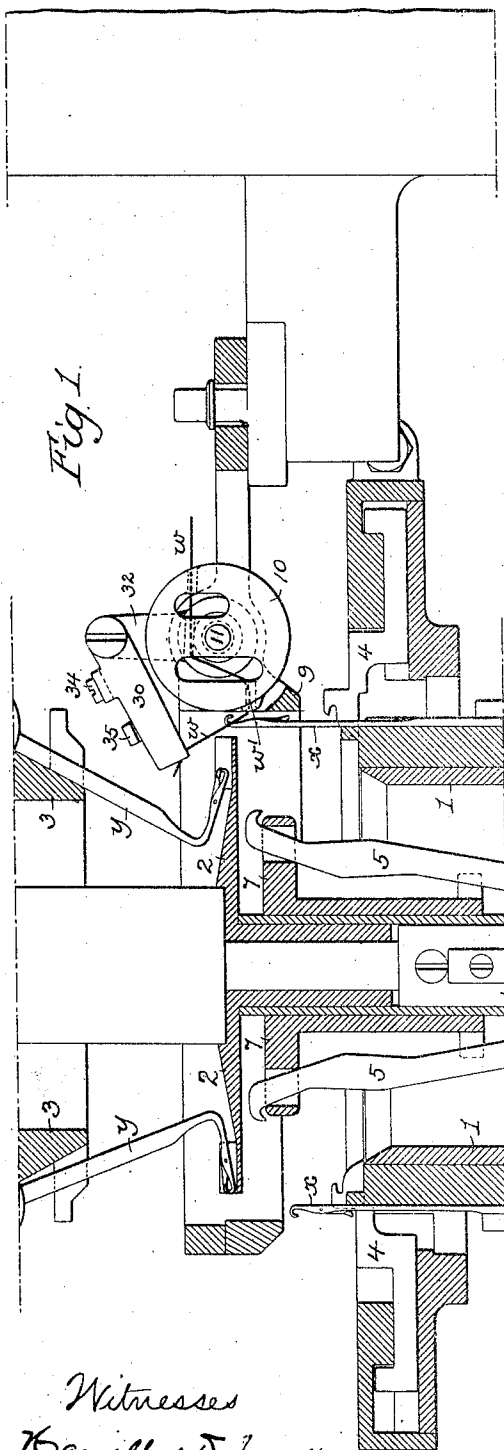


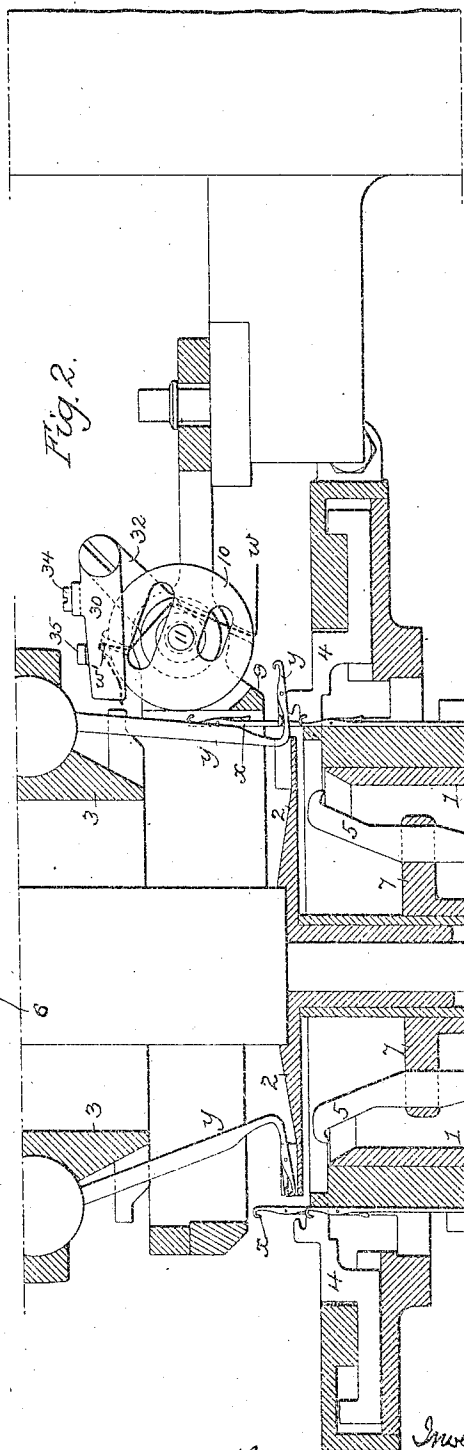
H. SWINGLEHURST.
YARN SUPPLYING DEVICE FOR KNITTING MACHINES.
APPLICATION FILED DEC. 8, 1909.

1,035,657.

Patented Aug. 13, 1912.
5 SHEETS-SHEET 1.



Witnesses
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Fig. 3.

