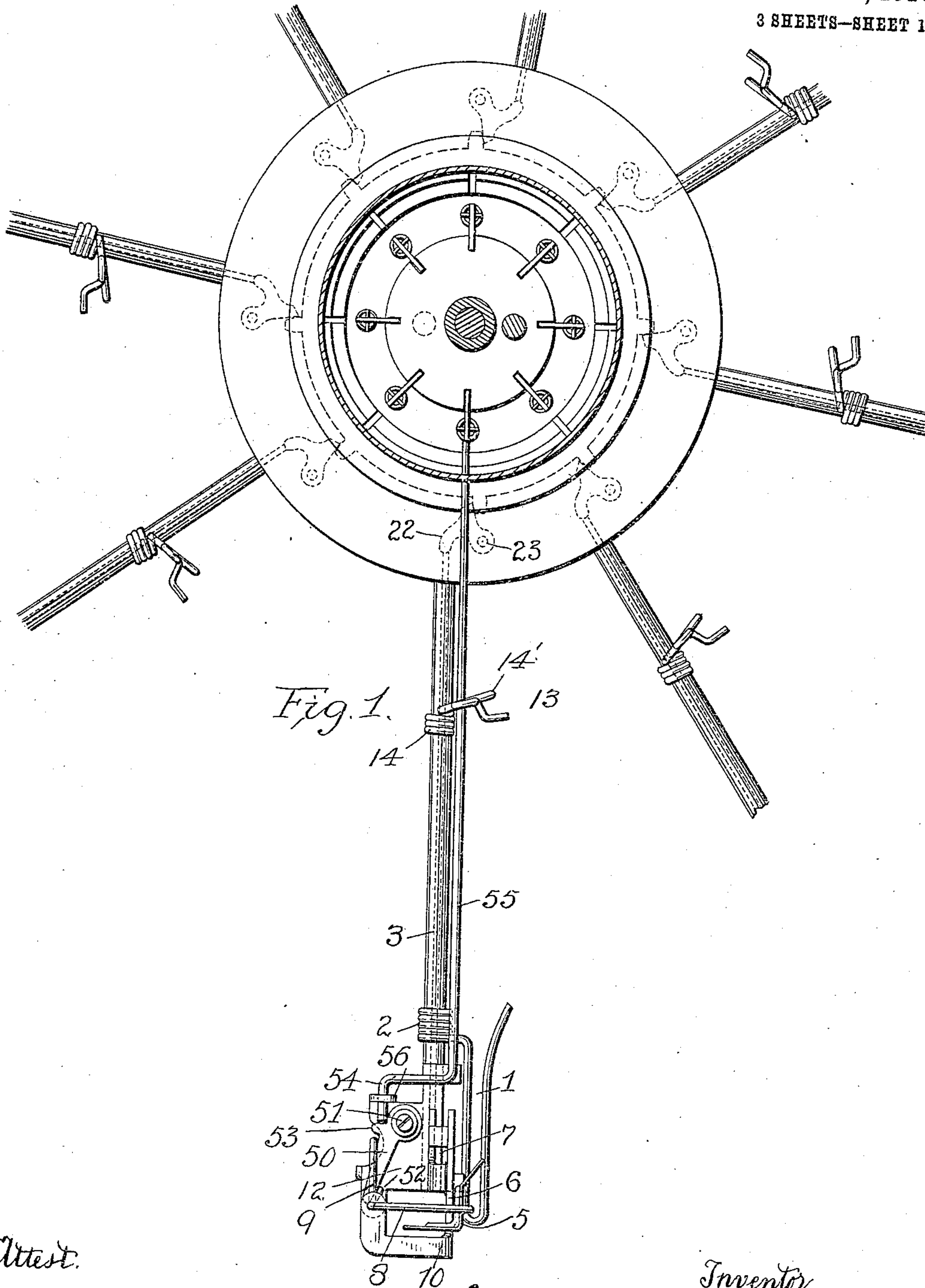


G. L. BALLARD.  
STOP MOTION FOR KNITTING MACHINES.  
APPLICATION FILED JUNE 4, 1908.

951,358.

Patented Mar. 8, 1910.  
3 SHEETS—SHEET 1.



Attest.

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Cwd. A. Tolson.

