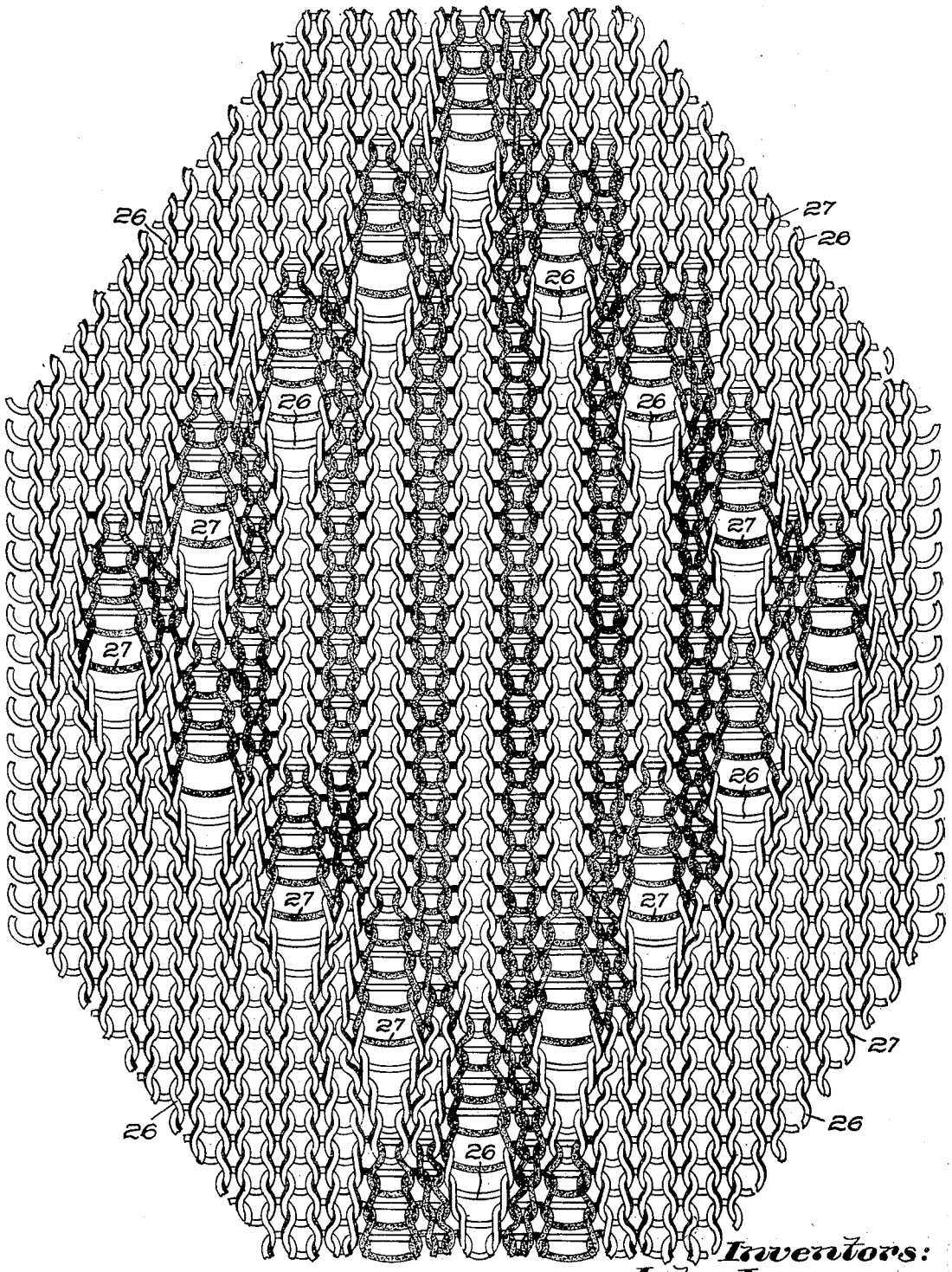
Feb. 10, 1931. J. LAWSON ET AL 1,792,231

CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

Filed Aug. 11, 1928 10 Sheets-Sheet 1

Fig. 1.



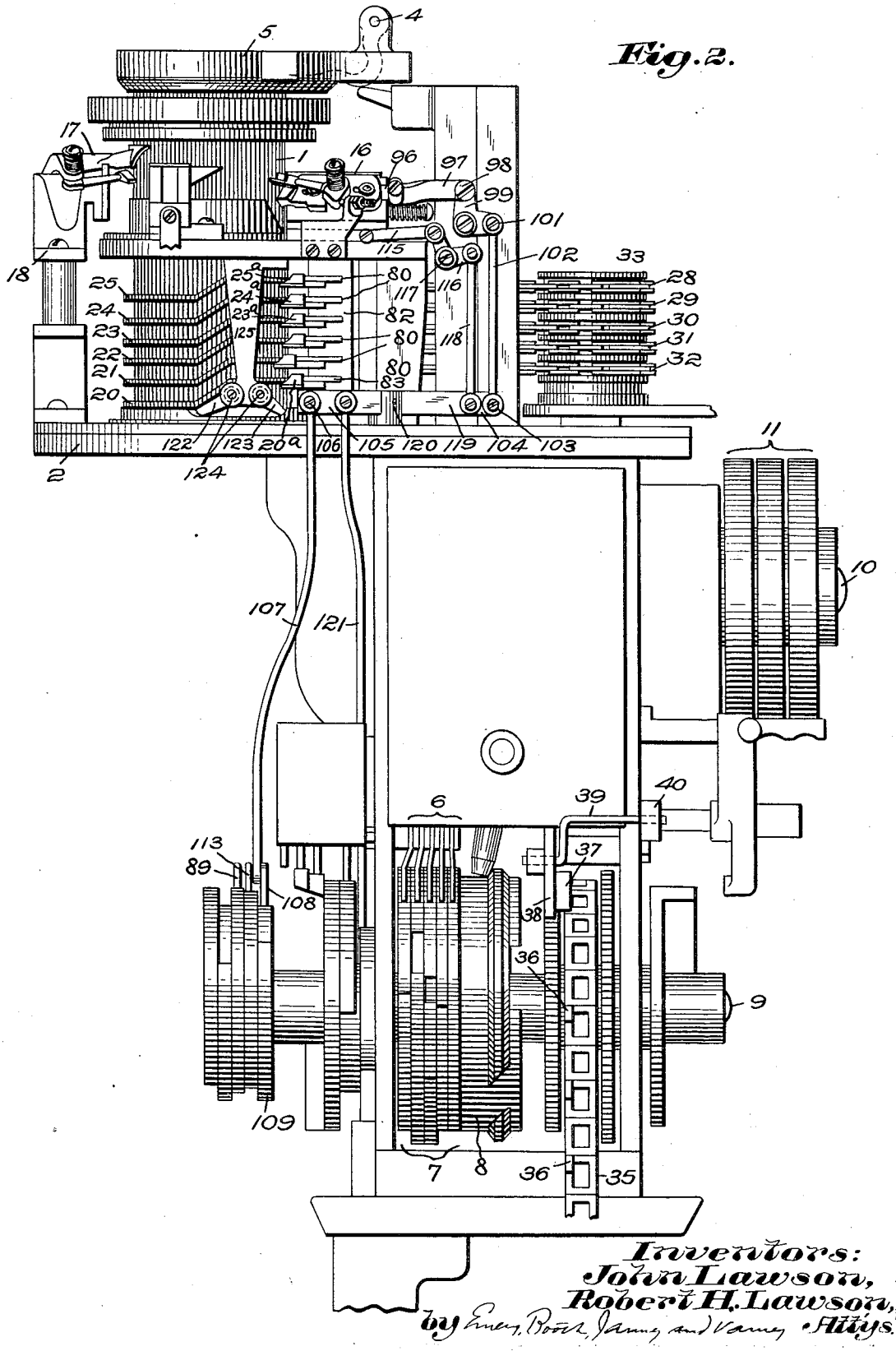
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Feb. 10, 1931. J. LAWSON ET AL 1,792,231

CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

Filed Aug. 11, 1928 10 Sheets-Sheet 2

Fig. 2.