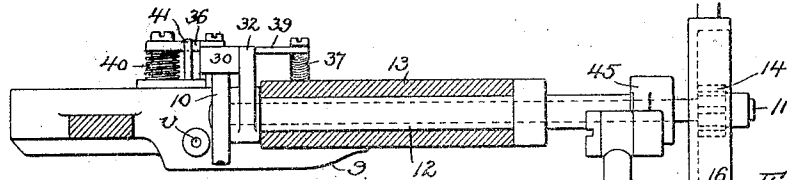
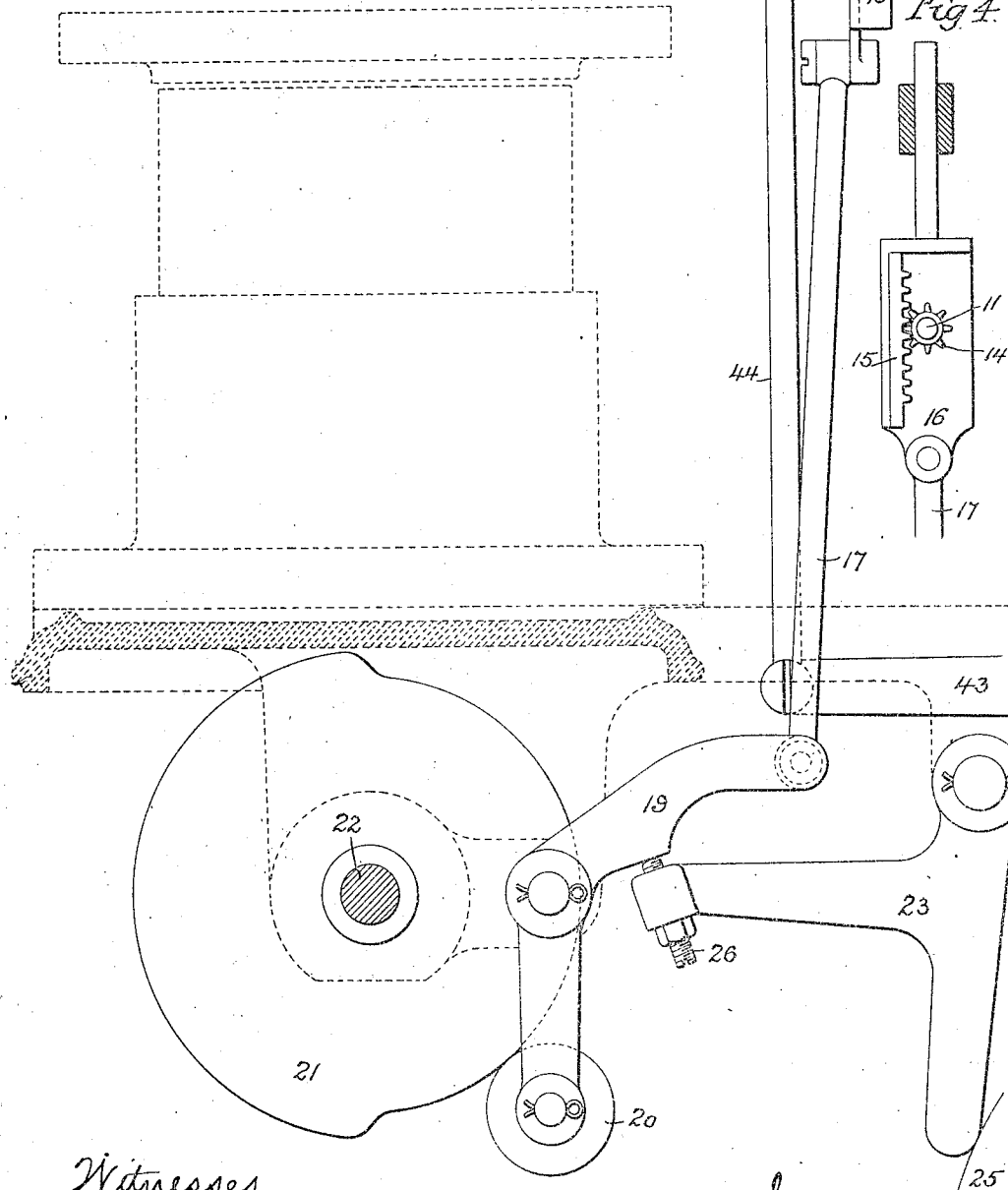
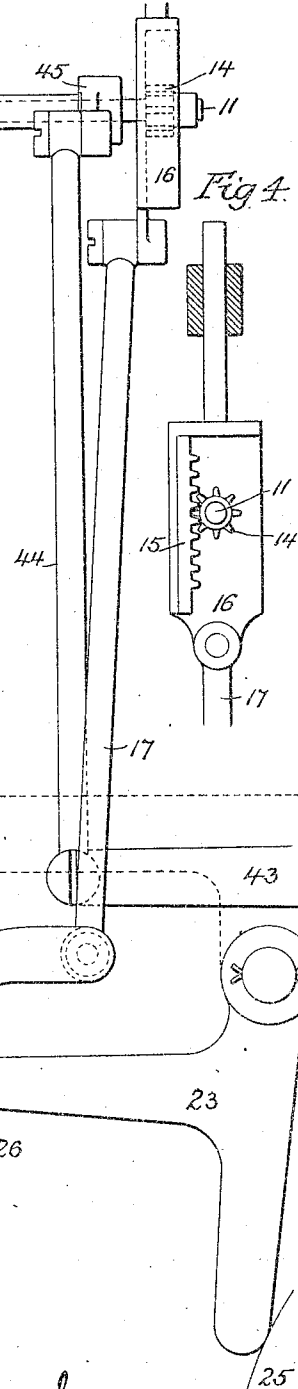


Fig. 4.