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George Lawson Ballard

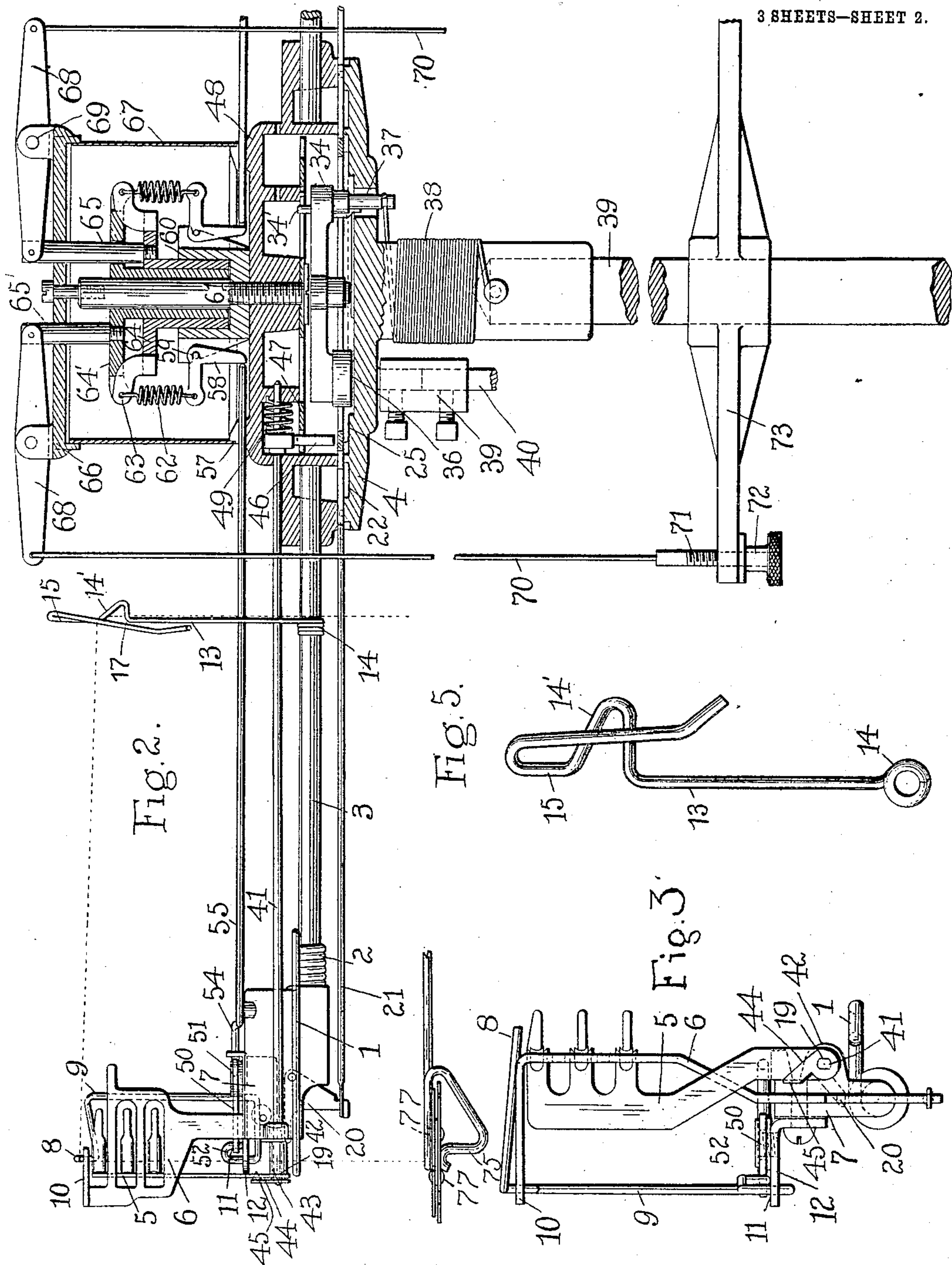
by Spear, Middleton, Donaldson & Spear,  
Attys.

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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 4.

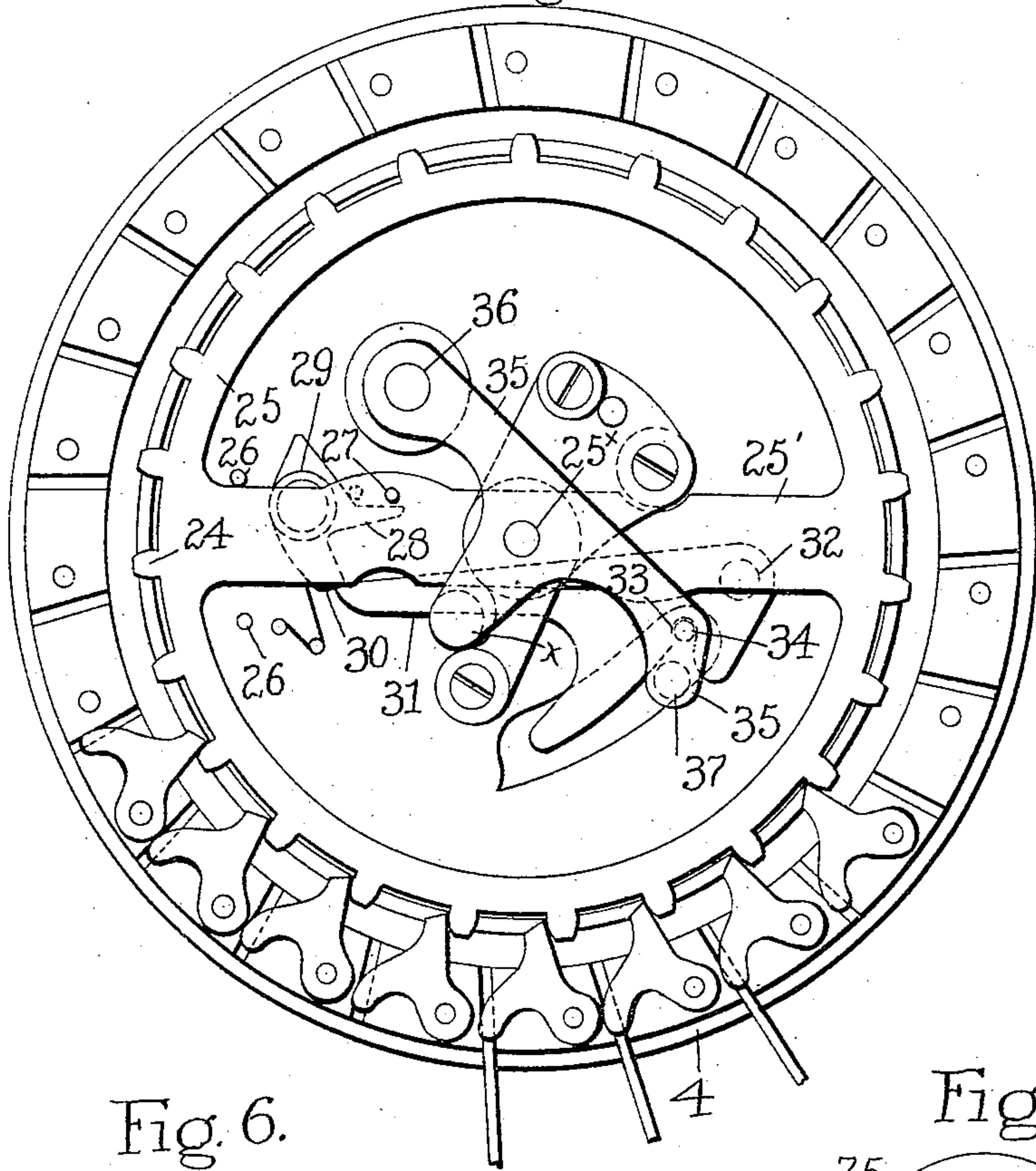


Fig. 6.

