

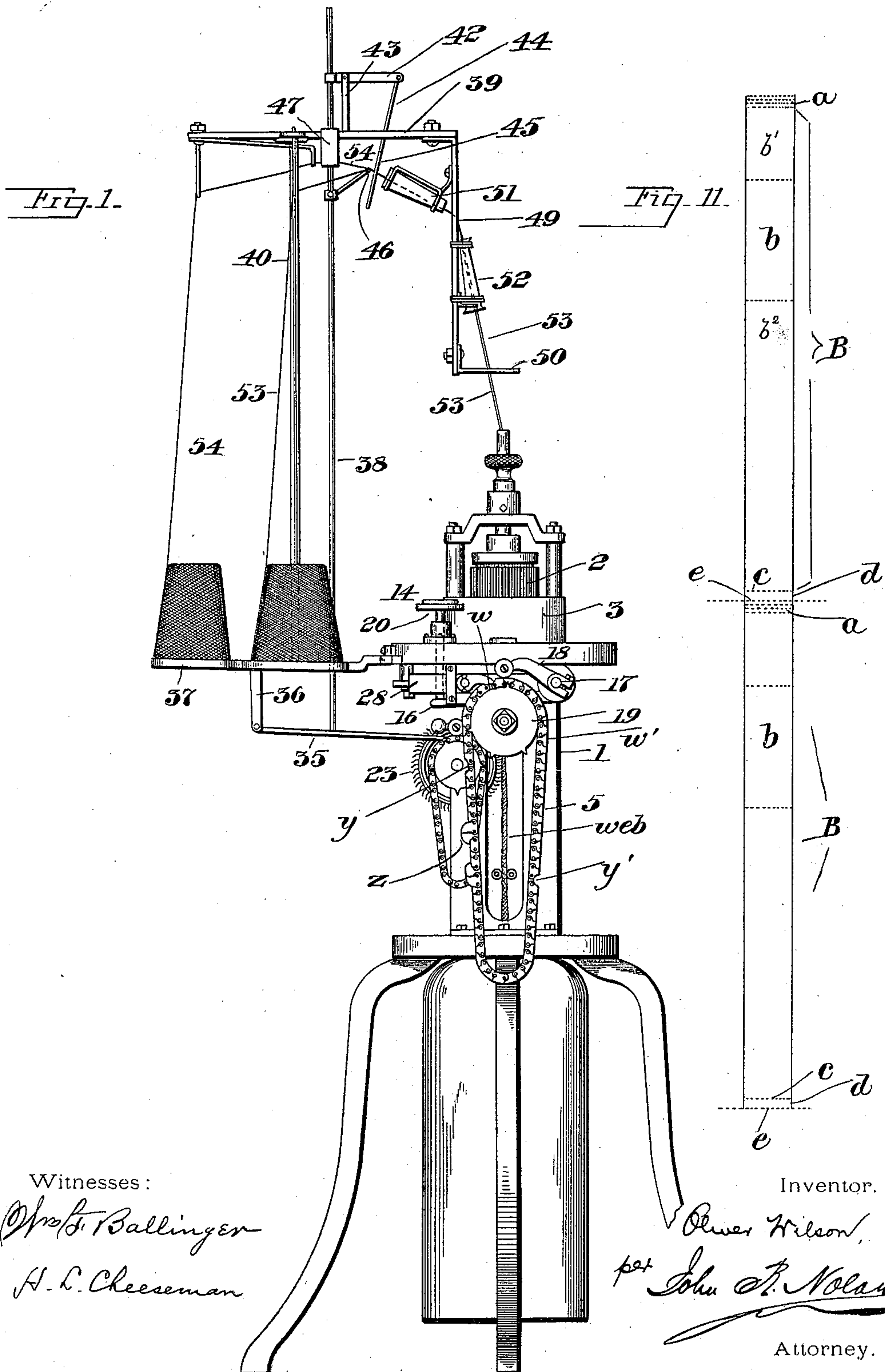
(No Model.)

3 Sheets—Sheet 1.

O. WILSON.  
KNITTING MACHINE.

No. 528,838.