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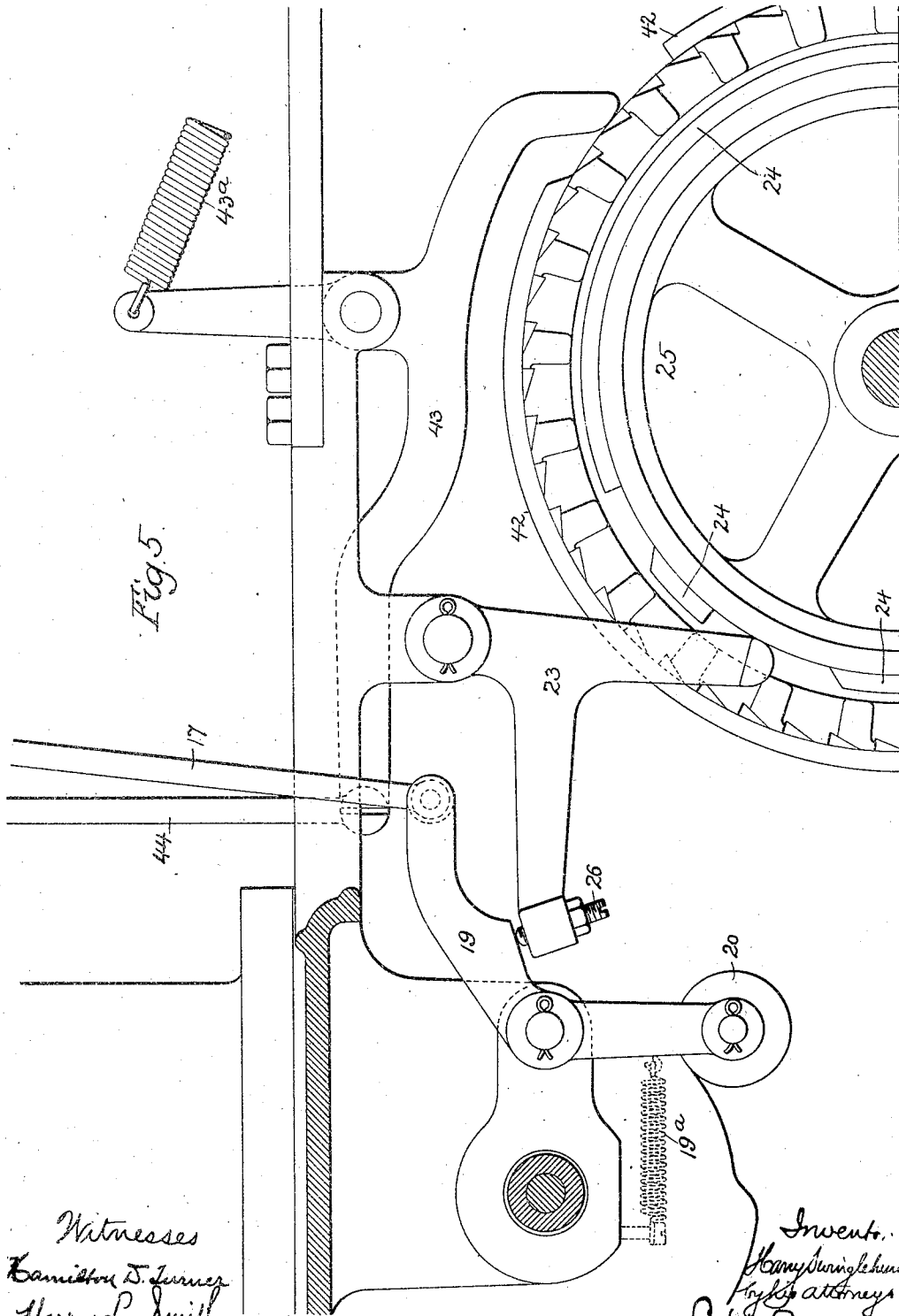
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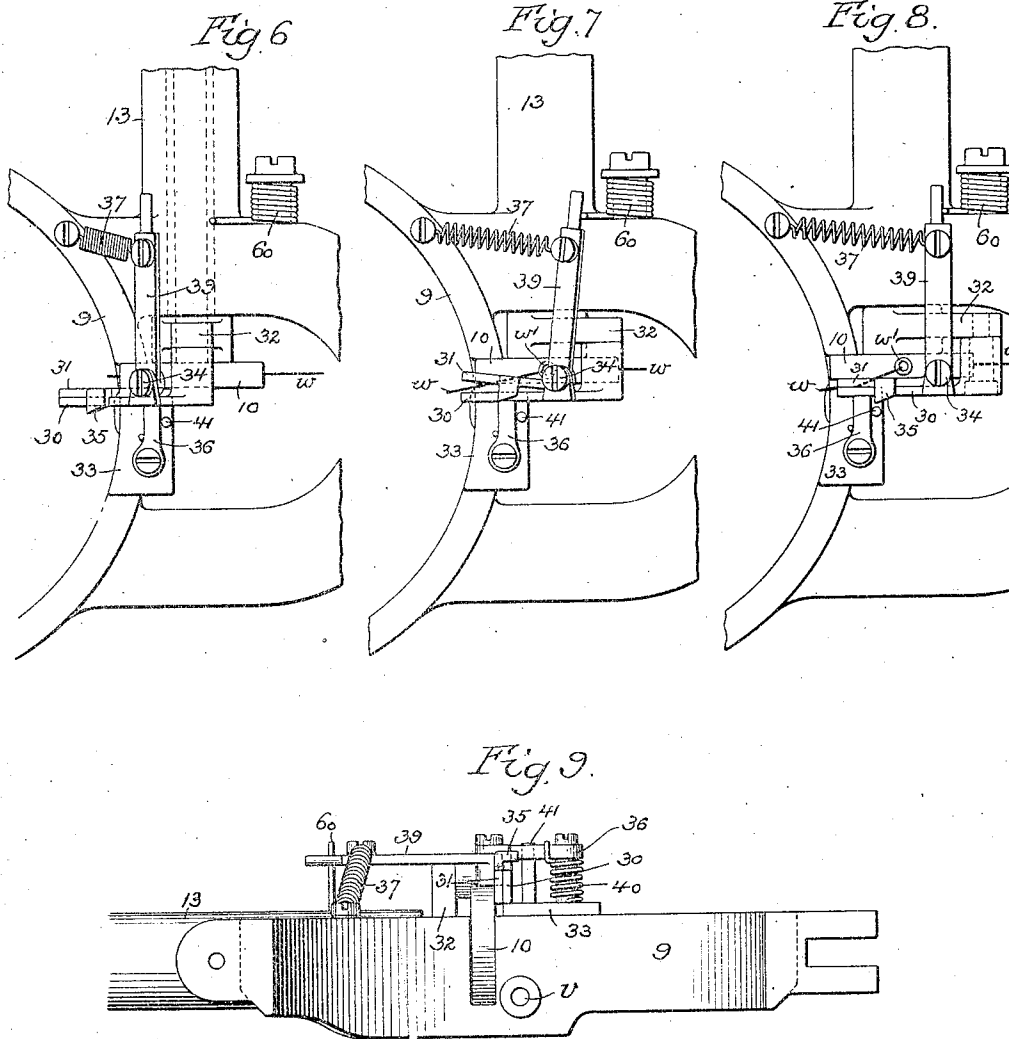