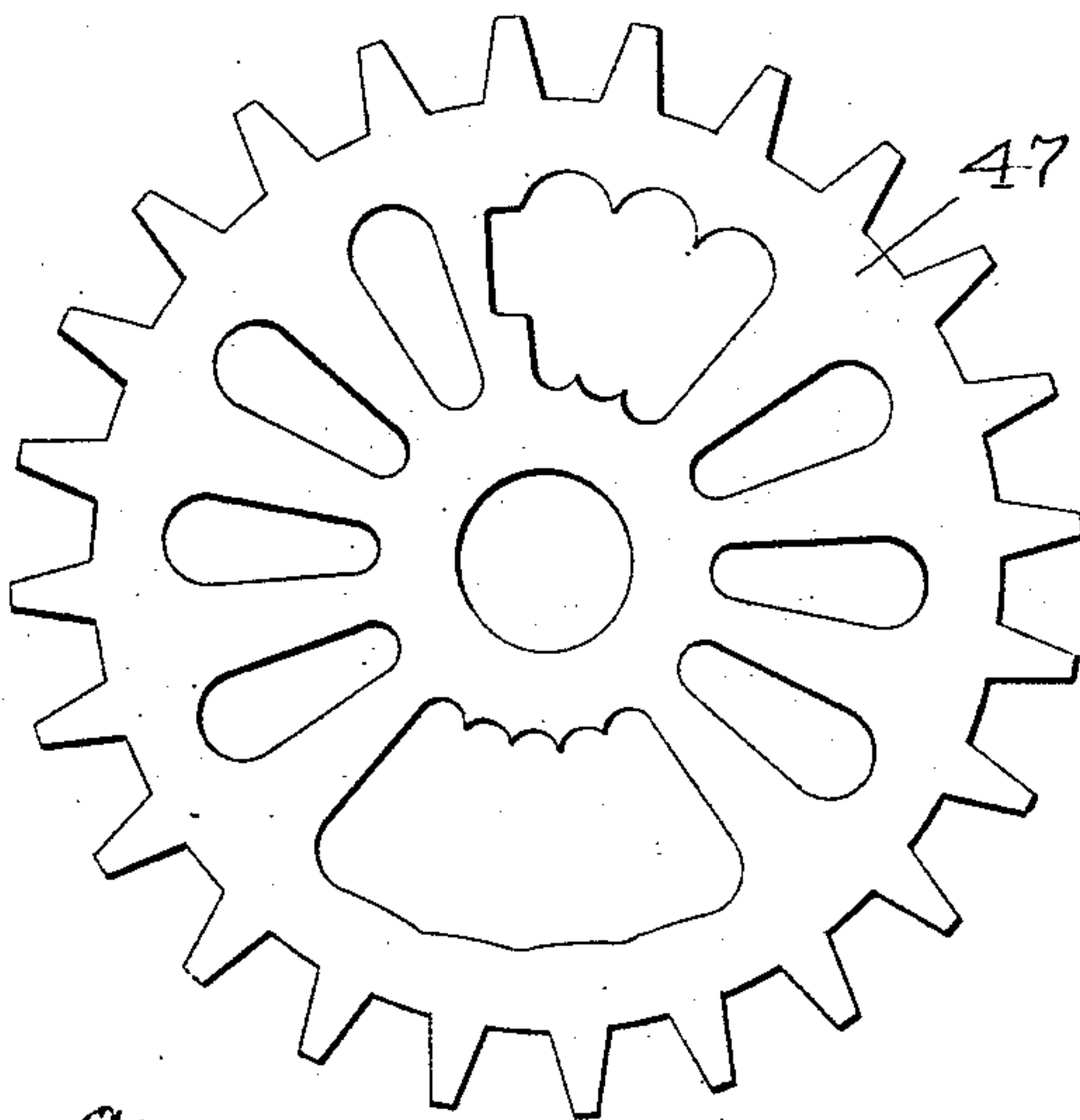


Fig. 7.