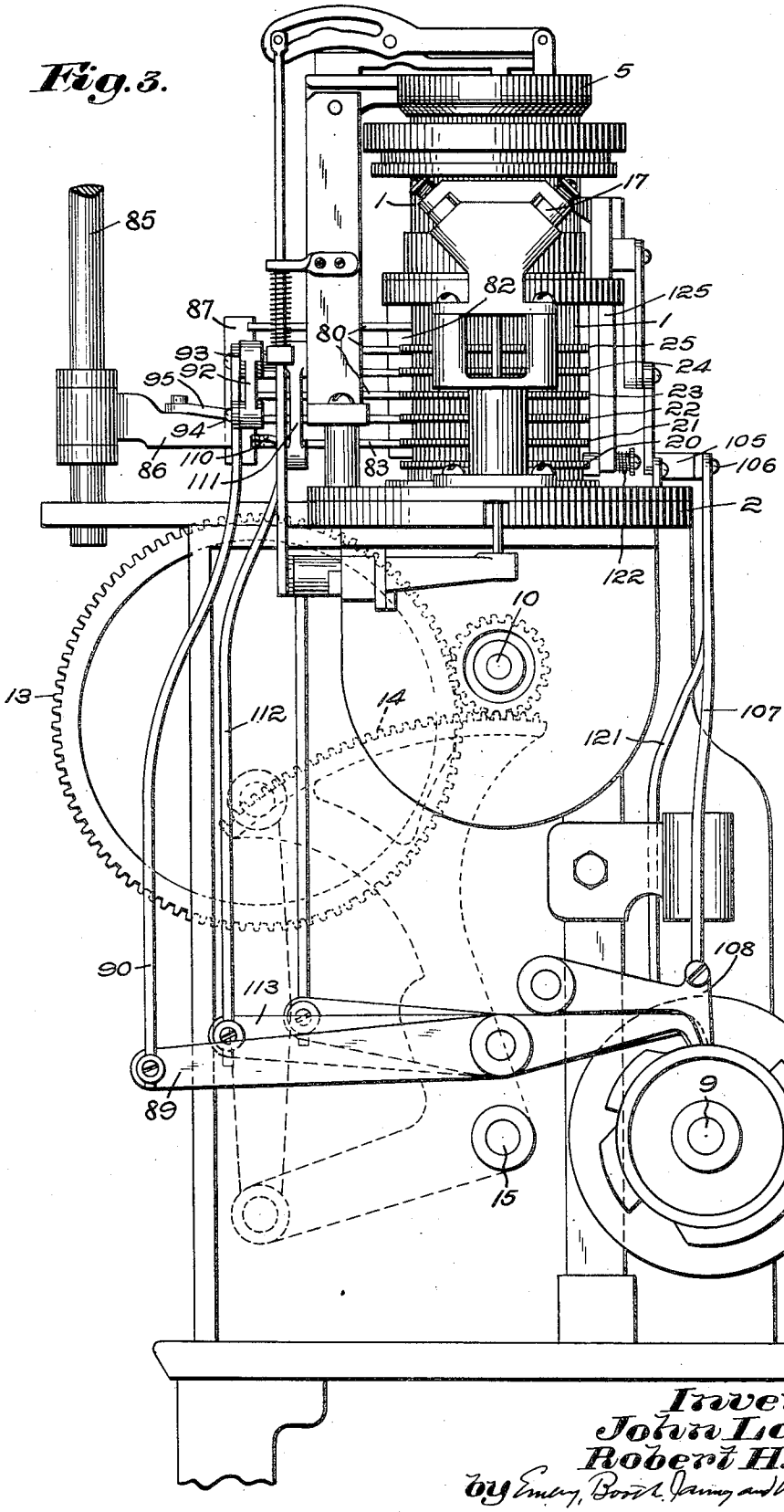
Inventors:
John Lawson,
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Feb. 10, 1931. J. LAWSON ET AL 1,792,231

CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

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Fig. 3.



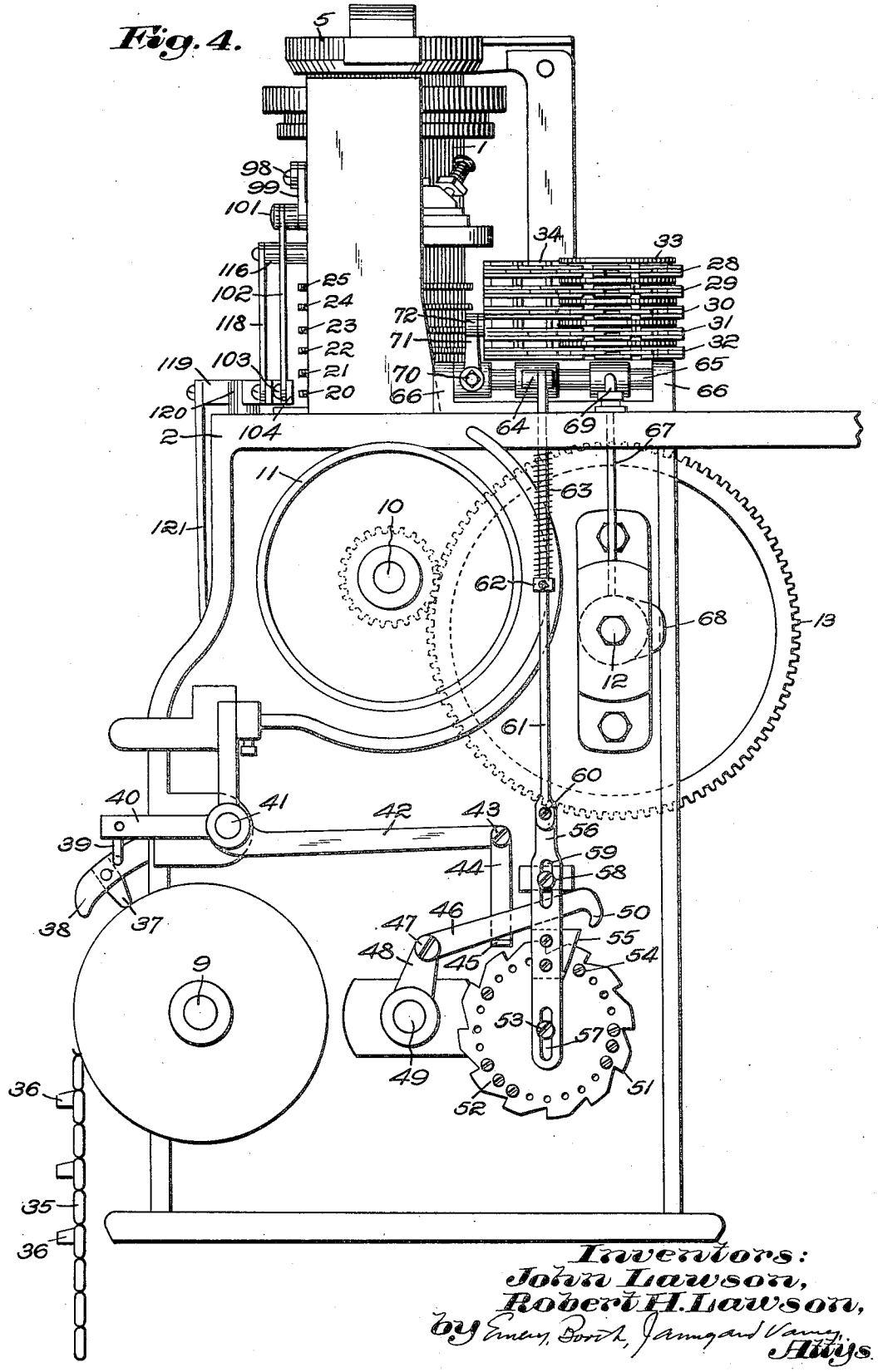
Inventors:
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Feb. 10, 1931. J. LAWSON ET AL 1,792,231

CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

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Fig. 4.