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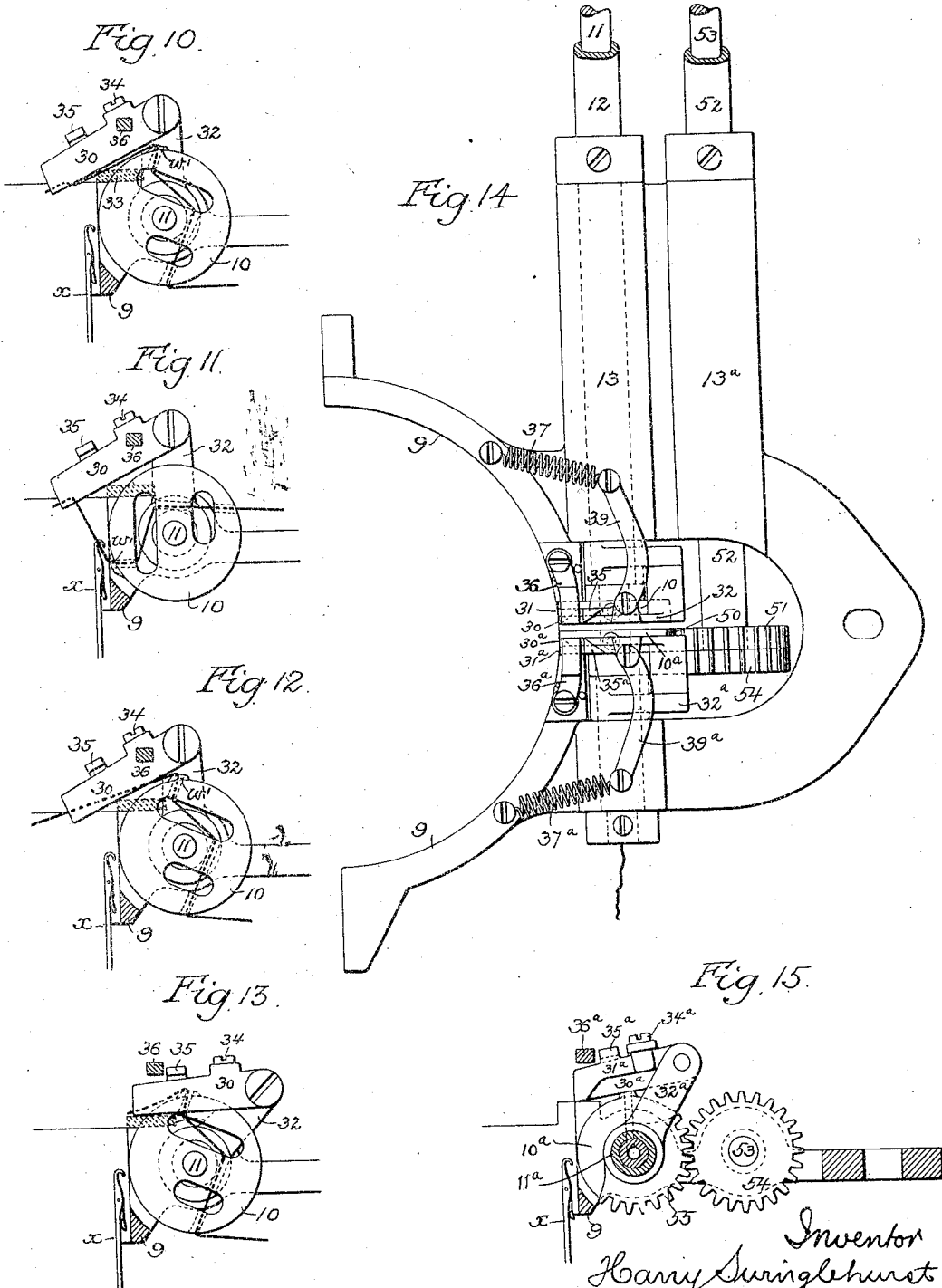
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6 SHEETS—SHEET 5.