Patented Nov. 6, 1894.



Witnesses:

*Wm. B. Ballinger*  
*H. L. Cheeseman*

Inventor.

*Oliver Wilson,*  
*per John P. Nolan*  
Attorney.

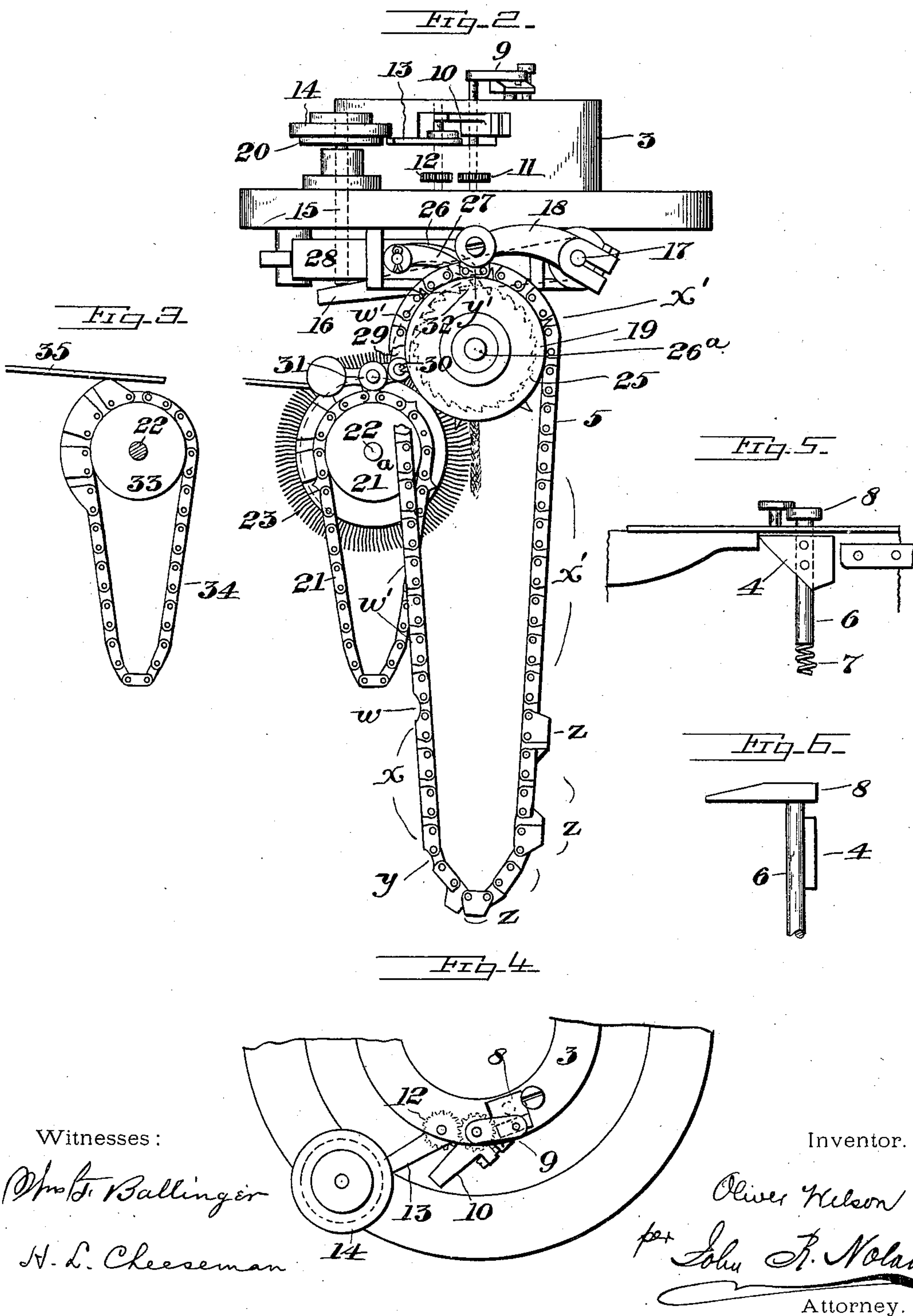
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