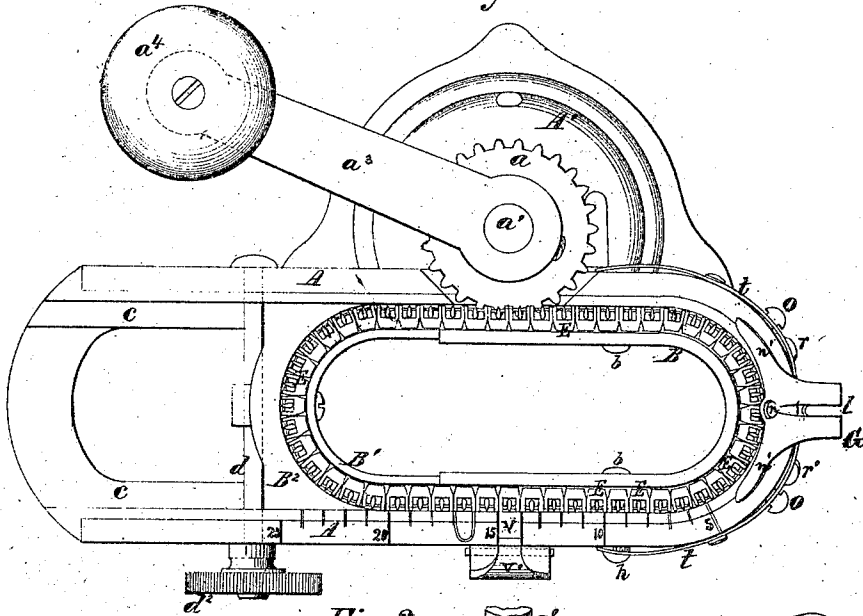
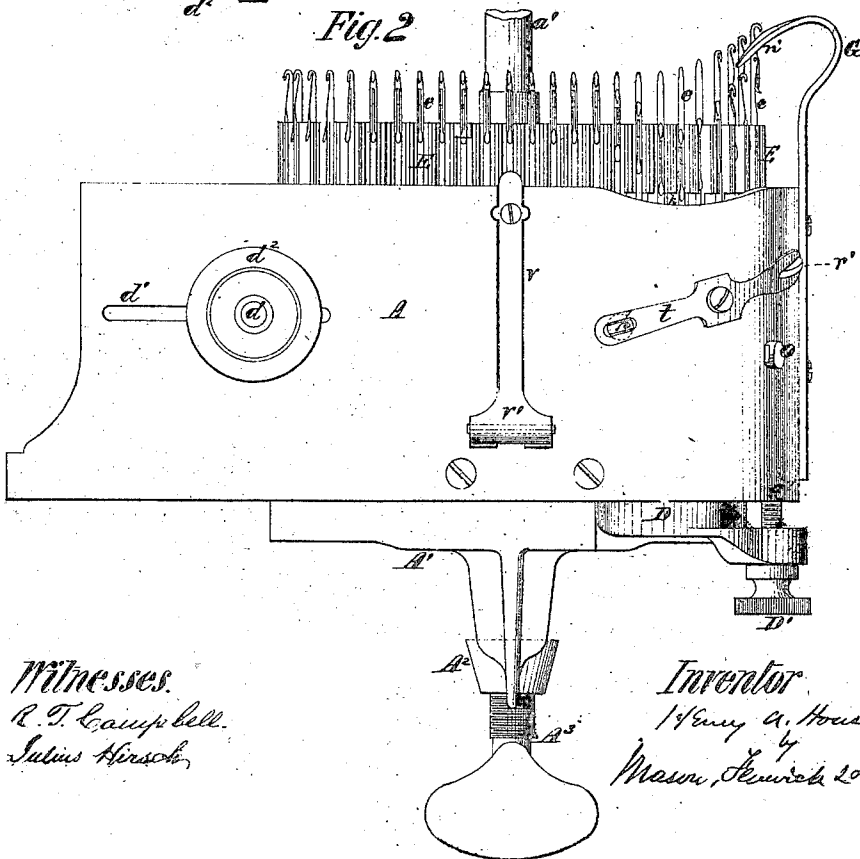