1,035,657.



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UNITED STATES PATENT OFFICE.

HARRY SWINGLEHURST, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SCOTT & WILLIAMS, INCORPORATED, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

YARN-SUPPLYING DEVICE FOR KNITTING-MACHINES.

1,035,657.

Specification of Letters Patent.

Patented Aug. 13, 1912.

Application filed December 8, 1909. Serial No. 532,117.

To all whom it may concern:

Be it known that I, HARRY SWINGLEHURST, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain improvements in Yarn-Supplying Devices for Knitting-Machines, of which the following is a specification.

My invention consists of certain devices fully described and claimed hereinafter and intended for the purpose of reinforcing or changing the yarn fed to the needles of a knitting machine, the devices, while applicable to knitting machines generally, having been devised with special reference for use in connection with machines of that type which are adapted for the production of either ribbed or plain web and for changing from the production of one character of web to the other, an instance of such machine being found in the patent of R. W. Scott, No. 834,763, dated October 30, 1906.

In the accompanying drawings—Figure 1 is a view, partly in side elevation and partly in transverse vertical section, of sufficient of the knitting machine to illustrate the application thereto of a yarn reinforcing device constructed in accordance with my invention, the parts being shown in the positions which they occupy when the reinforcing yarn controlled thereby is first brought into range of the needles; Fig. 2 is a similar view showing the parts of the device in the positions assumed by them when the reinforcing yarn controlled thereby has been withdrawn from range of the needles; Fig. 3 is a view partly in elevation and partly in section and illustrating certain elements of the mechanism whereby the yarn reinforcing devices are operated, part of the knitting machine being shown by dotted lines; Fig. 4 is an end view illustrating certain of said operating devices; Fig. 5 is a side view illustrating part of the pattern drum and certain of the devices acted upon thereby; Figs. 6, 7 and 8 are top or plan views illustrating, in different positions, the members of the reinforcing yarn controlling device; Fig. 9 is a front view of the main yarn guide and of the reinforcing yarn controlling device operating in conjunction therewith; Figs. 10, 11, 12 and 13 are side views of the reinforcing yarn controlling device illustrating the parts of the same in different positions; Fig. 14 is a top or plan view illustrating the ap-

plication of my invention to a yarn changing device, and Fig. 15 is an end view of the same, partly in section.

In the drawings, 1 represents the needle cylinder of the machine, *x* the needles carried thereby, 2 the needle dial and *y* the needles operating in conjunction therewith, these needles having bent shanks which are pivotally mounted in a ring 3 above the dial and are operated, both for knitting and for transferring their stitches to the cylinder needles, by cams in an upper ring which may be similar to those of the patent before referred to and which I have not, therefore, considered it necessary to illustrate or describe. Neither have I shown nor described the cams for actuating the cylinder needles *z* as these may also be similar to those of the patented machine.

Web holders 4 operate in conjunction with the cylinder needles and the knitted web is acted upon by take-up hooks 5 which are pivotally mounted in any suitable manner upon a tubular stem 6 depending from the needle dial and are acted upon by a ring 7 vertically movable upon said stem so that, by reason of such movement, the hooks may be thrown into and out of operative position, as illustrated in Figs. 1 and 2 of the drawings.