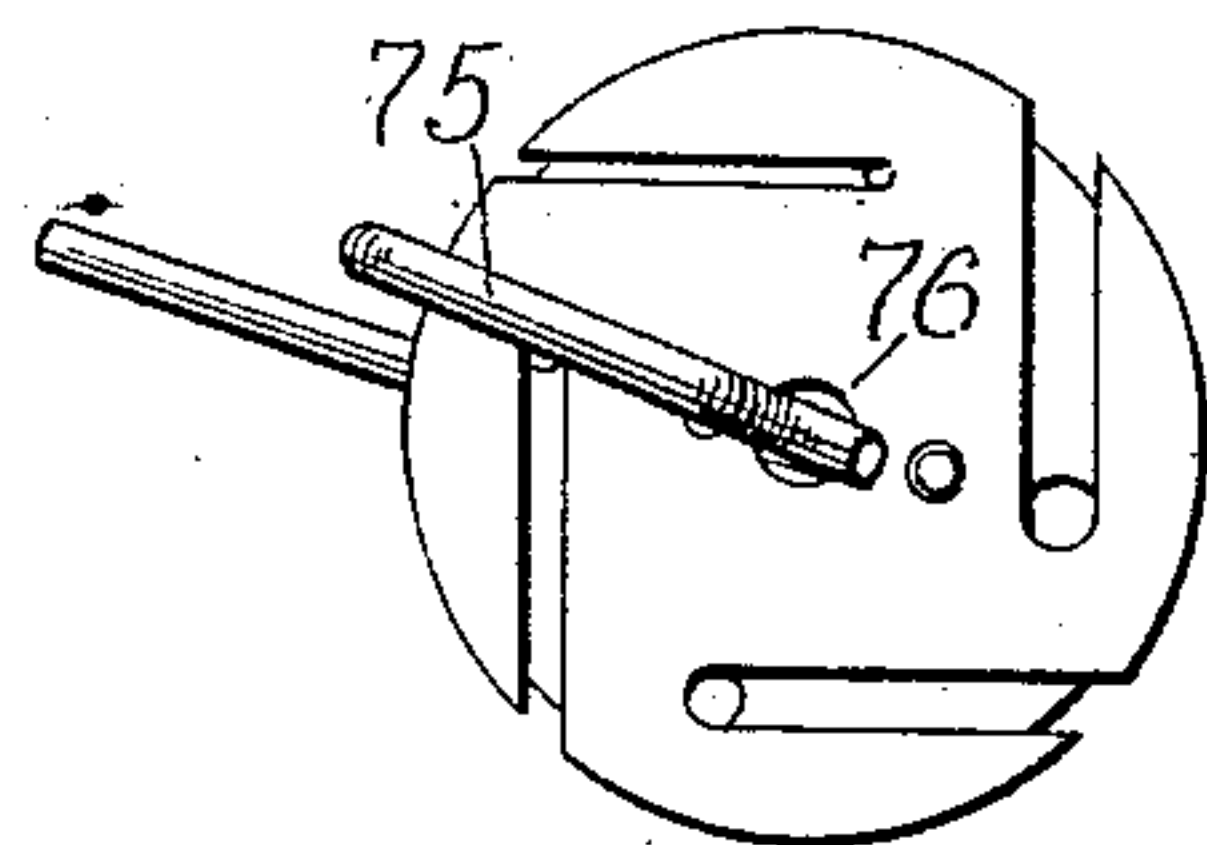


Fig. 8.

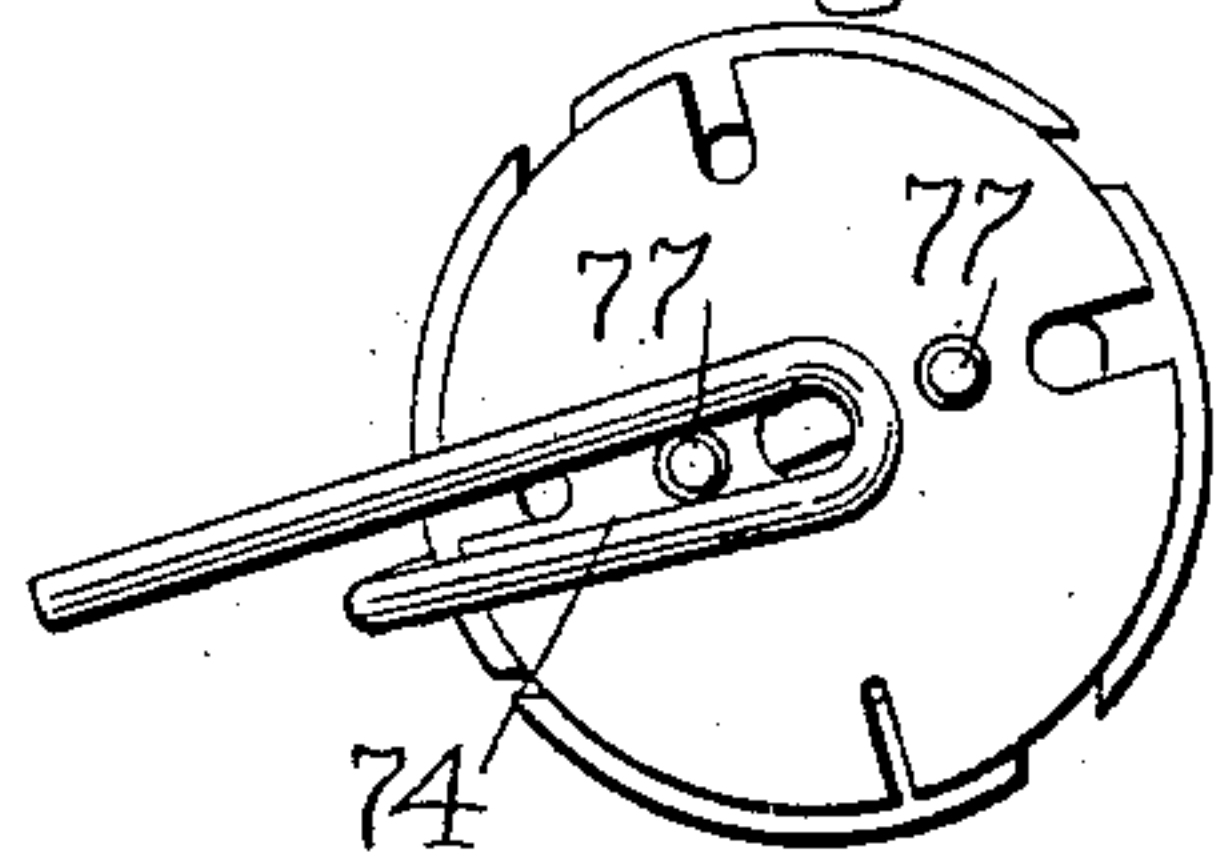
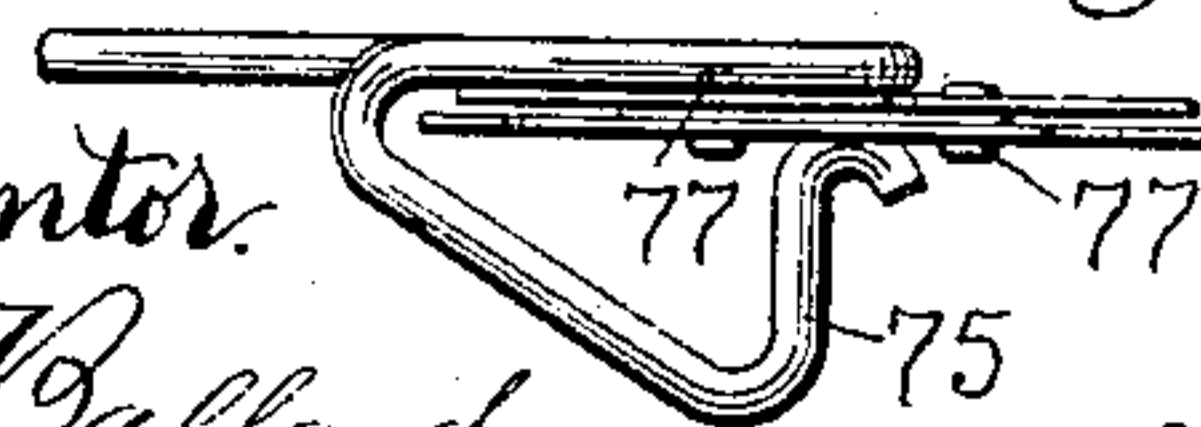


Fig. 9.