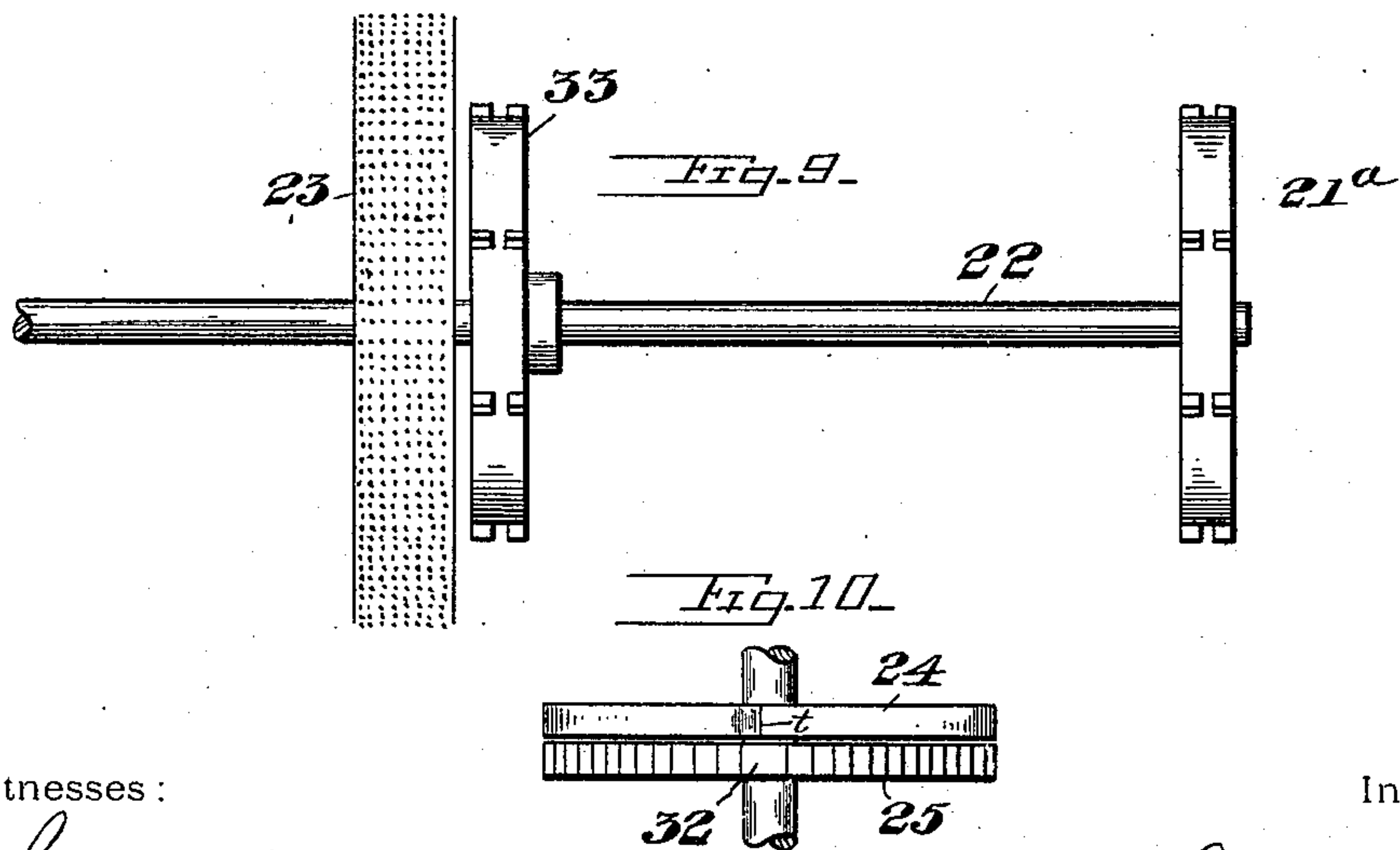
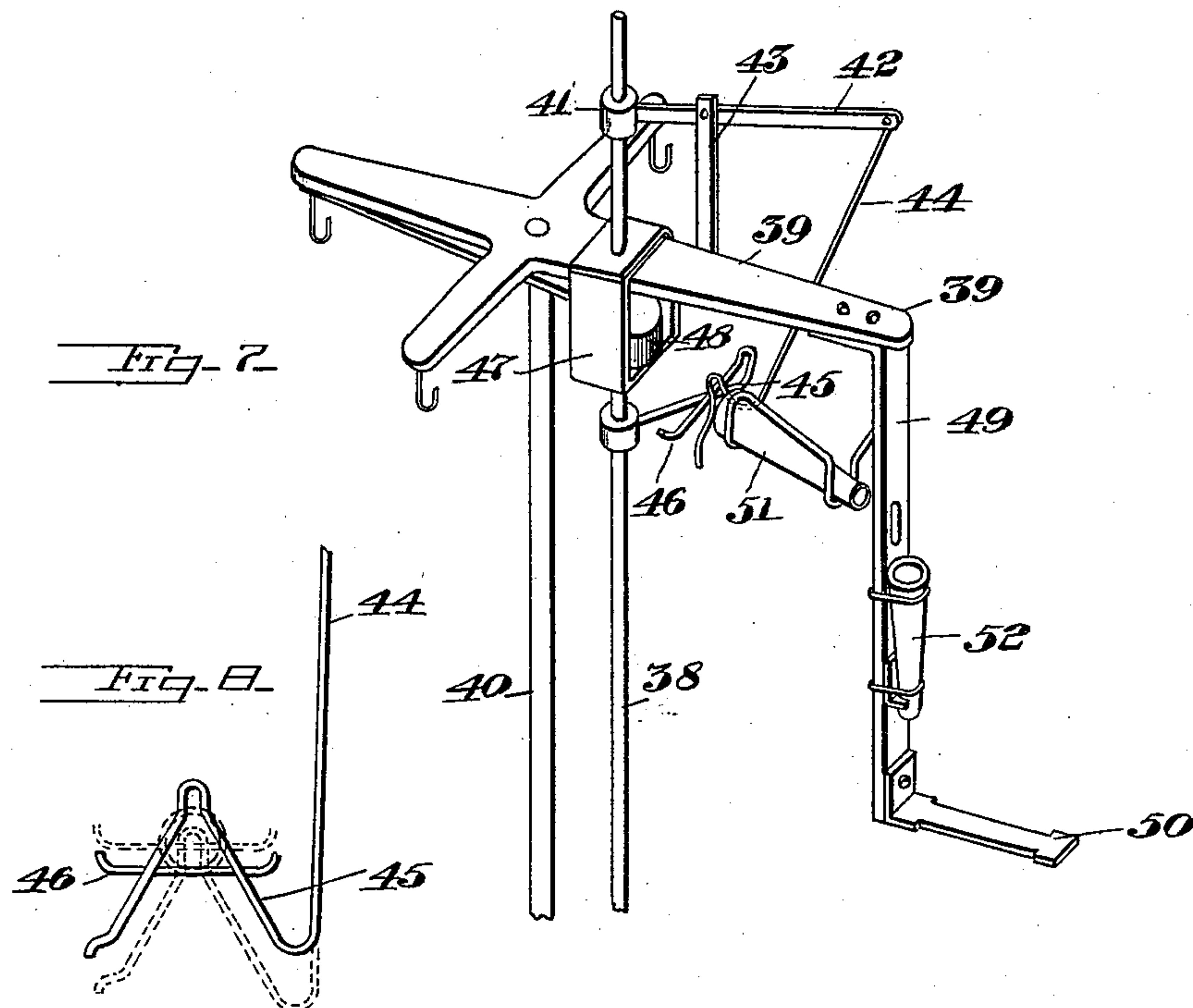
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Attorney.