The needle dial 2 and the dial needles *y* are vertically movable, in respect to the needle cylinder and its needles, such movement being effected by any suitable means under control of a pattern chain or drum, so that it may be automatically effected at the required times in the operation of the machine. As an instance of means available for this purpose, I may refer to those shown and described in the patent before mentioned. The tubular stem 6 and the take-up hooks carried thereby are also vertically movable with the needle dial.

Above the cylinder is the yarn guiding ring 9 which, in the present instance is fixedly mounted on the frame of the machine, the cylinder and dial with their needles, being the rotating elements. My invention is, however, equally applicable to a machine in which the cylinder and dial, with their needles, are non-rotating and the cam-carrying devices rotate, in which case the yarn guiding ring will be mounted upon a rotating member of the machine.

The main knitting yarn is fed to the needles through an eye *v* in the guide ring, as shown in Fig. 9 and the supplementary or reinforcing yarn *w* is, in the present instance, under control of a disk 10 to which a rocking motion is imparted so as to carry said reinforcing yarn into or out of range of the cylinder needles of the machine, although any desired substitute for this disk may be employed, so long as it has the necessary movement imparted to it to carry the thread into or out of range of the needles. The disk 10 is mounted upon a shaft 11 which passes through a tubular shaft 12 mounted in a bearing 13 on the guide ring, the outer end of said shaft 11 having secured to it a pinion 14 which meshes with a rack 15 upon a vertically guided slide 16, the lower end of the latter being connected by a rod 17 to one arm of a lever 19 hung upon the fixed frame of the machine, the other arm of said lever carrying an anti-friction roller 20 which engages a cam 21 on the main driving shaft 22 of the machine, as shown in Fig. 3, the anti-friction roller being held in contact with the cam either by the weight of the parts connected to the lever 19 or by a suitable spring acting thereupon, as shown, for instance at 19^a in Fig. 5, or both. On each rotation of the shaft 22, therefore, the disk 10 will be caused to rock so as to carry its yarn delivering eye *w'* into feeding position, as shown in Fig. 1, or out of feeding position, as shown in Fig. 2, the time during which the yarn feeding eye remains in either of these positions being dependent upon the conformation of the cam 21 which, in the present case, is designed to permit the yarn guiding eye *w'* to remain in feeding position for one-half of a revolution of the machine and out of feeding position for the other half of the revolution, so that it will feed the yarn to the needles around one-half of the cylinder and will then withdraw the yarn from knitting engagement with the needles and permit it to float behind the latter during the alternate half rotation, thus reinforcing the knitted tube throughout one-half its extent, as for instance in the production of the web immediately above the heel so as to produce what is termed a "high-spliced" heel.

When it is desired to stop the feeding of the reinforcing yarn to the needles, the lever 19 is actuated so as to carry its anti-friction roller 20 to a position where it will be free from contact with the high portion of the cam 21, the same action serving to move the yarn delivery eye *w'* of the disk 10 to the inoperative position shown in Fig. 2. This movement of the lever 19 is effected by means of another lever 23 hung to a lug on the fixed frame of the machine and acted upon by one or more cams 24 on the

pattern drum 25, with which the machine is provided, a portion of said pattern drum being illustrated in Fig. 5. The lever 23 carries an adjustable contact screw 26 which, when said lever 23 is lifted by one of the cams 24, will raise the lever 19 and prevent any further operation of the same by the cam 21.

In connection with the device for feeding the reinforcing yarn to the needles I employ a device for nipping and holding the end of the yarn when the reinforcing yarn guide is out of action during the formation of a non-reinforced portion of the knitted web. This device consists of a pair of nipping jaws 30 and 31, the jaw 30 being pivotally mounted upon the upper end of an arm 32 carried by the inner end of the tubular shaft 12 and being normally supported upon a plate 33 on the yarn-guiding ring 9, as shown by dotted lines in Fig. 10. The nipping jaw 31 is pivotally mounted at 34 on the jaw 30 so as to be free to swing from and toward the same, and said jaw 31 has a projecting beveled lug 35 which, by contact with an arm 36 on the yarn-guiding ring, causes the jaw 31 to open or move away from the jaw 30, when the latter is retracted or drawn back toward the yarn feeding disk 10, the jaw 31 being normally held closed against the jaw 30 by means of a spring 37 acting upon an arm 39 on said jaw 31. The arm 36 is acted upon by a spring 40 which permits it to yield when it contacts with the lug 35 on the forward movement of the nipping jaws, the contact of said arm 36 with a pin 41, or other suitable stop, holding it rigid when the lug 35 contacts with it on the backward movement of the nipping jaws. When the jaws are moved backward, therefore, as shown in Fig. 13, they will first be opened by contact of the lug 35 with the arm 36, so as to permit the reinforcing yarn to pass between them and will then be closed so as to nip and hold said yarn, which is therefore broken at a point between the nipping jaws and the needles, by reason of the strain upon it. When it is desired to again reintroduce the reinforcing yarn, the nipping jaws are moved forward to the position shown in Fig. 10, and the reinforcing yarn guide is then operated so as to carry its guide eye *w'* into feeding position, as shown in Fig. 11, the reinforcing yarn being thereby thrown into position to be engaged by the cylinder needles *x*, and being withdrawn from between the nipping jaws by reason of the pull of the needles upon it. When the time arrives to stop the further feed of the reinforcing yarn, the disk 10 is first moved so as to carry the guide eye *w'* to inoperative position, as shown in Fig. 12, and the nipping jaws are then retracted so as to engage the reinforcing yarn, as shown in Fig. 13.