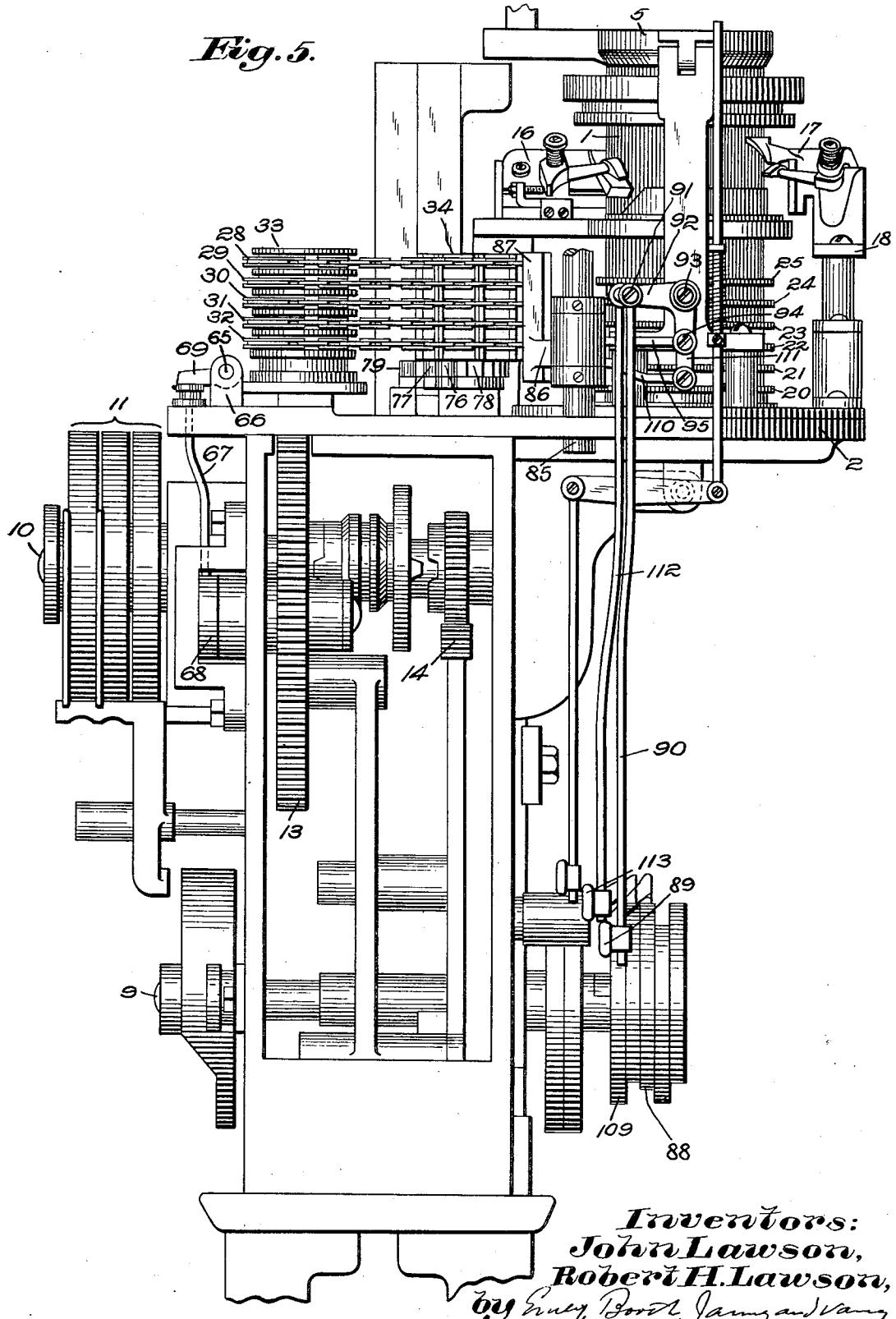
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Feb. 10, 1931. J. LAWSON ET AL 1,792,231

CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

Filed Aug. 11, 1928 10 Sheets-Sheet 5

Fig. 5.



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CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

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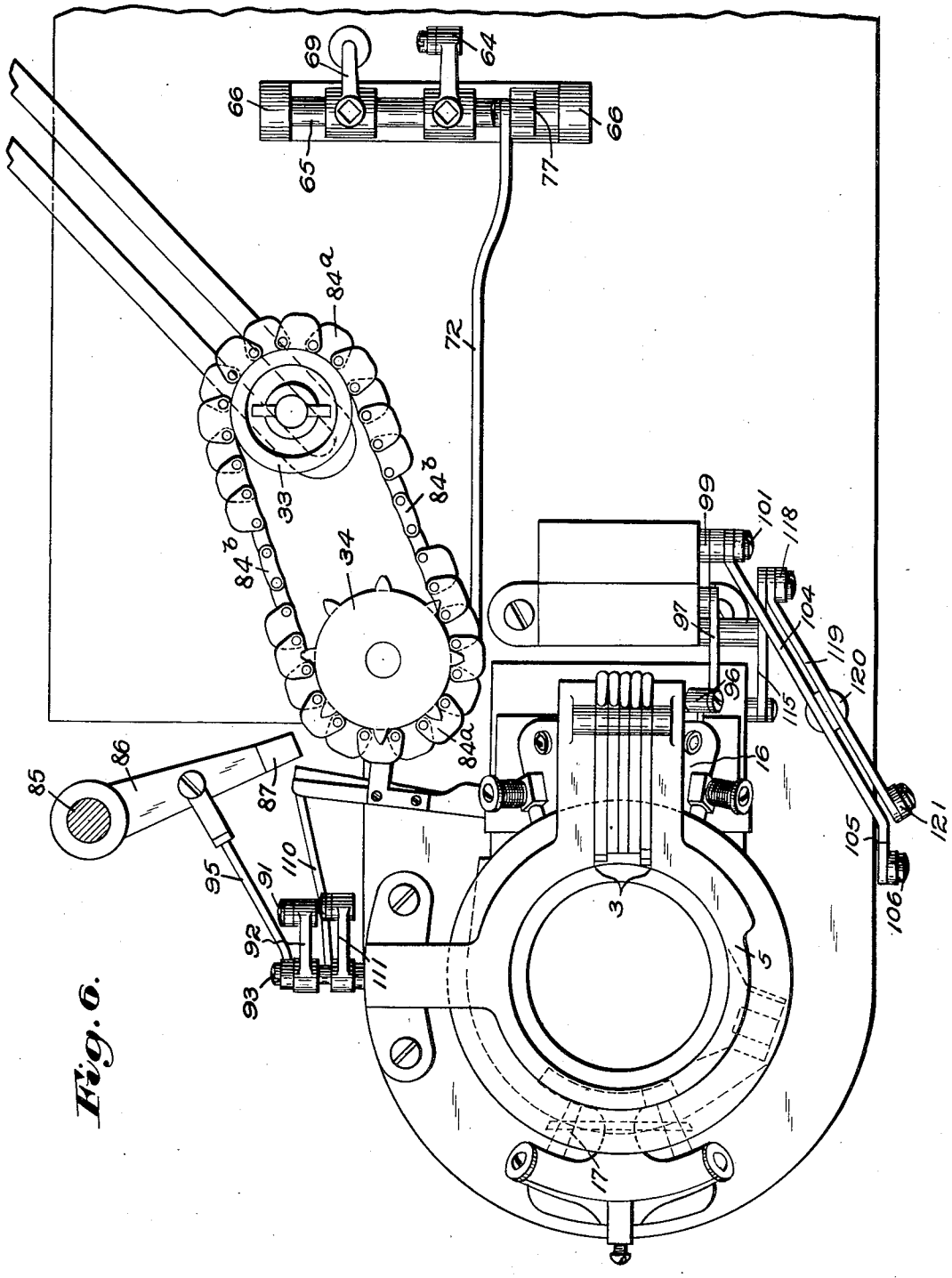