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# UNITED STATES PATENT OFFICE.

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STOP-MOTION FOR KNITTING-MACHINES.

951,358.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed June 4, 1908. Serial No. 436,668.

*To all whom it may concern:*

Be it known that I, GEORGE L. BALLARD, a subject of the King of Great Britain, residing at Norristown, Pennsylvania, have invented certain new and useful Improvements in Stop-Motions for Knitting-Machines, of which the following is a specification.

It is the object of my invention to provide a stop motion mechanism for knitting machines which will be simple in construction and effective and quick in operation, and my invention includes a feeler finger associated with a sweep and with a rigidly arranged drop off device whereby the yarn after being released from the sweep will drop freely from the drop off device which, however, as long as the sweep is not operated will act as a guide for the yarn on its way to the needles.

My invention concerns the sweep, the relation thereof to the feeler finger, the construction and arrangement of the fixed drop off device, and its relation to the sweep and feeler finger, the means for applying a tension to the sweep and to various features of construction and arrangement of parts as will be hereinafter made clear.

The invention is shown in the accompanying drawings, in which—

Figure 1 is a plan view of the main head of the stop motion with one of the radiating arms and the devices associated therewith for one feed, the positions of the arms for the other feeds being also indicated; Fig. 2 is a vertical sectional view through the main head of the stop motion and with one of the radiating arms and its associated device in elevation; Fig. 3 is an end view of the radial arm and the feeler finger, guard and sweep and other parts; Fig. 4 is a plan view of the main trip mechanism within the main head; Fig. 5 is a detail view of the drop-off wire or device; Fig. 6 is a detail view of the star wheel of the resetting device; Figs. 7, 8 and 9 are detail views of one of the knot catchers.

The yarn is fed from the bobbins up through the guide 1 of wire fixed by its coil-spring end 2 to the wire or rod 3 extending radially from the main head 4 of the main tripping mechanism hereinafter described. After passing through this guide the yarn passes between the feeler finger 5 and its fixed guard 6 which is secured to the block

or bracket 7 supported on the radial rod or bar 3. It passes over an arm 8 of a sweep 9 formed of wire bent into substantially right angular form and having its terminal ends pivoted respectively to an upper plate or extension 10 of the feeler finger guard and at its lower end at 11, to a plate or bracket 12 secured to the guard. This sweep swings in a horizontal plane and its horizontally extending arm 8 extends transversely over the space between the feeler finger and the guard. After passing over this sweep the yarn passes to a fixed drop-off device 13 fixed by its coil-spring end 14 to the radial rod above described. The thread thus passes radially inward and over the upwardly inclined part 14' of this drop-off device. This part extends also at an inclination to the radial course of the yarn as shown in the plan view and the drop-off wire is continued upwardly at the end of the inclined bearing part 14' as shown at 15, and it then turns downwardly alongside the inclined bearing part leaving a slight crevice or opening between itself and said inclined bearing part 14'. This downwardly extending wire acts as a guard to retain the yarn on the inclined bearing portion of the drop-off device, but there is no frictional resistance presented to the thread by this guard wire, because the pull on the thread as it passes over the upwardly inclined bearing portion 14' will cause the said thread to ride up slightly upon the incline and thus out of contact with the guard wire, this result being due to both the upward inclination and the lateral inclination of the bearing portion 14', that is its inclination in relation to the radial course of the thread as viewed in plan view Fig. 1.

So long as the thread is passing under proper tension and free from knots along its prescribed course to the needles, the thread will be controlled by the sweep or drop-off device; but should the tension increase beyond that for which the sweep is set the said sweep will swing on its pivot under the increased tension and will allow the yarn to slip in a radial direction inward in respect to the main head, and therefore out of contact with the feeler finger and its guard, and as a result of this the yarn will drop from the sweep and feeler finger and assume a vertical, or substantially verti-



cal, position, and it will also immediately drop from the drop-off device, slipping down the incline 14' and down through the crevice 17 between the vertical guard wire of the drop-off device and the bearing portion thereof. Both of these actions occur from a single pull on the yarn, the sweep acting to release the yarn which immediately drops from the drop-off device without any further pull on the yarn being necessarily exerted. As a result of this the yarn which is dropped does not have to render through any of the parts, but on the contrary it becomes freed from all of said parts practically simultaneously. The tension device for the sweep will be hereinafter described.

The dropping of the thread releases the feeler finger, and the same is true when the thread breaks, and this feeler finger then turns by gravity on its pivot 19 Fig. 2 and falls until its stem strikes the controlling device consisting, in the present instance, of a bell crank lever 20 pivoted to the block or bracket 7 and this bell crank lever in turning under the impact of the gravity feeler finger will operate the rod 21 to which it is attached and thus the main tripping mechanism in the central or main head 4 will be operated to actuate the let-off. This main tripping mechanism is similar in substance and general characteristics to that described in Letters Patent of the United States granted to Frank Wilcomb, Nos. 698,089, April 22, 1902 and 698,091, April 22, 1902, though differing in some respects. The inner end of the rod 21 or of the rods, if there be more than one feed, contacts with one arm of the bell crank lever 22 pivoted at 23 to the main head. The other arm of this bell crank lever engages a tooth 24 on a ring 25 arranged to turn circumferentially in the main head, its movement being limited by stops 26. This ring is pivoted at 25' to a bracket 25'' centrally of the main head, said ring having a cross arm 25' through which said pivot pin extends. This ring carries a depending pin 27 to act against a detent 28 pivoted to the head at 29 and having an arm 30 to engage the catch-lever 31 which is pivoted at 32. This catch-lever has a shoulder 33 to engage and hold a pin 34 which is fixed to and extends down from a lever 35 fixed to a shaft pivoted at 36 within the main head. The lever 35 also carries a pin 37 depending through a slot in the head, so as to be engaged by the main tripper spring 38 surrounding the post or standard 39 upon which the stop motion mechanism is supported above the machine. The other end of said spring is attached rigidly to said post. The shaft journaled at 36 is coupled by the block 39 with a shaft 40 leading to any suitable let-off or stop motion mechanism. Now supposing the lever 35 set against the tension of its spring so as to be held by