In order that the force of the hold of the nipping jaws upon the yarn may be increased as said jaws approach the limit of their rearward movement, so as to insure the breaking of the yarn, a supplementary spring 60 acts upon the arm 39 at such time, as shown in Fig. 8.

The forward and backward movements of the nipping jaws are effected by means of a cam 42 on the pattern drum 25, said cam acting upon a lever 43 which is connected by a rod 44 to an arm 45 on the outer end of the tubular shaft 12, as shown in Fig. 3, the lever 42 being held in engagement with the pattern drum either by means of its own weight and that of its connected parts or by means of a spring 43^a, as shown in Fig. 5, or both.

When the machine is producing ribbed web, the dial and its needles are lowered, as shown in Fig. 2, so as to occupy the proper relation to the cylinder and its needles for the production of such ribbed web, the supplementary yarn feeding devices being then in the inoperative or retracted position shown in Fig. 2, and the take-up hooks 5 being expanded so as to engage with the ribbed web. Before introducing the reinforcing yarn, however, the dial and its now retracted needles are elevated, as shown in Fig. 1, so that said dial needles will not interfere with the projection of the nipping jaws 30 and 31 into operative relation with the cylinder needles, as shown in Fig. 1, and at the same time the take-up hooks 5 are retracted by the action of the ring 7 so that they will not interfere with the proper floating of the reinforcing yarn from the point where its feed to the needles was discontinued to the point where said feed is again resumed.

My invention is not limited to means for effecting application of a reinforcing thread to a portion of the knitted tube but is also available for use in connection with means for feeding yarn of one color or character to the needles of the machine during part of a rotation and for feeding yarn of another color or character to said needles during another part of the rotation, as, for instance, in producing a stocking having a foot with yarn of one color in the instep portion and yarn of another color in the sole portion. Mechanism in accordance with my invention for making such a change in the yarns is shown in Figs. 14 and 15, and involves a duplication of the devices before described, one set of devices being numbered correspondingly with those shown in the other figures of the drawing and the other set being distinguished from the first by the addition of the letter *a* to the reference numerals. The yarn feeding disks 10 and 10^a are, in this case, set face to face, as shown in Fig. 14, and the feeder 10^a is provided with a

segmental rack 50 which meshes with a spur pinion 51 on a tubular shaft 52 adapted to a bearing 13^a alongside of the bearing 13, this tubular shaft having within it a shaft 53 which carries a spur wheel 54 meshing with a segmental rack 55 on the hub of the nipper-carrying arm 32^a. The tubular shaft 52 is operated by mechanism similar to that employed for operating the shaft 11 but so timed that the yarn guide 10^a will be moved to operative position at the same time that the yarn guide 10 is moved to inoperative position and vice-versa, the shaft 53 being combined with mechanism similar to that employed for operating the shaft 12 but so timed as to cause movements of the nipping jaws 30^a and 31^a in respect to the movements of the yarn guide 10^a in the same manner as the movements of the nipping jaws 30 and 31 are timed in respect to the movements of the yarn guide 10. The shaft 11^a which carries the disk 10^a is tubular in order to permit of the passage through said shaft of the yarn which is controlled by said disk 10^a.

Although I have shown my invention as applied to a machine in which are employed laterally swinging ribbing needles cooperating with a dial, it can be used in connection with any form of knitting machine intended for the production of plain and ribbed web alternately, and in which the ribbing needles, when in position to cooperate with the plain web needles would interfere with the proper use of the yarn reinforcing or yarn changing devices. The invention can also be applied to a machine for producing a knitted hem or welt upon a knitted web, such as that described in the Letters Patent of Robert W. Scott, No. 864,433, dated August 27, 1907, in which machine the needles corresponding to the ribbing needles only receive and temporarily retain certain of the loops of the primary or setting-up course of the welt and it will be evident that in a machine of this type simple loop-receiving points or hooks would be the equivalent of the ribbing needles of a rib knitting machine.

In the broad embodiment of my invention a construction in which the vertical movement was imparted to the cylinder needles, the yarn feeding devices and their appurtenances, would be the equivalent of the reverse construction which I have shown and described.

I claim:

1. The combination, in a knitting machine, of two sets of needles, those of one set being movable both longitudinally and transversely of the others so as to occupy either an operative or an inoperative relation thereto, devices for feeding yarn to one set of needles, and means for moving said devices into operative relation with its set of needles when the other set of needles has been moved longitudinally out of operative

relation therewith and for moving said feeding devices out of operative relation with its set of needles when the other set of needles has been moved longitudinally into operative relation with said set of needles.