# UNITED STATES PATENT OFFICE.

OLIVER WILSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-THIRD TO ARCHIBALD F. KENT, OF JAMESTOWN, NEW YORK.

## KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 528,838, dated November 6, 1894.

Application filed May 24, 1893. Serial No. 475,338. (No model.)

*To all whom it may concern:*

Be it known that I, OLIVER WILSON, a citizen of the United States, residing in the city and county of Philadelphia and State of Pennsylvania, 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 drawings, forming a part of this specification.

This invention is especially, though not exclusively, applicable to that class of circular knitting machines termed "ribbers," by which is produced a series of connected rib leg portions for hose; my object in this connection being to produce a leg portion in which the knee part is reinforced or supplemented by an additional thread without impairing, but rather increasing, the elasticity of the web. This object I attain by the combination with thread-reinforcing mechanism, of devices whereby the reinforced stitches comprising the knee part of the web are knit successively in slack courses. The thread-reinforcing mechanism herein set out is of novel construction, and applicable to any machine in which an additional or supplemental thread is periodically thrown into and out of action as will hereinafter appear.

In the annexed drawings, Figure I is a side elevation of a knitting machine embodying my invention, the parts being shown in the position which they occupy during the knitting of the plain rib portion of the web. Fig. II is a partial elevation of the head of the machine enlarged, showing the pattern chain mechanism, the parts being in the position which they occupy during the knitting of the knee portion of the web. Fig. III is a separate view of the pattern chain for operating the reinforcing thread devices. Fig. IV is a partial plan of the head of the machine showing the mechanism for operating the stitch-cam. Fig. V is a detail of the stitch cam and adjuncts, in elevation. Fig. VI is a view of the rod upon which the stitch cam is supported. Fig. VII is a perspective view of the thread-guide devices. Fig. VIII is a detail of the thread uniting devices, the full and dotted lines indicating said devices in their open and closed positions, respectively. Fig. IX is

an elevation of the sprocket and burr wheel shaft, detached. Fig. X is a view of the ratchet wheels detached. Fig. XI is a diagram of the knitted web as it is delivered from the machine.

The numeral 1 represents the supporting frame of a "rib-knitting machine" of a construction well known to knitting artisans; 2 being the needle cylinder with its needles, and 3 the rotatable cam cylinder provided with the stitch-cam 4 therein for actuating the vertical needles in the needle cylinder. The position of this cam determines the throw of the needles and hence the length of the stitches and the kind of courses produced. It is controlled by a suitable pattern chain 5 with which it is connected by appropriate mechanism, which in the several varieties of machine differs in matters of detail. The design in all these machines is to effect the knitting of a tubular web, such for example, as that indicated in the diagram Fig. XI, that is to say, to form a welt *a*, a body of plain rib work *B*, a loose course of stitches *c*, several courses of plain rib *d* and a second loose course of stitches *e*, following which is a repetition of these parts just mentioned. The connected series are severed on the loose course *e* nearest the welt, the object of the adjacent loose course *c* being to facilitate the transferring of the leg portion onto the needles of a plain circular machine to accomplish the knitting of the ankle and foot portions.

In the machine shown in drawings the stitch cam 4 is secured to a short rod 6 which is held normally in a raised position by a suitably disposed spring 7. When the rod is in this position the cam actuates the vertical needles to effect the formation of normal stitches; but when the rod is depressed against the action of the spring, the cam imparts a greater throw to the needles and thus effects the formation of longer or slack stitches. On the upper end of this rod is a bevel-faced head 8, upon which is adapted to act at predetermined intervals one arm of a crank lever 9, whereby said rod, and therewith the stitch-cam, may be depressed. The longer arm 10 of this lever projects through an opening in the side of the cam cylinder. On its pivot pin is secured a pinion 11, which engages with