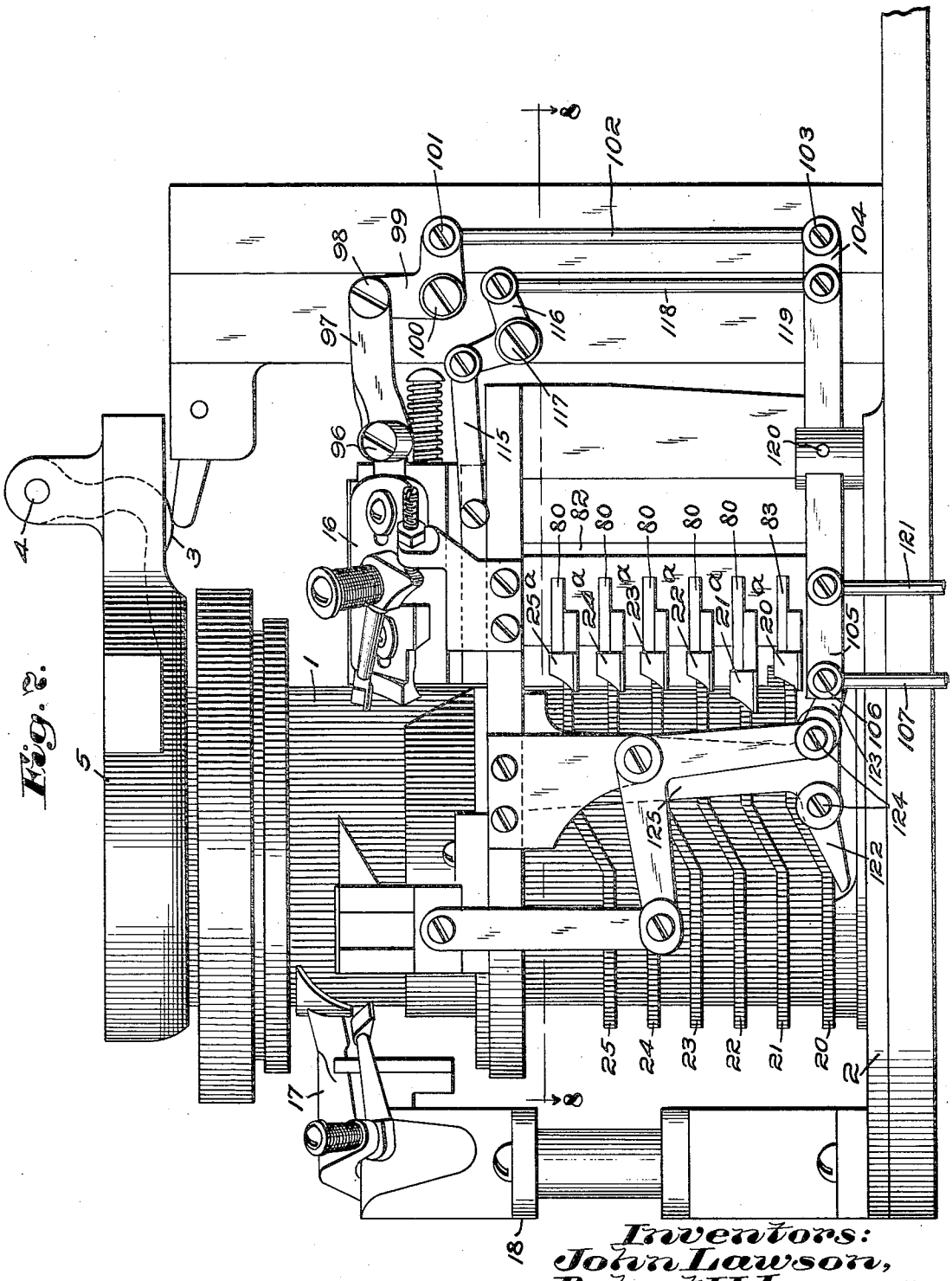
Fig. 6.

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Feb. 10, 1931. J. LAWSON ET AL 1,792,231

CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

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CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

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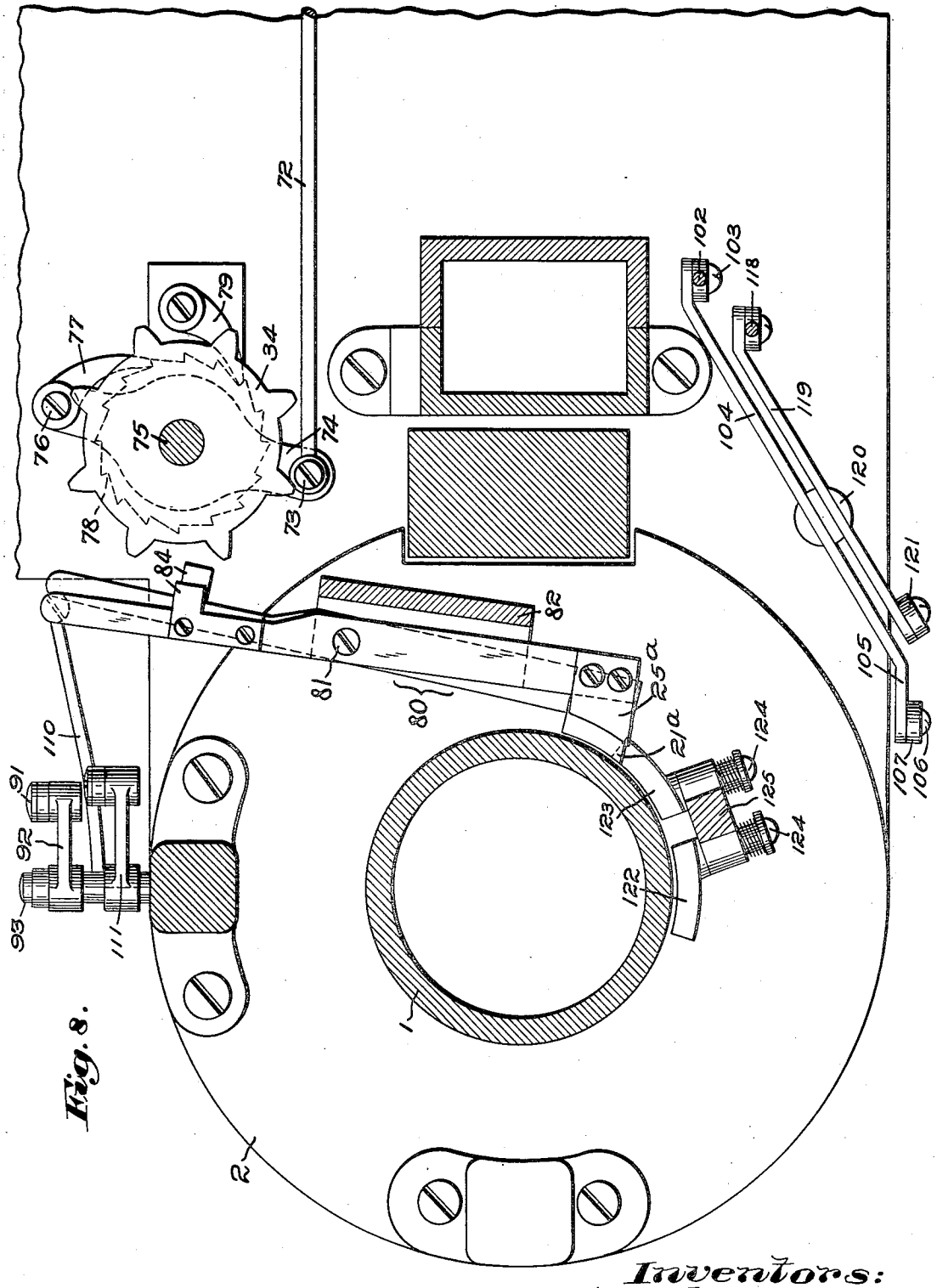


Fig. 8.

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CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

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Fig. 9.

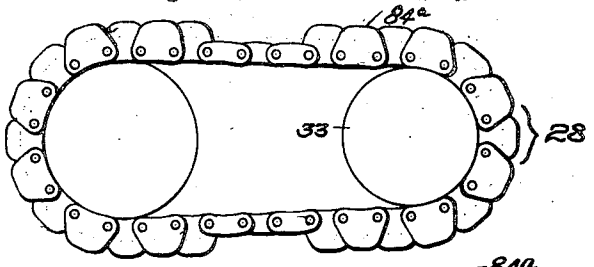


Fig. 10.

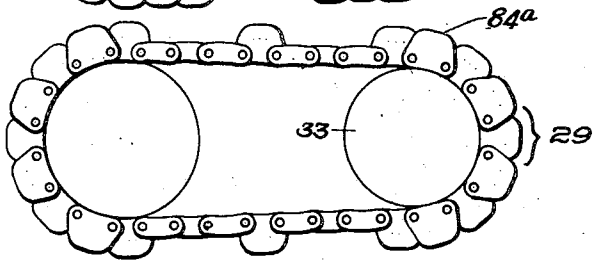


Fig. 11.