the shoulder on the catch lever 31 engaging the pin 34 and the yarn running along its prescribed course, if the yarn fails or becomes taut the feeler finger will be released and falling by gravity it will, through the described connections operate the detent 28, thus releasing the catch lever 31 and allowing the lever 35 to free itself therefrom under the tension of the main tripper spring and this lever, in turning, will turn the shaft 40 and thus operate the let-off of any suitable construction.

*Resetting mechanism.*—The supplemental tripping mechanism is reset by the operation of the main trip in a manner substantially similar to that described in the patents above referred to. This mechanism comprises a rock shaft 41, there being one of these for each feed, the outer end of each of these rock shafts being journaled in an ear 42 on the block or bracket 7. The feeler finger 5 is pivoted on this rock shaft by its sleeve 43. The rock shaft has fixed thereon a resetting arm 44 having a projection 45 to engage the edge of the feeler finger stem when the resetting action takes place. This arm normally lies in the position out of contact with the stem of the feeler finger so that said feeler finger will be free to fall by gravity when the yarn breaks or is pulled out of contact with the sweep. The resetting arm is held in this position by the tripper mechanism when this has been set ready to act. The inner end of the rock shaft 41 has an arm 46 thereon which is in engagement with teeth of the star wheel or disk 47. This star wheel is pivoted at its center to a cap 48 on the main head and an upward extension 34' of the pin 34 engages the star wheel to hold the same in position. The shaft 41 is under tension of a spring 49 tending constantly to rotate it. When, now, the feeler finger drops and through the described connections operates the main tripper mechanism in the main head to actuate the let off, the mechanism will be operated and the final part of the movement of the lever 35 will cause the pin 34 to act on the star wheel and turn the same, thus operating the rotary shaft 41 and causing the resetting arm 44 to engage the feeler finger stem and reset the said feeler finger. These resetting arms will turn the feeler fingers to their upright position, as shown in Figs. 2 and 3 in proper relation to their guards for threading, and the threading may be done without requiring any adjustment of the feeler finger on the part of the attendant. When the main trip lever 35 is again reset for action, the pin 34', by acting upon the star wheel 47, will actuate the rock shaft 41 which has just been operated, and thus return the resetting arm 44 to its inactive position, thus removing it from the stem of the feeler finger so that this feeler finger is now free to fall if the thread fails



or becomes taut. In Figs. 2 and 3 the arm 44 for convenience is shown up. It is normally down as in dotted lines Fig. 3.

*Adjustable tension means.*—I provide means whereby tension may be applied to the sweep, said means being capable of nice adjustment and being operated to apply tension to any desired number of feeds radially disposed to the main tripping head. This tension means comprises a compound lever or arm 50 pivoted at 51 to the bracket 12 at the outer end of the supporting arm 3, said compound lever bearing at one end upon the hook-shaped terminal 52 of the bent wire sweep, and having a short arm or lug 53 which is engaged by the bent end 54 of the wire or rod 55, the bent end of said wire being guided in an ear 56 of the bracket 12, and the inner end of said wire or rod extending through a guiding slot or opening 57 in the cap portion 48 of the main tripping head. The inner end of this tension transmitting rod bears upon one arm of a bell crank lever 58 pivoted at 59 to a collar 60 held in fixed position at the main tripping head by a bolt or screw stud 61. The other end of the bell crank lever has connected therewith a spring 62, the upper end of which is attached to a lug or ear 63 projecting from a sleeve or collar 64 which is adapted to have vertical adjustment axially of the main tripping head. There is one of these bell cranks and springs for each feed, and they may be arranged in a plurality of sets, one set being connected with the adjustable sleeve 64 and another set may be connected with an adjustable sleeve 64' arranged within the sleeve 64 and like said sleeve being capable of vertical adjustment. The bell crank levers and their springs of the two sets alternate in position in relation to each other. For adjusting the sleeves vertically I provide posts 65, 65' extending vertically from the sleeves through the top 66 of a shell or casing 67 which serves to inclose the tension devices and protect them from dust and lint. The upper ends of the posts are pivotally connected to levers 68 which are pivoted in ears 69 on the cover of the casing, the outer ends of said levers being connected to vertical rods 70 extending downwardly and provided at their lower ends with means for adjusting them vertically, said means consisting of the screw threaded pins 71 and the finger pieces or nuts 72, these parts being carried by a bracket 73 secured to the center post of the machine. It will now be seen that by adjusting either one or the other of the finger pieces 72 the corresponding rod will be drawn down thus lifting the sleeve and straining the set of springs connected thereto, and thus applying additional tension to the sweeps through the tension transmitting rods 55 and the compound levers 50. By

these means the tension on all of the sweeps of the series may be nicely adjusted and this adjustment may be effected for all of the sweeps simultaneously. Each of the collars or sleeves 64, 64' is capable of adjustment independent of the other to adjust the tension on the group or series of feeds belonging thereto.