2. The combination, in a rib knitting machine, of a cylinder and its needles, ribbing needles, a support therefor movable longitudinally in respect to the cylinder to carry the ribbing needles into and out of operative relation with the cylinder needles, a yarn feeding device, and means for moving the same into operative relation with the cylinder needles when the ribbing needles are out of operation with the cylinder needles when the ribbing needles are in operative relation therewith.

3. The combination, in a rib knitting machine, of a cylinder and its needles, ribbing needles, a support therefor movable longitudinally in respect to the cylinder to carry the ribbing needles into and out of operative relation with the cylinder needles, a yarn feeding device, means for moving the same into operative relation with the cylinder needles when the ribbing needles are out of operative relation therewith and out of operation with the cylinder needles when the ribbing needles are in operative relation therewith, and take-up hooks also movable into and out of operative relation with the cylinder needles along with the ribbing needles.

4. The combination, in a yarn feeding device for knitting machines, of a yarn guiding eye, a pair of yarn-nipping jaws, means for opening and closing the latter, means for moving the jaws into operative and inoperative position in respect to the needles, means for opposing a light resistance to the opening of the jaws, and means for increasing the pressure upon the jaws when they are closed.

5. The combination, in a yarn feeding device for knitting machines, of a yarn guiding eye, a pair of yarn-nipping jaws, means for projecting them into operative relation with the needles, means for first opening and then closing said jaws as they are being retracted to the inoperative position, means for opposing a light resistance to the opening of the jaws, and means for increasing the pressure upon them when they are closed.

6. The combination, in a yarn feeding device for knitting machines, of a yarn guide, a pair of yarn-nipping jaws, means for moving the same to operative and inoperative position in respect to the needles, a carrier arm upon which one of said jaws is pivotally mounted, and means for pivotally mounting the other jaw upon the first so as to permit it to move from and toward the same.

7. The combination, in a yarn feeding de-

vice for knitting machines, of a yarn guide, a pair of yarn-nipping jaws, means for moving the same to operative and inoperative position in respect to the needles, and a trigger acting to open the jaws as they are retracted.

8. The combination, in a yarn feeding device for knitting machines, of a yarn guide, a pair of yarn-nipping jaws, means for moving the same to operative and inoperative position in respect to the needles, and a trigger acting upon the jaws as they are retracted, said trigger being free to swing in one direction under control of the spring but being prevented by a rigid stop from swinging in the opposite direction.

9. The combination, in a yarn feeding device for knitting machines, of a yarn guide, a pair of yarn-nipping jaws, and means for moving the same to operative and inoperative position in respect to the needles, one of said jaws being mounted so as to swing from and toward the other and being provided with a projecting lug, and a trigger for engaging said lug as the jaws are retracted, thereby effecting the opening movement of the jaws.

10. The combination, in a yarn feeding device for knitting machines, of a yarn guide, a pair of yarn-nipping jaws, and means for moving the same to operative and inoperative position in respect to the needles, one of said jaws being mounted so as to swing from and toward the other and being provided with a projecting lug, and a trigger for engaging said lug as the jaws are retracted thereby effecting the opening movement of the jaws, said trigger being free to yield when struck by the lug on the forward movement of the nipping jaws.

11. The combination, in a knitting machine, of a yarn guiding device movable to operative and inoperative position in respect to the needles, a yarn-nipping device also movable to operative and inoperative position in respect to said needles, and shafts carrying said yarn feeding and nipping devices, one of said shafts being tubular and the other disposed within it.

12. The combination, in a knitting machine, of a yarn feeding device, a cam carried by the main shaft of the machine, means actuated by said cam and serving to adjust said yarn feeding device to operative position in respect to the needles during a portion of the rotation of the machine and to inoperative position in respect to said needles during the remainder of such rotation, and pattern-controlled means for moving said operating devices out of the range of the cam.

13. The combination, in a knitting machine, of a yarn feeding device, a cam on the main shaft of the machine, means whereby said cam is caused to move said yarn-feed-

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ing device into operative position in respect to the needles during part of the rotation of the machine and out of such operative position during the remainder of such rotation, 5 a yarn-nipping device also movable into and out of operative position in respect to the needles, pattern-controlled means for rendering inoperative the means for actuating the yarn feeding device, and pattern-controlled means for moving the yarn nipping 10 device into and out of operative position.

14. The combination, in a knitting machine, of two yarn feeding devices, each movable into operative and inoperative relation to the needles, means for actuating 15 the said yarn feeding devices so as to cause

them to feed yarn alternately to the needles, a yarn-nipping device operating in conjunction with each yarn-feeding device, shafts carrying each of said yarn feeding and 20 yarn-nipping devices, and a counter-shaft and gearing whereby one yarn-feeding device and one yarn-nipping device are operated.

In testimony whereof, I have signed my 25 name to this specification, in the presence of two subscribing witnesses.

HARRY SWINGLEHURST.

Witnesses:

A. W. WALKDEN,
HAMILTON D. TURNER.