an adjacent pinion 12, to the shaft of which is affixed an arm 13 which extends beyond the side of the cylinder somewhat below the arm 10. Thus by alternately striking the arms 10 and 13, the lever 9 will be moved to and fro to effect the depression or elevation of the rod 6 with its stitch cam. The arms are actuated at the proper periods by means of a circular head 14 on a vertically reciprocative rod 15 fitted to the base of the machine. The lower end of this rod is supported upon an arm 16 which is secured to a stud 17 to which is secured a forwardly extending arm 18 that rests upon and is governed by the links of the pattern chain 5. This chain comprises a series of relatively disposed links of varying height which are supported upon a sprocket wheel 19 to which an intermittent rotary motion is imparted by suitable pawl and ratchet mechanism hereinafter described. When the machine is knitting plain ribbed work, the chain 5 is at rest, the arm 18 being supported upon a medium link so as to maintain the head 14 in the path of the upper arm 10 and thus allow the stitch cam to remain in its normal or elevated position.

Preparatory to the knitting of a slack course (the parts being in the position represented in Fig. 1), the chain is operated, thereby bringing a low link *w* below the arm 18, and causing the latter to descend sufficiently far to allow the head 14 to drop into the path of the lower arm 13. Hence as the cam cylinder revolves the latter arm abuts against the head and effects the action of the lever 9 upon the inclined face of the head 8 to depress the stitch cam. A slack course of stitches is thus produced. This done, the chain is moved the distance of another link, whereupon the arm 18 rides upon a medium link and is returned to its original position, the head 14 thereupon entering the path of the upper arm 10 and effecting the release of the stitch cam for normal knitting. A series of these medium links is brought successively below the arm 18 to effect the knitting of several plain rib courses, whereupon a low link *y* is moved below said arm and the knitting of another slack course accomplished. Following this low link is a series of high and medium faced links *z* which control the action of the mechanism to effect the formation of the welt. As such mechanism has no bearing upon the present invention, no description thereof is deemed necessary. The welt being formed, a series of medium links *x'* is brought into play, so as to occasion the knitting of a plain rib portion, thereupon a low link *y'* is brought below the arm 18 and the motion of the chain arrested until a predetermined number of slack courses has been produced. This done, the chain is again actuated to bring a series *w'* of medium links below the arm 18 to continue the knitting of a plain rib portion. Following this series is the low link *w* which effects the knitting of

the loose course previously described. The above operations are repeated as often as desired to form the connected series of leg blanks.

Heretofore, the intermediate portion *b* of the web has been formed by ordinary stitches similarly to the adjacent portions *b'* *b''* said portion *b* comprising the knee part of the stocking leg. An additional thread has sometimes been thrown in at this knee portion for the purpose of thickening or reinforcing the same, but such thickening has impaired the elasticity of the web. I find, however, that by knitting the knee portion *b* in slack courses— with the addition of this thickening thread— this portion of the web is not only reinforced but rendered more elastic than formerly. Although any suitable mechanism for applying the reinforcing thread may be employed, I prefer the construction shown in the drawings and hereinafter described.

To secure good results the degree of slackness of the stitches in the knee portion should be somewhat less than that usually made in the slack courses *c*, *e*. Otherwise the elastic or yielding quality of the fabric will be too great. To attain this end in the machine herein considered, I provide the under face of the head 14 with a smaller ring 20 which is brought at the proper time into the path of the arm 13 so as to effect the requisite depression of the stitch cam, the low link *y'* being of course slightly higher than those *w* *y* that are brought into action preparatory to the knitting of the single slack courses *c*, *e*. By removing this ring 20 and substituting therefor one of less or greater diameter, the degree of slackness and elasticity of the stitches may be varied, as desired.

The sprocket wheel upon which the chain 5 is supported, is actuated by means of a pawl and ratchet mechanism under the control of a chain 21 on an adjacent sprocket wheel 21<sup>a</sup>, the shaft 22 of which is operated by the out-drawn knitted web engaging a burr wheel 23 on said shaft, in the usual manner. This pawl and ratchet mechanism in the present machine is of the following construction: 24, 25 are two ratchet wheels secured upon the transverse shaft 26<sup>a</sup> to which the sprocket wheel 19 is secured, and 26, 27 are two pawls adapted to coact with said ratchet wheels respectively. These pawls are pivoted to a bar 28 which is positively reciprocated by appropriate devices not necessary to herein show or describe. The pawl 26 rests upon the longer arm of a bell-crank lever 29, which is fulcrumed at a point 30 on the main frame of the machine, the shorter arm of said lever being equipped with a roller 31 that rests upon the links of the chain 21. The wheel 24 has a single tooth *t* in its periphery while the adjacent ratchet wheel 25 has a continuous peripheral series of teeth interrupted by a blank space 32, this blank space being arranged in line horizontally with the single tooth in the