The knot catcher employed by me is similar in its general features to that disclosed in Letters Patent of the United States granted to Frank Wilcomb above mentioned, in that it consists of two disks suitably held together and having notches which conjointly form the passageways or eyes for the yarn. I have, however, provided a simple and effective means for holding these knot catchers and whereby they may be readily adjusted. As shown in Figs. 7 and 8 the knot catchers are supported at the ends of wire arms which are bent into the form of a rectangular loop 74 on the upper side of the knot catchers, the free end of the loop being carried under the knot catcher and having an upwardly turned end at 75 which is provided with a curved end adapted to engage a depression or opening 76 at the center of the knot catcher disks. The knot catcher disks will be held between the loop portion and the curved end of the lower portion by the spring of the wire and for adjusting the knot catcher to bring different eyes or openings into use it may be turned, for which purpose the curved ends act as a pivot support and for retaining the knot catcher in any position to which it may be adjusted I provide studs or pins 77 projecting from the surface of the disk, which studs or pins are adapted severally to lie between the sides of the loop portion of the supporting arm to be retained thereby. There is sufficient resilience in the wire of which the support is made, however, to permit these studs to ride past the arms of the loop to get in position between them when the disk is turned for the purpose of adjusting the knot catcher to bring the desired eye or opening into play. The pins or studs may serve as the rivets for holding the pair of disks together of which the knot catcher is composed, these two disks being secured to an intermediate smaller disk which holds the main disks slightly spaced apart.

I am aware that it is not new to employ a feeler finger associated with a hook or controlling arm over which the thread passes to be drawn down when the tension on the yarn increases beyond a certain limit, to thereby release the feeler finger, the said hook being on the inner end of a radial rock shaft having at its outer end an arm in the nature of a sweep, it being necessary that both the hook and the sweep like arm, as well as the rock shaft, be positively operated by the yarn in releasing itself therefrom



before the yarn will fall and release the feeler finger. With my improvement, however, the feeler finger is released as soon as the sweep arm at the outer end of the radial support releases the yarn as a result of the pull thereon reaching the predetermined degree and this operation of the single movable element or sweep is all that the pull on the yarn has to do, it being understood that having been released from this sweep it will fall as a matter of course and simply by the action of gravity from the fixed or immovable drop-off wire above described located toward the inner end of the radial support or arm, this drop off wire serving to guide and retain the yarn under normal conditions, but allowing the yarn to drop freely therefrom when abnormal conditions arise.

An important feature of my invention relates to the facility with which the tension on the detector means, such as the sweep, may be adjusted. It will be observed that the tension devices are mainly supported in the central head, and connections extend thence radially to the sweeps or detectors, and for adjusting the tension means I provide the rods which extend vertically in respect to the central supporting post, these rods depending to a point just above the knitting machine to which the stop motion is applied and being connected with the adjusting devices arranged in this low down position where they are readily accessible to the hand of the operator.

I claim as my invention:

1. In a stop motion, controlling means engaging the yarn and an immovable guide for the yarn having a fixed guard from which the yarn drops by gravity when released from the controlling means, substantially as described.

2. In combination in a stop motion a main tripping head, a radial supporting arm extending therefrom, a feeler finger and sweep or tension member supported at or near the outer end of said arm, said feeler and sweep acting as guards for each other and a drop-off and guiding device for the yarn located at a point radially inward in respect to the said feeler finger and sweep member, and consisting of the fixed guide and fixed guard substantially as described.

3. In combination in a stop motion a main tripping head, a radial supporting arm extending therefrom, a feeler finger and sweep or tension member supported at or near the outer end of said arm, and a drop-off and guiding device for the yarn located at a point radially inward in respect to the said feeler finger and sweep member and consisting of the wire fixed to said supporting arm, substantially as described.

4. In combination with the vertically arranged feeler finger and its guard, a tension

device or sweep extending transversely of the passageway between the feeler finger and its guard, and arranged to swing in a horizontal plane and in a direction lengthwise of said passageway.

5. In combination with a feeler finger and guard, a tension device or sweep extending transversely across the crevice between the said feeler finger and guard and arranged to swing in a direction lengthwise of said crevice, substantially as described.

6. In combination in a stop motion a feeler finger, a guard a sweep at the feeler finger extending transversely in relation to the feeler finger and means for guiding the yarn radially inward in respect to the vertical axis of the machine, said sweep being arranged to yield in a radial direction inwardly, substantially as described.

7. In combination with a feeler finger and guard, a sweep or tension finger at the feeler finger and a guide for directing the yarn from all of said parts toward the vertical axis of the machine, said feeler finger being pivoted to swing in a direction transversely to the radial course of the yarn, and said sweep extending normally transversely to the feeler finger and its guard and swinging in a horizontal plane to allow the yarn to slip radially inward from between the faces of the feeler finger and guard, substantially as described.

8. In combination the feeler finger pivoted at its lower end and normally standing upright, a guard and a sweep or tension finger located directly adjacent said parts extending horizontally transversely to the guard and feeler finger and arranged to swing in a direction horizontally and lengthwise of the yarn space between said feeler finger and guard, substantially as described.

9. In combination in a stop motion, a sweep having a horizontally extending arm to engage the thread, a vertically extending portion having two lateral arms, one connected with the horizontal arm and the other having a hooked end, a bearing for said hooked end and a bearing for the horizontal arm, and a tension device engaging the hooked end of the sweep, substantially as described.

10. In a stop motion, the feeler finger, a sweep, a support to which said sweep is pivoted, a radially movable tension rod and a connection between said rod and sweep, substantially as described.

11. In combination in a stop motion a main support, an arm extending therefrom, a feeler finger and sweep at the outer end of said arm, tension means at the main support a radially movable member between said tension means and the sweep, and a connection between the rod and sweep substantially as described.

12. In combination in a stop motion a



sweep, tension means, a radially movable rod, and a lever connection between said tension means and sweep, substantially as described.

5 13. In combination in a stop motion a main support, a feeler finger and sweep, a radially extending support for the sweep and feeler finger at the outer end of which  
10 said feeler finger and sweep are supported, the radially movable rod, and a lever connection between the tension means and sweep, substantially as described.

14. In combination a main support, an arm extending therefrom, a bracket on said  
15 arm, a feeler finger and sweep supported on the bracket, a tension rod extending from the main support to said bracket, and a lever on the bracket between the tension rod and sweep, substantially as described.

20 15. In combination with the feeler finger and its guard a sweep pivoted to said guard, substantially as described.