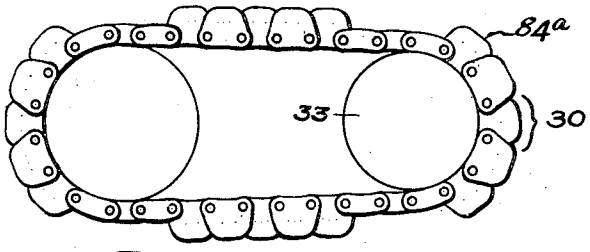


Fig. 12.

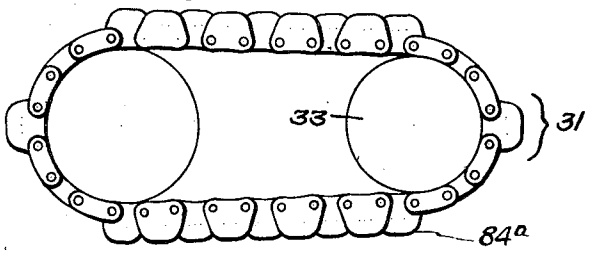


Fig. 13.

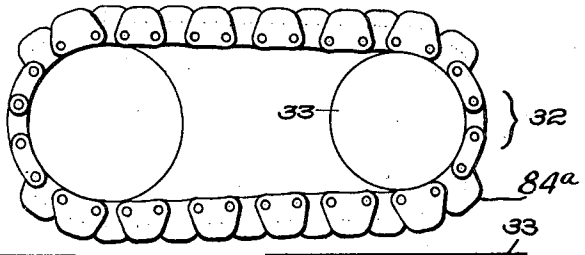
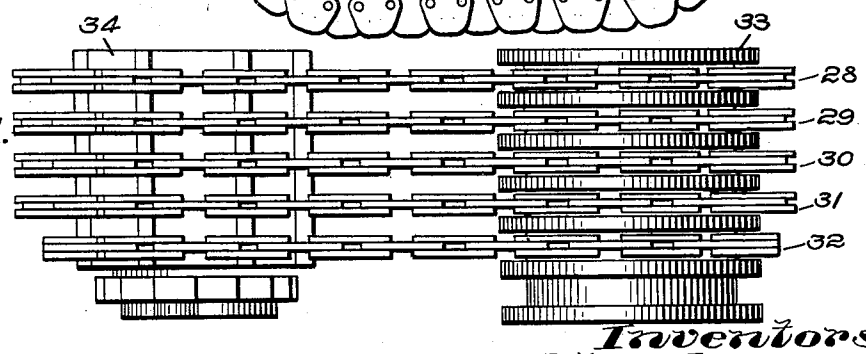


Fig. 14.



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CIRCULAR KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

Filed Aug. 11, 1928 10 Sheets-Sheet 10

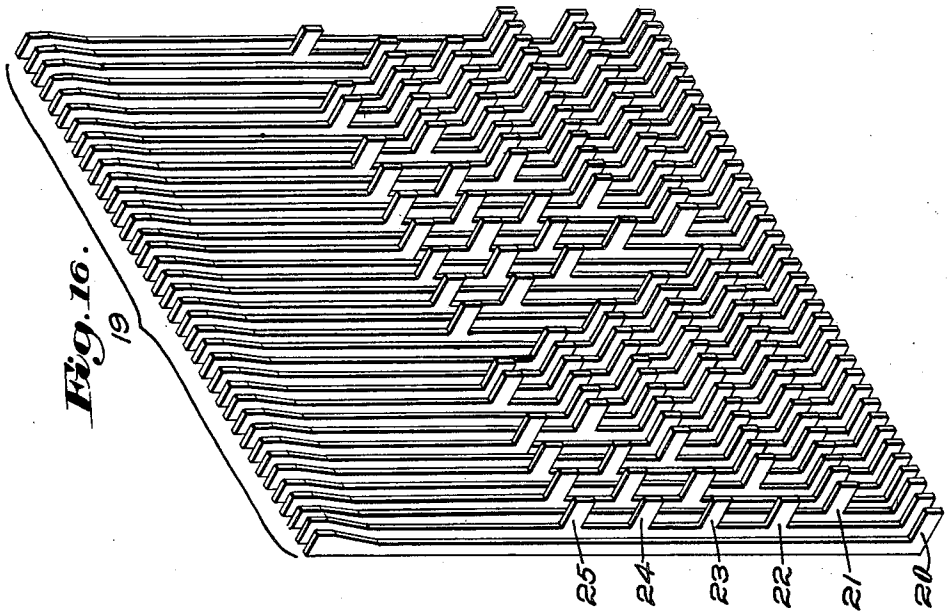


Fig. 16.

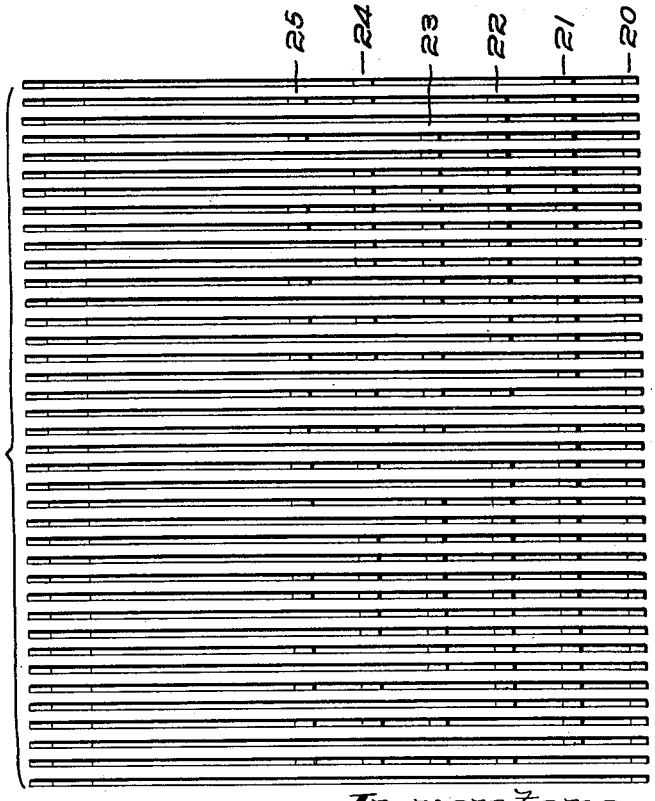


Fig. 15.

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Patented Feb. 10, 1931

1,792,231

UNITED STATES PATENT OFFICE

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CIRCULAR-KNITTING MACHINE FOR PRODUCING PATTERNS IN PLATED WORK

Application filed August 11, 1928. Serial No. 298,940.

This invention relates to circular knitting machines for producing patterns in plated and like work, and more particularly to means for producing patterns of various shapes and sizes by a two color effect in a knitting machine wherein two threads are fed in a plating relation.

This application is an improvement upon the construction shown in the co-pending application of Frank E. Jones, Serial No. 92,746.

In order that the principle of the invention may be readily understood, we have disclosed in the accompanying drawings improved means for producing patterns by color effect in plated work.

In said drawings,—

Fig. 1 is a plan view upon a greatly enlarged scale of a small portion of plated fabric showing a pattern effect in color therein;

Fig. 2 is a front elevation of a circular knitting machine having our invention applied thereto;

Fig. 3 is a left hand end elevation of the mechanism shown in Fig. 2;

Fig. 4 is a right hand end elevation thereof;

Fig. 5 is a rear elevation thereof;

Fig. 6 is a plan view thereof;

Fig. 7 is an enlarged front elevation of the knitting head and showing a part only of the mechanism of our invention;

Fig. 8 is a horizontal section on the line 8—8 of Fig. 7, and looking downward in said figure;

Figs. 9 to 13 inclusive are plan views of the five pattern chains used in the present disclosure or embodiment of the invention;

Fig. 14 is a side elevation of all said pattern chains in assembled relation;

Fig. 15 is a front elevation showing a group of jacks for controlling the needles to produce the pattern effect by two color work in a plated fabric; and

Fig. 16 is a perspective view of the series of jacks shown in Fig. 15.