wheel 24. By properly moving this crank lever 29, the pawl 26 may be raised above and out of action with the tooth of the ratchet wheel. This being done, when the pawl 27 which rotates the ratchet wheel 25 reaches the blank space in the latter, said wheel, and therefore the shaft, will not be operated. This shaft will remain quiescent until the pawl 26 is dropped into engagement with the tooth in the wheel 24, whereupon the latter will be advanced sufficiently far to bring the teeth of the adjacent wheel 25 into engagement with its pawl.

The chain 20 is provided with a series of relatively disposed plane and studded links, which act upon the lever 29 at the proper intervals to control the operation of the pawl and ratchet mechanism in accordance with the order prescribed by the several links in the chain 5 hereinbefore described.

I shall now describe the novel mechanism for automatically introducing the additional thread during the knitting of the series of slack courses in the knee portion of the web, reference being had to Figs. I, III, VII and VIII of the drawings.

Upon the driven shaft 22 is secured a sprocket wheel 33 which carries a chain 34 having a series of relatively arranged high and low links, said wheel and chain thus being driven simultaneously with the wheel 21<sup>a</sup> and its chain. Resting upon the chain 34 is the free end of an arm 35 the outer end of which is pivoted to a hanger 36 depending, in this instance, from the usual projecting arm 37 upon which the bobbins are supported. Thus said pivoted arm will be raised or lowered in accordance with the chain links in action therewith.

Bearing upon the arm 35 is the lower end of a vertically movable rod 38 which extends through and above the usual support 39 that carries the depending guide eyes or hooks for the passage of the knitting threads, this support being affixed to a vertical rod or post 40 rising from the arm 37. On the projecting upper end of the movable rod 38 is secured a collar 41 with which is pivotally connected one end of a horizontal lever 42 that is fulcrumed on a vertical post 43. Depending from the free end of this lever is an arm 44 on the lower end of which is a V-shaped portion 45, the whole being preferably constructed from a single piece of wire bent into proper shape. In the rear of the portion 45 extends a transverse arm 46 which is secured to the rod 38 at a point below the support 39. This arm is also preferably formed of properly bent wire, as shown.

Attached to the support 39 is a depending rectangular frame 47 through which the vertical rod extends, the latter being provided with a weight or collar 48 which is contained within the frame. From the forward end of the support 39 depends a vertical arm 49 which terminates in an angular extension 50.

On the rear of the arm 49, just in advance of the V-shaped portion is secured an inclined thread guide tube 51 and on the front of said arm is secured a similar tube 52. The main knitting threads 53 are carried over the arm 46, through the V-shaped end 45, and through the tubes 51, 52 being separated by the extension 50 before their final introduction to the needles. The reinforcing thread 54 is run through the frame 47 below the weight 48, then over the arm 46, thence through the V-shaped end 45 to and within the tube 51.

The above is a description of the preferred form of my thread feeding mechanism. Its operation is as follows: During the knitting of the plain portion of the web, the low links of the chain 34 are successively brought below the arm 35, the latter, and perforce the rod 38, thus being maintained in a down position. When the parts are in this position, the weight on said rod bears upon the reinforcing thread and clamps it against the opposed face of the frame 47. Hence the said thread is not delivered to the needles. Preparatory to the commencement of the knee portion, the high links of the chain are brought below the pivoted arm, thereby raising the latter and the rod 38, and of course, releasing the reinforcing thread. At the same time, the upward movement of the rod raises the arm 46, and through the action of the lever 42 depresses the V-shaped head 45 thereby drawing the several threads into the apex of the latter. This done, the main knitting threads by their frictional contact with the reinforcing thread, carry the latter to the needles. When the requisite amount of reinforced work has been finished, the low links are brought below the pivoted arm, whereupon the parts assuming their original or down position, the weight 48 drops upon and checks the reinforcing thread. The instant the progress of this thread is checked it is broken off by the strain of the needles, and the machine proceeds with the knitting of plain rib work. The loose end of the reinforcing thread during the operation of the machine, frays off for a portion of its length but not sufficiently far to affect the action of the arm 46 and head 45 the next time said thread is brought into play.