Fig. 2



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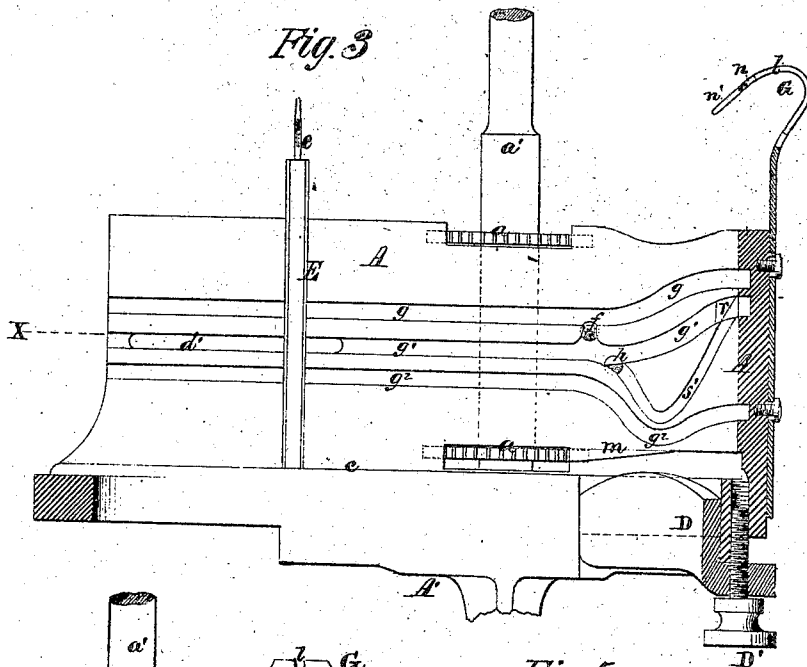


Fig. 4.

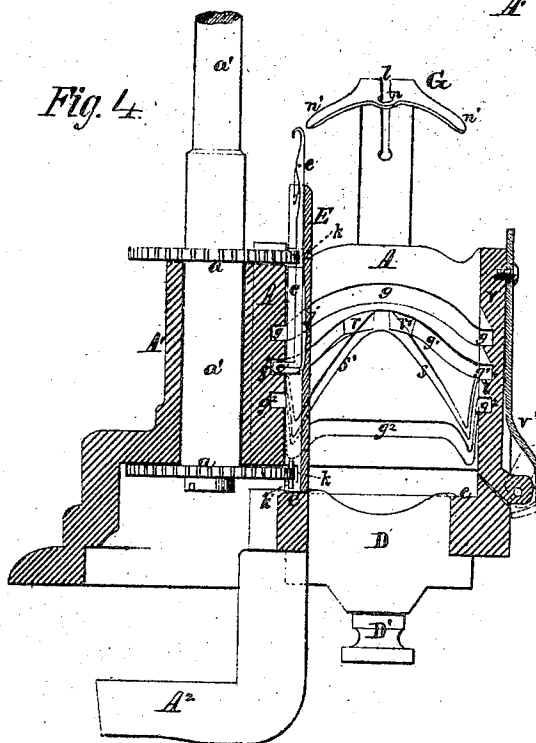
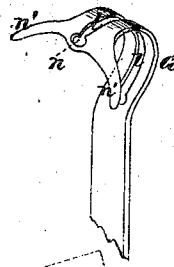


Fig. 5.



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3, Sheets, Sheet 3.

No. 104878.

Patented Apr. 12. 1870.