16. In combination in a stop motion a sweep of bent wire having pivot bearings  
25 at its upper and lower end and having its lower end extended to one side of its pivot and a tension device bearing on said extending end, substantially as described.

17. In combination in a stop motion a  
30 centrally arranged head or support, detector devices disposed radially about the said central support or head, and a tension device comprising a vertically movable member arranged centrally of the head, means for ad-  
35 justing the same, and connections between the said vertically movable member and the detector devices, said connections including radially movable rods substantially as described.

40 18. In combination in a stop motion a plurality of detector devices, a centrally arranged support or head, a vertically movable member arranged centrally of the main head, and a plurality of radially extending  
45 connections between said vertically movable member and the detector devices, respectively, including springs which are adjusted by the said vertically movable member, substantially as described.

50 19. In combination in a stop motion with a plurality of sets of detector devices, a main head, a plurality of vertically movable members on the said head, one for each set of detector devices, means for adjusting the  
55 said vertically movable members and radially extending tension connections one for each set of detector devices between the said members and the sets of detector devices, substantially as described.

60 20. In combination in a stop motion, a plurality of detector devices, one for each feed, a centrally arranged head, a vertically movable sleeve, means for adjusting the sleeve and tension connections one for each  
65 detector device extending radially between

the said sleeve and the detector devices, substantially as described.

21. In combination in a stop motion a plurality of detector devices, one for each  
70 feed and arranged in sets, a centrally arranged main head, a plurality of concentric sleeves, one for each set of detector devices arranged centrally of the main head, means for adjusting the said sleeves individually,  
75 and tension connections between the said sleeves and the sets of detector devices, substantially as described.

22. In combination with a main head arranged axially over the machine, a detector  
80 device arranged to one side of the main head, a vertically movable member on the main head, a lever connected with said movable member, means arranged low down in respect to the main head for adjusting the  
85 said member through the said lever, and connections from the vertically movable member to the detector device, substantially as described.

23. In combination with a stop motion having a main head arranged in elevated  
90 position, a detector device supported upon the main head, tension means for the said detector device arranged at the head, and a depending operating connection for said tension means, substantially as described.

24. In combination, detector means including a feeler finger, a guard and a sweep  
located adjacent each other, a main head, a laterally extending arm connected with said head and supporting the said detector  
100 means, and tension means for the sweep extending vertically in respect to the said support and thence laterally along the laterally extending arm to the sweep, substantially as described.

25. In combination with the vertical support the main head, the detector device supported laterally in respect to the main head, a bracket on the vertical support, tension  
110 means and adjusting means extending vertically and thence laterally of the vertical support to the detector device for the tension means supported by the bracket, substantially as described.

26. In combination in a stop motion a  
115 guide and drop-off device for the yarn having a fixed downwardly inclined bearing surface for supporting the yarn with a fixed guard extending down alongside the same with a permanently existing open mouthed  
120 downwardly directed crevice or opening between the said guard and the said bearing through which the yarn may drop by gravity, substantially as described.

27. In combination in a stop motion, a  
125 drop off device comprising a member having a bearing surface for the yarn inclining downwardly and inclining transversely in respect to the course of the yarn on its way to the needles, with a guard portion ar-  
130



ranged with a space between itself and the bearing surface having a downwardly directed open mouth, the said yarn normally having a tendency to ride up the incline away from contact with the guard, and means for directing the yarn in relation to the drop off device substantially as described.

28. In combination in a stop motion a guide and drop-off device formed of bent wire having a portion inclining upwardly and affording a bearing for the yarn, said bearing portion also inclining in a horizontal plane in respect to the course of the yarn, and a guard portion extending down alongside the bearing portion with an opening therebetween for the yarn to drop through, and means for directing the yarn in relation to the drop off device substantially as described.

29. A guide and drop-off device for stop motions consisting of the upright wire fixed to its support bent intermediate of the length of the upright portion to one side and returned upon itself in inclined position to provide a bearing portion for the yarn, the upper end of the upright portion being bent over and downwardly alongside the bearing portion to form a guard, said guard having a space between itself and the bearing portion for the yarn to drop through, substantially as described.

30. In combination in a stop motion with detector means a knot catcher and a support therefor comprising the spring jaw in which the knot catcher is clamped, substantially as described.

31. In combination in a stop motion with detector means a knot catcher, a support therefor comprising a spring jaw formed of bent wire, substantially as described.

32. In combination in a stop motion with detector means a knot catcher, a support therefor comprising the wire having a portion bearing on one side of the knot catcher and having a spring arm pivotally engaging the other side of the knot catcher, substantially as described.

33. In combination in a stop motion, de-

tector means a knot catcher and a support having a bearing on one side of the knot catcher and a spring pivot bearing on the other side, substantially as described.

34. In combination in a stop motion, detector means a knot catcher and a support therefor consisting of the bearing on one side of the knot catcher and the spring arm having a curved end engaging a recess on the opposite side of the knot catcher, substantially as described.

35. In combination with a knot catcher, resilient means for holding the same to permit its rotary adjustment under frictional restraint.

36. In combination with the rotary knot catcher having the projections thereon, a resilient support for the knot catcher to be engaged by said projections to hold the knot catcher under frictional restraint, substantially as described.

37. In combination with a knot catcher adapted to be turned for adjustment, a support therefor and locking means between said support and the knot catcher to hold the same in adjusted position, substantially as described.

38. In combination with the rotary knot catcher a supporting arm in the form of a wire loop on one side of the knot catcher and having an extension pivotally engaging the knot catcher on its other side said knot catcher having projections adapted to fit between the sides of the loop to hold the knot catcher in adjusted position, substantially as described.

39. In combination in a stop motion, a feeler finger, a guard therefor, and a sweep, said parts being arranged directly adjacent each other in a group with the sweep extending transversely in relation to the crevice between the guard and the feeler finger, substantially as described.

In testimony whereof, I affix my signature in presence of two witnesses.

GEORGE LAWSON BALLARD.

Witnesses:

E. R. ROBERTS,  
OWEN BALLARD.