The object of separating the main threads on their passage to the needles, is to prevent them from twisting during the rotation of the yarn carrier. Should such twisting occur, these threads would catch the clamped reinforcing thread, and result in the breaking of all the threads.

Having thus described my invention, I claim—

1. In a knitting machine, the combination with the needle support, the cam carrier and its stitch cam, of provisions whereby the latter is actuated at predetermined intervals to effect the knitting of normal courses, single slack courses, and medium slack courses,



thread-reinforcing devices, and pattern mechanism for operating the same simultaneously with the knitting of the medium slack courses, substantially as described.

2. In a knitting machine, the combination with the needle support, the cam carrier and its cam, of a V-shaped head through which the main knitting threads and an additional or reinforcing thread extend, a thread support in rear of said head, means for sustaining said head and support, and means for operating the same so as to draw the threads into the apex or reduced portion of the V-shaped head; substantially as described.

3. In a knitting machine, the combination with the needle support, the cam carrier and its cam, of a V-shaped head through which the main knitting threads and an additional or reinforcing thread extend, a thread support in rear of said head, means for sustaining said head and support and means for operating the same so as to draw the threads into the apex or reduced portion of the V-shaped head, together with means for checking the advance of the reinforcing thread at predetermined intervals; substantially as described.

4. In a knitting machine the combination with the needle support, the cam carrier and its cam, of a reciprocative rod, a V-shaped head and thread supporting arm connected therewith, and means for reciprocating said rod at predetermined intervals whereby said head and arm are moved in respect to each other; substantially as described.

5. In a knitting machine the combination with the needle support, the cam carrier and its cam, of a reciprocative rod, a V-shaped head and thread supporting arm connected therewith, and means for reciprocating said rod at predetermined intervals whereby said head and arm are moved in respect to each other, together with the frame through which said rod extends, and the collar or weight on the rod within said frame; substantially as described.

6. In a knitting machine, the combination with the needle support, the cam carrier and its cam, of a V-shaped head through which the main knitting threads and an additional or reinforcing thread extend, a thread sup-

port in rear of said head, means for sustaining said head and support, and means for operating the same so as to draw the threads into the apex or reduced portion of the V-shaped head, together with means for separating the main threads at a point in advance of the said head; substantially as described.

7. In a knitting machine, the combination with the needle support, the cam carrier and its stitch cam, of devices mounted on said carrier and adapted to be actuated to increase the throw of the stitch cam, a head for actuating said devices to effect the knitting of single slack courses, and a ring or abutment adjacent to said head, for actuating said devices to knit a series of medium slack courses, together with pattern mechanism for operating said head and ring or abutment at predetermined intervals; substantially as described.

8. In a knitting machine, the combination with the needle support, the cam carrier and its stitch cam, of devices mounted on said carrier and adapted to be actuated to increase the throw of the stitch cam, a head for actuating said devices to effect the knitting of single slack courses, and a ring or abutment adjacent to said head, for actuating said devices to knit a series of medium slack courses, together with pattern mechanism for operating said head and ring or abutment at predetermined intervals, thread reinforcing devices and pattern mechanism for operating the same simultaneously with the medium slack course controlling devices; substantially as described.

9. In a knitting machine, the combination with the needle support, the cam carrier and its cam, of a reciprocative V-shaped device through which the main knitting threads and an additional or reinforcing thread extend, means for sustaining said device, and means for operating the same to press the threads closely together, substantially as described.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

OLIVER WILSON.

Witnesses:

JOHN R. NOLAN,

WM. F. BALLINGER.