Our invention relating, as it does, to circular knitting machines may be applied to or embodied in various types of such machines, but we have chosen to represent the same as applied to a machine of the well-known Banner type disclosed in the patent to Joshua D. Hemphill, No. 933,443, dated September 7, 1909. In this type of machine the needle cylinder rotates while the cams remain stationary and, although the machine disclosed is for the purpose of producing hosiery, it is obviously not limited to this class of work. We will, however, describe our invention as applied to a machine of such type without limiting it thereto excepting when expressly so stated in the claims.

Generally speaking, the machine includes a rotating needle cylinder 1, mounted upon a suitable table 2, constituting a part of the frame of the knitting machine and, as is customary in this type of machine, said cylinder is arranged to be rotated to form the leg and foot and to be reciprocated to form the heel and toe of the stocking,

The means for effecting the rotary and reciprocating movements are substantially the same as those shown and described in the said Hemphill patent and, being well known, require no further description.

A plurality of yarn feeding elements is provided at the usual position characteristic of the Banner machine, and a series of said elements is indicated at 3 in Fig. 6 and one of them is indicated at 3 in Fig. 7. Desirably as many as four or five yarn guides may be mounted side by side at the same place each to introduce a yarn or thread as called for by the controlling cams, as, for example, for the leg, the heel and toe, and the foot, etc. All of said yarn guides are pivoted at 4 upon a latch ring 5 itself suitably pivoted, so that it may be swung up out of action to afford access to the needles or for any other purpose. Since the particular type of machine here shown is the latch needle type, we have represented the member 5 as a latch ring, but if the machine be equipped with spring beard needles, as it may be within certain aspects of our invention, then the member 5 is in the form of a partial ring as well understood in this art.

Each of the yarn guides is normally pressed into action in the general manner disclosed

in said Hemphill patent as by a series of levers suitably mounted upon the standard rising from the bed plate 2, and need not be more particularly described. The levers and connecting wires are provided in the general manner disclosed in said patent, and said levers are generally indicated at 6 in Fig. 2. They ride respectively upon suitable cams indicated at 7 in Fig. 2 upon a drum 8 on a cam shaft 9 in a manner not herein necessary to describe in detail, being desirably similar to the construction shown in said Hemphill patent. Assuming that there are four or five levers in the said group, it is evident that, according to the dictates of the cams 7 upon the disk or drum 8, the said yarn guides are permitted to act in suitable order, as, for example, to supply yarn or thread for the leg of the stocking, another for the heel, another for the foot, etc.

Each of the said yarn guides supplies its own yarn or thread in proximity to the knitting point, and each yarn so taken is knitted upon all the needles in action unless there be a stitch variation to make a pattern effect. Such stitch variation, in the disclosed embodiment of our invention, is produced by causing the desired needles to take only one of the threads so that the other thread is floated for short distances in making the pattern.

The machine is provided with the usual driving shaft 10 having the customary pulleys 11, and in the rear thereof is a shaft 12 driven from the shaft 10 and having fast thereon the large gear 13 known as the "104" gear. Controlled from the shaft 12 is the usual quadrant 14 pivoted at 15 and operated in a manner not herein necessary to describe in effecting the reciprocation of the needle cylinder for forming the heel and toe. These parts being desirably of customary construction here need no further description.

The machine is provided with the usual narrowing pickers mounted as customary upon a block indicated at 16 in Fig. 2 and with the customary widening pickers, one of which is indicated at 17 in Figs. 2, 7 and elsewhere, being mounted upon a suitable bracket 18, preferably of usual construction.

Having thus referred to the main parts of the usual mechanism of the plain or rotary Banner machine, it is pointed out that our invention, shown for convenience as applied to such type of machine, is concerned particularly with the formation of pattern effects in the fabric. While said pattern effects may be of the general character indicated in the said application of Frank E. Jones, we have herein, for purposes of illustration, chosen to represent or describe the pattern effect as produced as a color effect secured by introducing at least two yarns which, at times, are so controlled as to produce plated work, at other times but one of said yarns being taken by a needle or needles, so as to produce a different color effect.

Merely for convenience of description we shall refer to the pattern as the diamond pattern, but it is to be understood that within the principle of the invention the pattern is obviously varied within wide limits, as to both shape and size, and also as to position upon the stocking or other fabric. The needles, which it is unnecessary to show in detail, and which are desirably like those shown in the said Jones application, are in the disclosed embodiment of the invention of the latch needle type, but they may be of the spring beard type, in which case suitable pressers and other cooperating parts are employed.

Each of the needles is mounted as is customary within its groove in the needle cylinder, and said cylinder, as clearly indicated in the figures of the drawing, is of increased height so that the grooves may be prolonged below the needles and receive in each of them a controlling jack 19, a group whereof is represented in Figs. 15 and 16.

The said jacks are distinct from the needles and are mounted so as to be reciprocated with suitable friction within their grooves by the cams to be hereinafter described, and they are positioned directly below the needle butts, so that when elevated or depressed the needles are correspondingly elevated or depressed

The jacks are each provided with at least a single butt or with a plurality of butts in vertical alignment according to the pattern effect to be produced, and the various jacks so differentiated among themselves are distributed in the proper needle grooves, so as to secure the proper pattern by elevating their respective needles at the proper time. In the selected embodiment of the invention the butt formation of the jack is the same as in said co-pending application. Briefly stated, all of the jacks 19 have the lower butts 20. Certain of said jacks have thereabove a second butt 21; certain only of the remaining butts have thereabove a butt 22; certain of the remaining butts have thereabove a butt 23; certain of the still remaining butts have thereabove a butt 24; and certain of the still remaining butts have thereabove a butt 25. Such butts as are present upon any one jack are vertically spaced, as clearly indicated in Figs. 15 and 16.

The said butts 20 to 25 inclusive are adapted to be acted upon by a series of cams 20*a*, 21*a*, 22*a*, 23*a*, 24*a*, 25*a*, as shown in Fig. 7 and elsewhere, and adapted to act substantially as shown in said co-pending application. Said cams are mounted one above another as herein more fully described, and are capable of movement into and out of engagement with the respective butts controlled thereby, such movement being preferably a radial one with re-

spect to the axis of the needle cylinder. The function of the cam 20*a* is to effect the raising of all the needles, and in this embodiment of the invention all the jacks are provided with butts 20. The remaining cams (namely, 21*a* to 25*a*) are selecting cams to act upon the jack butts similar in number, so as to elevate the needles pertaining thereto for the reception of the plating yarn. We have not attempted to show a development of the knitting cams or the said selecting cams in such a development, but it is to be understood that the cams may be in this respect substantially as shown in said co-pending application.

When a pattern effect is to be produced by a color effect, as by plating, we introduce through the two yarn guides or fingers, two yarns of contrasting color or nature in a plating relation, as, for example, a white yarn and a red yarn, and the tension condition thereof is desirably such as to produce a plated effect when both yarns are taken by the needles.

The needles which are not elevated, because of lack of a butt formation upon the jack at the determining point or level, will therefore take only the red yarn in the present instance, being so low when they pass the white yarn that they miss the same. The needles whose jacks have butts calling for elevation in effecting the pattern would in such instance take the red yarn and immediately thereafter take the white yarn, and thus effect a plating operation as the stitch is completed.

Unless a needle is elevated by its jack, it moves along its lower level so as only to engage the red yarn and after taking the same is depressed in the usual manner. If, however, the needle is elevated through the action of a selecting cam on its jack, then it passes along at sufficiently higher level to take the red yarn as well as the white yarn, and plating results. It will be understood, of course, that the shape or outline of the pattern effects may be varied as desired. In Fig. 1 we have represented upon an enlarged scale two threads (namely, a white thread 26 and a red thread 27). At desired points the white thread 26 is floated so that the red thread 27 appears in lengthwise stripes. Other patterns may be provided as desired. When both threads 26 and 27 are knitted, they appear in a plated relation.

In said application Serial No. 92,746, there is disclosed a small upright drum or barrel mounted upon the bed plate. In order to give greater pattern effect we have substituted for said drum or barrel a series of chains, which are indicated at 28, 29, 30, 31 and 32, in Figs. 9 to 13, and elsewhere. Said chains, as indicated in side elevation in Fig. 14, are mounted upon a drum 33 suitably supported upon the framing 2 of the machine in such a manner that the said chains may be rendered taut, and also upon another drum 34 which is suitably mounted upon the framing 2 of the machine nearer the needle cylinder.