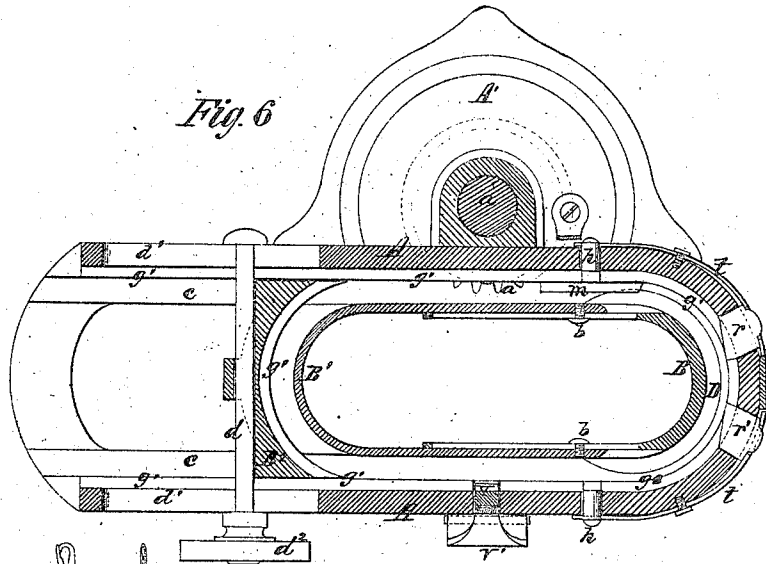


Fig. 6

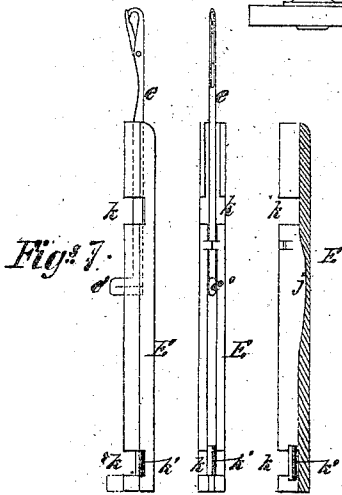
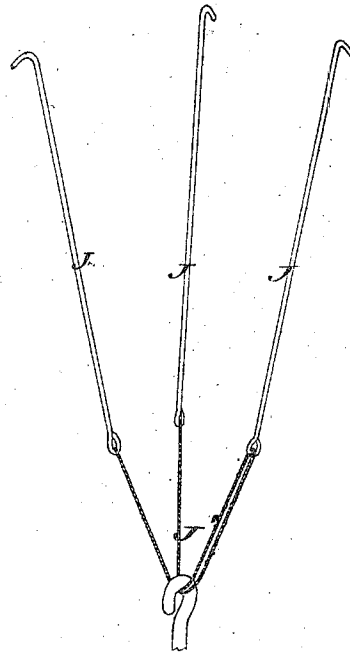


Fig. 7.

Fig. 8.



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HENRY A. HOUSE, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO HIMSELF
AND FRANK ARMSTRONG, OF HAMBURG, GERMANY.

Letters Patent No. 101,878, dated April 12, 1870.

IMPROVEMENT IN KNITTING-MACHINES.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern :

Be it known that I, HENRY A. HOUSE, of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Knitting-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings making part of this specification, in which—

Figure 1, plate 1, is a top view of the improved knitting-machine complete.

Figure 2, plate 1, is an elevation of the front side of the machine, with the hand-crank removed from its shaft.

Figure 3, plate 2, is a section taken longitudinally and vertically through the center of the main portion of the frame, with the inner walls taken away.

Figure 4, plate 2, is a section taken transversely through the center of the machine, showing the gate in two positions.

Figure 5, plate 2, is a perspective view of the yarn-guide.

Figure 6, plate 3, is a section taken horizontally through the machine in the plane or course of the intermediate groove, indicated by dotted line *x x* in fig. 3, plate 2.

Figures 7, plate 3, are views showing the construction of the quills and needles.

Figure 8, plate 3, is a perspective view of the tension-hook used in knitting the heel of a stocking.

Similar letters of reference indicate corresponding parts in the several figures.

The improvements which I shall hereinafter explain are especially applicable to the extensible-frame knitting-machine, for which I made application for Letters Patent on the 6th day of April, 1869, wherein the needles are arranged and guided so as to travel around in the path of a flattened ellipse, and at proper times to rise and descend for receiving the yarn and casting off the loops.

The nature of my invention consists—

First, in a provision for adjusting any desired number of the needles with the work upon them, so that these needles shall not take the yarn nor form loops, at the same time allowing these needles to travel around either to the right or left with those needles which do form loops, thereby allowing the operation of knitting to be conveniently performed.

Also, in a provision for depressing certain needles, so that they shall neither carry the work upon them nor take yarn from the yarn-guide, for the purpose of knitting ribbed work, employing for this purpose a hinged and stepped gate, which will allow the toes on the lower ends of the needles, which it is desired to drop out of operation, to be adjusted so as to travel

in a groove beneath the main working groove, as will be hereinafter explained.

Also, in certain spring switches, combined with grooves in which the toes on the needles are designed to travel, which will allow the needles to be moved around either toward the right hand or toward the left hand, for the purpose of knitting the heel portion of a stocking, or other straight or single work.

Also, in the combination with said grooves of a spring latch or a guide, which will allow the needle toes to be adjusted so as to travel in the highest groove, when it is desired to raise certain needles with the work upon them out of operation, as will be hereinafter explained.

Also, in the application of each needle to a groove formed in a narrow quill, so that each needle is allowed to receive endwise movements independently of its quill, as will be hereinafter explained.

Also, in a provision for lightening or loosening the stitches by means of a vertically-adjustable cam applied at the point where the needles are depressed or caused to dip, for the purpose of casting off the loops, said cam being arranged so as to operate upon the quills by raising or depressing them, and thereby causing more or less of the yarn beneath the hooks of the needles to be drawn into their upper ends before casting off the loops, as will be hereinafter explained.

Also, in quills or needle-sheaths, constructed with slots or notches at or near their lower ends, adapted for receiving a rib or flange on the frame of the machine, for the purpose of preventing these quills or sheaths from rising while in operation.

Also, in a vertical gate, constructed as hereinafter described, and applied to the stationary or main frame, which will allow the insertion of the needles and their quills into their proper places in the frame of the machine, the removal of the same at pleasure, and also the raising or lowering the needles from or to the highest or lowest groove of the frame.

Also, in a horizontal and lateral clamping-bar, applied to the frame of the machine, and arranged so as to confine the adjustable section of said frame rigidly at any desired points.

Also, in the employment of certain hooked rods, connected at the ends opposite their hooks by means of a doubled cord or chain, and adapted for use with the tension-weight for drawing down the work equally while knitting a heel, as will be hereinafter described.

Also, in extending the vertical shaft of the spurs, which gear with and move the needles and their sheaths around in their guides, high enough to receive upon its upper end a hand-crank, and in applying such crank so as to turn in a horizontal plane above the needles, and out of the way of the same, as will be hereinafter explained.

To enable others skilled in the art to understand my invention, I will describe its construction and operation.

The general form of the frame of the machine is that of a flattened ellipse.

This frame is composed of three sections, A B B', and a side bearing-box, A', in which latter one of the spur-wheels, *a*, which moves the needles and the shaft *a'* of these wheels, has its bearing.

Below this box A' is a jaw, A², having a clamp-screw, A³, tapped through it for confining the machine to the edge of a table or other established object.

The main section A of the frame consists of two parallel sides, terminating in semicircular ends, one of which ends is cut away, so as to leave only a thin connecting portion, as shown in figs. 1, 3, and 6.

Within this section A are the two sections B B', which are of the same form as the main section, when taken horizontally, but are made somewhat smaller than this section, so as to leave a vertical channel wide enough to receive the quills or needle-sheaths, as shown in figs. 1 and 4, and allow these quills, with their needles, to be moved around by turning the spur-wheel shaft *a'*.

The section B is rigidly secured to the outer section A, and grooved horizontally in its external sides for receiving the parallel arms of the movable section B', as shown in fig. 6.