The pattern chains are adapted to be driven in a step-by-step manner, and we provide means, under the control of the main pattern means of the machine, whereby the movement of said pattern chains 28 to 32 is interrupted whenever desired. For this purpose, and without limiting ourselves thereto, we have provided the following mechanism.

The main pattern chain of the machine, mounted in the usual manner, is shown at 35 in Fig. 4, and has an upward direction of travel viewing said figure. Upon said chain are provided certain links or lugs 36 which, in the movement of said main pattern chain, are adapted to ride under a projection 37 upon a lever 38, indicated also in Fig. 2, and to which is connected a bent wire 39 itself connected to a lever 40 pivoted at 41 upon the framing and having a long horizontally extending arm 42.

Jointed at 43 to said lever arm 42 is a depending strap-like member 44 having a flange or right-angled part 45 at its lower end adapted to take under, and at times to lift, a lever 46 pivoted at 47 upon a constantly rocking lever arm 48 itself mounted on the quadrant shaft 49. When said lever 46 remains in its lowermost position, its hooked end 50 engages teeth 51 upon a ratchet wheel 52 pivoted at 53 upon the framing and turns the same in a step-by-step manner.

The said ratchet wheel is provided with a series of spaced pins 54 arranged in a circular series and adapted to be brought successively into engagement with the inclined edge 55 of a lateral enlargement upon an upright rod or member 56 which is mounted and positioned for vertical movement, it being guided by the pivotal screw or pin 53 received in the lengthwise slot 57 and also by the screw or pin 58 in the lengthwise slot 59 in said rod 56. The impingement of a pin 54 upon the inclined edge 55 results in a slight lifting movement of said rod 56 at times determined by the link 36 upon the main pattern chain 35.

To the upper end of said rod 56 is secured at 60 another rod 61, which extends vertically and is provided with a collar 62 surrounded by a coiled spring 63 tending to depress said rod. The upper end of said rod 61 is pivotally connected to a lateral extension or arm 64 on a rock shaft 65 horizontally supported in suitable bearings 66 in a bracket on the bedplate 2.

Through the said connections the shaft 65 is adapted to be turned at intervals depending upon the links or lugs 36 upon the main pattern chain 35. If said shaft 65 is not so turned by the rod 61 and its connections, said rock shaft 65 is, under the control of a vertical rod 67, guided in the framing and adapted to be moved vertically by a cam 68

co-axial with the "104" gear 13 at each revolution of said gear, as illustrated in Fig. 4. To this end, the said rock shaft 65 is provided with a lateral lug 69, shown most clearly in Figs. 4, 5 and 6, which, when said shaft 65 is not turned by the rod 61, rests upon the upper end of the upright rod 67, with the result that said shaft 65 receives a rocking impulse once for every rotation of the "104" gear. The purpose of rocking the shaft 65 is to impart lengthwise or traveling movement to the various pattern chains 28 to 32.

Secured to the said rock shaft 65 at 70, as shown in Fig. 4, is an arm 71 to which is pivotally connected the rod 72, shown also in Figs. 6 and 8. Said rod 72 is positioned horizontally, and at its opposite end has pivotally connected at 73 a lever 74 pivoted at 75 co-axially with the drum 34. Pivoted at 76 to the opposite end of the lever 74 is a pawl 77 to engage teeth 78 upon a ratchet fast with the drum 34, and thereby acting to turn the same in a step-by-step manner. A hold back pawl 79 may be provided, if desired.

By the described connections, the said drum 34 with its chains 29 to 32 is constantly moved in a step-by-step manner, excepting as said step-by-step movement is interrupted by the engagement of a link or lug 36 of the pattern chain 35 with the projection 37 on the lever 38. In the event of such engagement of a lug 36 with the projection 37, the shaft 65 is turned sufficiently to lift the arm or lateral projection 59 so that the latter will not be engaged by the constantly vertically moving rod 67.

The several selecting cams 21*a* to 25*a* are adapted to be moved inwardly with respect to the needle cylinder, so as respectively to come under the butts upon the jacks 19, as already described with respect to Figs. 15 and 16. Said cams 21*a* to 25*a* are mounted upon a corresponding number or set of levers, one of which set of levers is shown at 80 in Fig. 8. In Fig. 8 said set of levers is co-axially pivoted, as shown at 81, to a block 82 on the lower side of the cam block plate. In addition to the said five levers, there is also one lever, indicated at 83 (see Fig. 7), which is connected to the lowermost cam 20*a* to elevate all the jacks. Said cam 20*a* is not operated from any of the pattern chains 28 to 32, but through independent connections to be hereinafter described.

The said cams 21*a* to 25*a* are respectively secured to the appropriate levers on the set of levers 80, as indicated in Fig. 8. As shown in said figures, each of the levers of the set of levers 80 is provided with a lug or lateral projection 84 adapted to be moved by the high lugs 84*a* upon the respective chains 28 to 32, as clearly evident from Figs. 9 to 13. The engagement of one of the projections 84 by a high lug 84*a* on the corresponding pattern chain moves the corresponding pattern cams 21*a* to 25*a* radially outward. When one of the projections 84 slides off the high lug 84*a*, it will drop onto the link 84*b* of the chain, allowing the lever to move radially inward so as to take under the desired butts on the jacks, as hereinbefore described. The projection 84 will remain on the links 84*b* for four courses and then will be raised by high lugs 84*a*.

We provide suitable means to withdraw from operative relation with the pattern chains 28 to 32, the corresponding cams 21*a* to 25*a*. Herein for the purpose we have mounted upon the creel rod 85, shown in Figs. 3 and 6, a bar 86 whose end 87, when swung to the left viewing Fig. 6, is adapted to strike all the levers 80 so as to move them out of the range of said pattern chains. Said bar 86 is herein operated in the following manner.

The disk cam 88, shown in Fig. 5 as upon the pattern shaft 9, is adapted to act upon a lever 89 to which is connected a long, upright rod or link 90 which, at its upper end, is pivotally connected at 91 to a bell crank 92 pivoted at 93 on the framing, and having connected at one end 94 thereof a link 95 which, as shown in Fig. 6, extends to the said bar 86 so as to operate the same at the desired times.

The purpose of the said bar 86 is either to throw all the way out all of the levers of the said set 80 in the heel and toe or to throw them part way out. The needles are arranged in a long butt series and a short butt series, and under the long butt needles are long butt jacks, and under the short butt needles are short butt jacks. When the bar 86 is moved to its greatest extent to the left, viewing Fig. 6, it moves the entire series of levers 80 sufficiently far to withdraw all of the cams 21*a* to 25*a* from their jacks. When said bar 86 is positioned in an intermediate position, it will so withdraw the cams 21*a* to 25*a* that said cams can act only upon the long butt jacks with the result that the stocking is made with a plain sole and diamond instep. If it be desired to make a diamond sole and diamond instep, then the bar 86 would be moved to its outermost position.

It is desired to move out one of the stitch cams just as the pattern is commenced. Viewing Fig. 7 the stitch cam thus to be moved out is that nearest the operator who is facing the mechanism in Fig. 7. In said figure, we have represented the said stitch cam as connected at 96 to a link 97 pivotally connected at 98 to the bell crank 99 itself pivoted at 100. Pivoted at 101 to said bell crank 99 is a vertical link 102, the lower end 103 whereof is connected to horizontal lever 104 whose opposite end 105 is pivotally connected at 106 to a vertical link 107. The said construction is shown upon a smaller scale

in Fig. 2, and in said Fig. 2 the link 107 is shown as connected at its lower end to a lever 108 riding upon the cam 109 on the pattern shaft 9. By the described connection, the front stitch cam is withdrawn from action just prior to the commencement of the pattern, inasmuch as, to make the pattern, the first operation is to elevate all the jacks.

Whenever plating is to occur without any pattern effect therein (that is, when the two threads are to be fed in a plating relation to all the needles), it is necessary to elevate all the jacks. In this embodiment of the invention, this result is obtained by moving inward the cam 20*a* so as to engage all the butts 20 on the jacks. While any suitable means may be employed for this purpose, we have herein provided the following mechanism.