By means of the screws *b b*, which pass transversely through the arms of section B', and through oblong slots made through the sides of section B, the section B' is connected to B, so that it can be extended or contracted for increasing or diminishing the capacity of the machine for receiving needles.

The head B², having a semicircular inner surface, is rigidly secured to the semicircular end of section B', so as to leave between it and this section a space, which is equal in width and depth to the space between the sections B, B', and A, and to form a continuation of said space, as shown in figs. 1 and 6.

The head B² is fitted in the open end of section A, so as to slide freely therein, and to rest upon the horizontal ways *c c* of this latter section, and through the back of head B² a hole is made, transversely through which a bolt, *d*, is passed, which also passes through oblong horizontal slots, *d'*, made through the sides of frame-section A, and receives upon one end a clamping-nut, *d*².

The slotting of frame-section A weakens its sides sufficiently to allow them to be drawn tightly against the flat sides of the head B², and the location of said slots *d' d'*, at or near the middle of the vertical height of the semicircular portion of this head B², will cause the bolt and its nut to clamp the sides of frame A equally against the head, so as to hold it rigidly at any point to which it may be adjusted.

By reference to fig. 4, plate 2, it will be seen that I employ, for moving the quills and their needles around in their channel, two spur-wheels, *a a*, one of which is arranged in a horizontal plane just above the ways *c*, and works through a slot made through one side of frame section A, and the other is arranged in a plane just below the plane of the upper edge of said frame section, and works in a depression made into said edge.

The vertical shaft *a'* of the spur-wheels *a a* is extended above the top of frame-section A high enough to receive upon its upper end a crank-arm, *a*², on which is a hand-knob, *a'*, by which the operator can with one hand conveniently turn the shaft *a'*.

By this arrangement of the driving-shaft and hand-crank, intermediate gearing is dispensed with, and power applied directly to the said shaft.

Directly opposite the shaft *a'* a narrow slot is made vertically through the frame-section A, extending

from the upper edge of this section down to or nearly to the ways *c*, and in this slot is fitted a gate, *v*, which is hinged at its lower end, and acted upon by a spring, *v'*, applied so as to hold the gate either open or shut. In fig. 4, plate 2, the gate *v* is represented shut in full lines, and open in dotted lines. When it is shut, it completely fills the space formed for its reception, and when it is open the quills, with their needles, can be readily removed, one at a time, from their channel, or introduced one at a time into this channel. Said gate, with its spring, also serves another purpose, which will be hereinafter explained.

In the inner surface of the section A are three main grooves, either one of which is adapted for receiving the angular protruding toes *e'* on the needles *e*, as shown in fig. 4, plate 2, and, in the inner semicircular surface of the adjustable head B², there are also three grooves made, corresponding to and registering with their respective grooves in the sides of the frame section A.

From a vertical plane intersecting a latch, *f*, shown in fig. 3, and around the inner surface of the head B², the grooves *g g' g*² are parallel to the horizontal ways *c c*, but from said latch *f* to a corresponding point on the opposite side of the frame section A, the said grooves are curved, as shown in figs. 3 and 4.

The highest groove *g* is continuous except at the point where the latch *f* forms the lower side of it, and into this groove the toes *e'* of the needles are adjusted, when it is desired to raise a certain number of needles out of action with the work upon them, during the operation of knitting the heel of a stocking by means of a certain number of needles whose toes traverse in the intermediate groove *g'*. To adjust the toes of needles from the groove *g'* into groove *g*, the needles are drawn up at the point where latch *f* is located, which latch will recede and allow the needle-toes to pass over it, but prevent them from passing back again in the same way. One needle at a time, from each end of a row of needles, can be thus raised out of action with the work upon it, during the narrowing operation of forming a heel.

The groove *g*² is also continuous or unbroken, except at the hinged gate *v*, and into this groove the toes *e'* on the needles are adjusted, when it is desired to produce ribbed work, by having certain needles in the chain or series which do not take the yarn, and which do not carry work upon them.

The needles, while in the groove *g'*, cross the space filled by the gate *v* by means of a bridge or step, *t*, which is formed on the inner surface of this gate, in a plane with the base of said groove, as shown in fig. 4.

There are three steps on this gate, corresponding to the three grooves, and two of these steps are beveled under, so as to allow needles brought against the gate to be raised from any one of the grooves into any other groove.

In raising the needles at this gate by a hooked tool used for the purpose, the spring *v'* will allow the gate to open slightly, until a needle-toe has passed a step, *t*, when said spring will shut the gate again, and leave the needle in the desired position. In this way, needles whose toes are in the lowermost groove *g*² can be raised, so as to bring their toes into the intermediate groove *g'*.

The intermediate groove *g'* leads into two short switch-grooves, *s s'*, curved so as to give the required vertical movements to the needles, to receive yarn from the yarn-guide G, and to cast off the loops.

Two curved switch grooves are used for adapting the machine to work right and left; and, in order to effect this object successfully, beveled spring switches, *v v'*, are arranged as shown in figs. 2, 4, and 6, one of which will direct the needle-toes into the proper groove, while the other will yield, and allow the needle-toes to pass around into the proper switch-groove.

When the needles are moved around in one direction, the switch r will yield and allow the needle-toes to pass it, and the switch r' will direct the needle-toes downward into the switch-groove s . When the motion of the needles is reversed, the switch r' will yield, and the switch r will direct the needle-toes downward into the switch-groove s' to cast off the loops of the course last formed.

In figs. 3 and 4 the curved form of the groove g' and its switch-grooves s s' is clearly shown.

The switches r r' are acted upon by springs, t t' , which also act upon double latches, h h' , as shown in figs. 2, 3, and 6. These latches h h' will allow the needle-toes to pass up from a switch-groove into the main groove, in rising from a switch-groove after the needles have cast off the loops of the course last formed, but neither of said latches h h' will allow the needle-toes to pass into a switch-groove before the needles receive the yarn from the yarn-guide, and from new stitches.

Directly beneath the grooves which give vertical movements to the needles, and inserted into a recess formed by cutting away a portion of the ways c , is a vertically-adjustable semicircular cam, D , the upper edge of which is waved, as shown in figs. 3 and 4, and adapted for supporting the quills or needle-sheaths as they pass around over it.

The thumb-screw D' is used for adjusting this cam-plate, as shown in fig. 3. The object of this adjustable cam is to regulate the tightness of the stitches, by changing the relative positions of the upper ends of the quills with respect to the hooked ends of the needles, as will be shown after I have explained the construction of the quills and their uses.

Each needle-quill or sheath, E , consists of a longitudinally-slotted angular rod, which has its external sides beveled, as shown in fig. 1, and which is scored at j , as shown in the sectional view of figs. 7.

At two points, k k' , this sheath is notched, to receive into it the teeth of the two wheels a a' , and in the lower notch a short pin, k , is fastened, to engage with the teeth on the lower spur-wheel a . The shank of the needle e engages with the upper spur-wheel a' at the upper notch k' . Just below the upper notch the sides of the sheath are closed about the needle e , so as to keep it in place, but allow it to move up and down freely in the sheath. The sheath of each needle should be somewhat longer than the needle which it incloses, so that, in casting off the loops, the hooked end of the needle may be drawn more or less within its sheath, according to the degree of tightness or looseness required for the stitches.

The lower ends of the sheaths may be constructed with toes on them, as indicated by the dotted lines in one of the views of figs. 7, for the purpose of working under and being held down by a groove, which may be formed on the inner side of frame-section A and head B' .

If this toe is not made on the sheath, then the lower notch k is used to receive a flange or rib, m , shown in figs. 3 and 6, which will hold the needle-sheaths down upon the ways c at the point where the sheaths are most liable to rise from said ways. I prefer to provide for holding the sheaths down positively at all points in their travel, either by the toe and a continuous groove, or by a rib and notch, as above stated.

I construct the sheaths with scores, j , in them, for the purpose of affording sufficient play laterally to the needles, to allow their toes to be readily adjusted from the slot g' into the slot g , past the latch f .