To the lever 83 carrying the cam 20*a*, as indicated in Fig. 7, there is connected a link 110 which is connected to a bell crank lever 111, shown most clearly in Figs. 3 and 5, and indicated also in Fig. 8. Said bell crank lever is connected to an upright long link 112 which, at its lower end, is provided with a lever or member 113 to ride upon a suitable cam on the pattern shaft 9, whereby at the desired time or times the said cam 20*a* is moved inward to elevate all the needles.

To move outwardly a stitch cam at the desired times, as at the commencement of a pattern, we have connected thereto a link 115 (see Fig. 7) pivoted to a bell crank lever itself pivoted at 117 and having an arm 116 to which is pivoted an upright link 118 pivoted at its lower end to a horizontal lever 119 which is pivoted at 120 and has connected to its opposite end an upright link 121 (see Figs. 6 and 7), which extends down to the pattern chain mechanism by which it is connected, as by a lever at its lower end resting on said pattern chain mechanism.

Having thus described one illustrative embodiment of our invention, it is to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims:

1. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, a plurality of pattern chains adapted to act upon said cams respectively, and means to move said pattern chains.

2. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, a series of pattern chains to move said cams respectively, and means to impart step-by-step movement to said pattern chains.

3. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, a series of pattern chains to move said cams respectively, means to impart step-by-step movement to said pattern chains, and means to interrupt the movements of said pattern chains according to the control of a master pattern.

4. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, a series of pattern chains to act upon said cams respectively, a main pattern chain, a ratchet wheel, means tending constantly to rotate said ratchet wheel, connections from said main pattern chain to suspend the movement of said ratchet wheel, whereby the said pattern chains may be moved constantly in a step-by-step manner or their movement may be interrupted.

5. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, a plurality of pattern chains adapted to control the cams respectively, means connected with the "104" gear tending to drive said pattern chains constantly in a step-by-step manner, a main pattern chain, and connections therefrom to interrupt as desired the constant step-by-step movement of said pattern chains.

6. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, pattern means to act upon said cams respectively, and a cam and operating means there-

for to elevate all the jacks and their needles when unfigured plating is desired.

7. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, a series of pattern chains for the cams respectively, means to control the movements of said pattern chains, and means to withdraw a stitch cam at the commencement of the pattern.

8. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, a plurality of pattern chains to act upon the cams respectively, means tending to drive said pattern chains at a constant rate in a step-by-step manner, master pattern means for interrupting the movement of said pattern chains, and means to withdraw a stitch cam from action at the commencement of the pattern.

9. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, a series of pattern chains to act upon said cams respectively, and means adapted to act upon all of said cams to withdraw them from the action of said pattern chains.

10. In a knitting machine having means to introduce a backing yarn and a plating yarn in a plating relation, so as to provide a solid color effect in each face of the fabric as desired, a circular series of needles, jacks therefor provided with butts arranged at different levels, a series of cams positioned to engage respectively the butts at different levels, a series of pattern chains to act upon said cams respectively, levers whereon said cams are carried, a bar adapted to act upon said levers to withdraw them from the action of said pattern chains, and pattern means for moving said bar to predetermined position.

11. In a circular, independent needle, knitting machine having a needle cylinder with needle grooves and a cam carrier with knitting cams; means relatively to rotate said needle cylinder and cam carrier; needles respectively mounted for lengthwise movement in said needle grooves, needle-elevating means individual to each needle, structurally separate therefrom, located in the groove for said needle and including a lengthwise movable jack for each needle, each said lengthwise movable jack having a formation to engage its needle, and thereby to elevate said needle so as, through the action of a knitting cam, to take a knitting yarn, and if not so elevated to miss said yarn; an upright pattern barrel or drum-like member mounted on a vertical axis in proximity to the needle cylinder for relative movement of the needles and said barrel or drum-like member past each other; a plurality of pattern chains mounted in superposed relation for rotation with and about said barrel or drum-like member; means to rotate said barrel or drum-like member step by step upon its own axis so as to present said pattern chains for action upon said needle-elevating means; a series of needle-elevating means selecting cams mounted in close proximity one above another between said barrel or drum-like member and the needle cylinder, in operative relation to said barrel or drum-like member and said needle-elevating means, so that each selecting cam as operated upon by a pattern chain mounted on the barrel or drum-like member is moved inward toward the needle cylinder and thereby controls, determines or governs the lifting or non-lifting of the respective needle-elevating means, said needle-elevating means having a series of butts distributed therealong at various heights to be engaged by the selecting cams respectively, whereby each selecting cam controls, determines or governs the lifting of the needle-elevating means in accordance with the indications of the pattern chains on the said barrel or drum-like member.

12. In a circular, independent needle, knitting machine having a needle cylinder with needle grooves and a cam carrier with knitting cams; means relatively to rotate said needle cylinder and cam carrier; needles respectively mounted for lengthwise movement in said needle grooves, needle-elevating means individual to each needle, structurally separate therefrom, located in the groove for said needle and including a lengthwise movable jack for each needle, each said lengthwise movable jack having a formation to engage its needle, and thereby to elevate said needle so as, through the action of a knitting cam, to take a knitting yarn, and if not so elevated to miss said yarn; an upright pattern barrel or drum-like member mounted on a vertical axis in proximity to the needle cylinder for relative movement of the needles and said barrel or drum-like member past each other; a plurality of pattern chains mounted in superposed relation for rotation with and about said barrel or drum-like member; means to rotate said barrel or drum-like member step by step upon its own axis so as

to present said pattern chains for action upon said needle-elevating means; a series of needle-elevating means selecting cams mounted in close proximity one above another between said barrel or drum-like member and the needle cylinder, in operative relation to said barrel or drum-like member and said needle-elevating means, so that each selecting cam as operated upon by a pattern chain mounted on the barrel or drum-like member is moved inward toward the needle cylinder and thereby controls, determines or governs the lifting or non-lifting of the respective needle-elevating means, said needle-elevating means having a series of butts distributed therealong at various heights to be engaged by the selecting cams respectively, whereby each selecting cam controls, determines or governs the lifting of the needle-elevating means in accordance with the indications of the pattern chains on the said barrel or drum-like member, and means to interrupt the movement of said pattern chain according to the control of a master pattern.

13. In a circular, independent needle, knitting machine having a needle cylinder with needle grooves and a cam carrier with knitting cams; means relatively to rotate said needle cylinder and cam carrier; needles respectively mounted for lengthwise movement in said needle grooves, needle-elevating means individual to each needle, structurally separate therefrom, located in the groove for said needle and including a lengthwise movable jack for each needle, each said lengthwise movable jack having a formation to engage its needle, and thereby to elevate said needle so as, through the action of a knitting cam, to take a knitting yarn, and if not so elevated to miss said yarn; an upright pattern barrel or drum-like member mounted on a vertical axis in proximity to the needle cylinder for relative movement of the needles and said barrel or drum-like member past each other; a plurality of pattern chains mounted in superposed relation for rotation with and about said barrel or drum-like member; means to rotate said barrel or drum-like member step by step upon its own axis so as to present said pattern chains for action upon said needle-elevating means; a series of needle-elevating-means selecting cams mounted in close proximity one above another between said barrel or drum-like member and the needle cylinder, in operative relation to said barrel or drum-like member and said needle-elevating means, so that each selecting cam as operated upon by a pattern chain mounted on the barrel or drum-like member is moved inward toward the needle cylinder and thereby controls, determines or governs the lifting or non-lifting of the respective needle-elevating means, said needle-elevating means having a series of butts distributed therealong at various heights to be engaged by the selecting cams respectively, whereby each selecting cam controls, determines or governs the lifting of the needle elevating means in accordance with the indications of the pattern chains on the said barrel or drum-like member, a main pattern chain, a ratchet wheel, means tending constantly to rotate said ratchet wheel, and connections from said main pattern chain to suspend the movement of said ratchet wheel, whereby the said pattern chains may be moved constantly in a step-by-step manner, or their movement may be interrupted.

In testimony whereof, we have signed our names to this specification.

JOHN LAWSON.
ROBERT H. LAWSON.