I have represented the well-known latch-needles e applied to the sheath, but I may use the bearded needles in their stead.

G represents the yarn-guide, for guiding the yarn on its way from the spool or yarn-carrier to the needles, as they successively pass around. This guide is

formed upon one end of a shank, which is secured in a vertical central position to the semicircular end of the frame-section A , and which may be made vertically adjustable, if desired, by making the holes through which the binding-screws pass, oblong.

This guide is curved, as shown in figs. 3 and 5, and slotted at l , the slot terminating at each end in an eye, n .

On each side of this eye a wing, n' , may be formed, if desirable, such wings being curved and inclined, and serving to keep the latches of the needles from closing before their hooks take the yarn, whether the needles are moved toward the right hand or the left.

My guide G I construct out of a flat piece of metal, and cut the eyes and slot in it before bending the plate into its curved form. The slotted portion is bent, after the punching-operation, into the bow form shown, so as to afford room for the operator's fingers, in holding open the latches of the needles, if the wings n' are not used or fail to perform their duty. The bow form enables me to provide two guiding-eyes, and, consequently, an additional bearing for the yarn. At the same time, all the advantages of a single eye, intersected by a kerf, are secured.

In practice, I intend attaching the frame which carries the reel or spool and tension-device to the frame-section A ; and, for this purpose, the lugs o are cast on the end of this frame, as shown in figs. 1 and 2.

In fig. 8, I have represented three hooked rods, J J J , connected together by means of a cord, J' , from which depends the tension-weight for drawing down the work. These hooks are used during the operation of knitting the heel of a stocking, and are attached at three different points to the work, so as to allow the weight to draw it down equally from these points of attachment.

It will be seen, from the above description, that each needle-sheath is acted upon by two spur-wheels; that these spur-wheels are applied directly to a shaft, carrying the hand-crank; that the needle-sheaths can be moved toward the right hand, just as well as toward the left hand; and that the stitches can be made tighter or looser by a single adjustment of a cam-plate, over which the needle-sheaths pass while the needles receive yarn and cast off loops.

It will also be seen that needle-sheaths and needles can be quickly applied to or removed from the frame of the machine through a side opening, provided with a gate; that the needles can be adjusted into or out of operation at pleasure, with the work on or off of them; and that any one or more of the needle-sheaths can be removed from the machine, and the machine adjusted so that those needles which are left therein can be operated.

By reference to fig. 1, plate 1, it will be seen that a portion of the upper edge of frame-section A is marked off in inches and fractions of inches, and numbered from five to twenty-five. This is done for the purpose of readily counting the number of needles which it may be desired to have in working position.

Having described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

1. The groove g , in combination with the main working-groove g' and latch f , or its equivalent, substantially as and for the purposes described.
2. The grooves g , in combination with the main working groove and the gate v , the latter being constructed and arranged substantially as described.
3. The switches r r' and latches h h' , in combination with the groove g' and switch-grooves s s' , substantially as and for the purposes described.
4. A grooved needle-sheath, E , constructed substantially as described.
5. A needle-sheath or quill, E , in combination

with a knitting-needle, when both are allowed vertical movements independent of each other during the operation of knitting, substantially as described.

6. The quills or sheaths E, notched at *k*, substantially as described.

7. The clamping-bar *d* and nut *d'*, in combination with the frame-section A and adjustable head B², substantially as described.

8. The vertically-swinging gate *v*, notched or stepped, as specified, in combination with the grooved frame-section A, substantially as described.

9. The sections A B B' and gate *v*, combined and constructed substantially as described.

10. The combination, with the needles and their sheaths, of the upright crank-shaft *a'*, provided with

spur-wheels *a a*, when said spur-wheels engage directly with the needles and their sheaths, substantially as described.

11. The combination of the adjustable cams D with the sheaths of the needles, when said sheaths are independent in their adjustment of the needles, substantially as described.

12. The tension-hooks J J J, connected to the double cord J', and adapted to operate substantially as described.

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