

1,025,470.

W. A. INGALLS.
KNITTING MACHINE.
APPLICATION FILED JUNE 5, 1909.

Patented May 7, 1912.
3 SHEETS-SHEET 1.

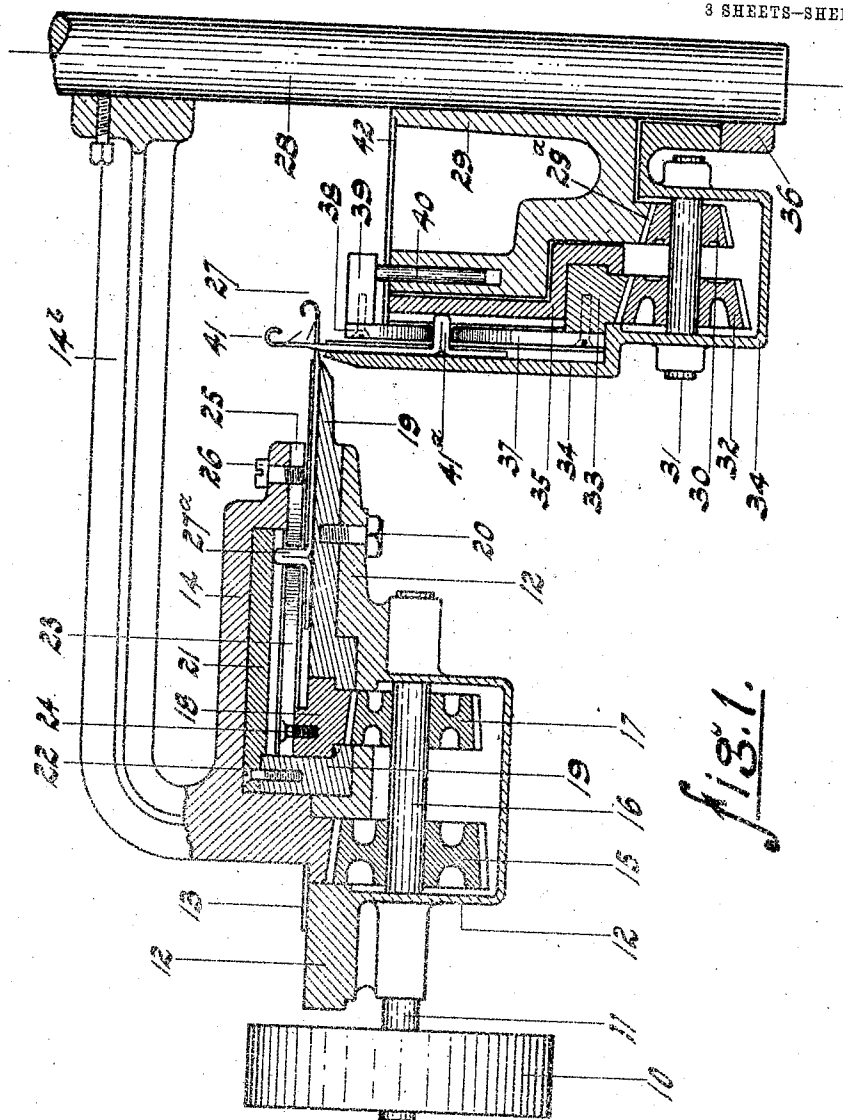


fig. 1.

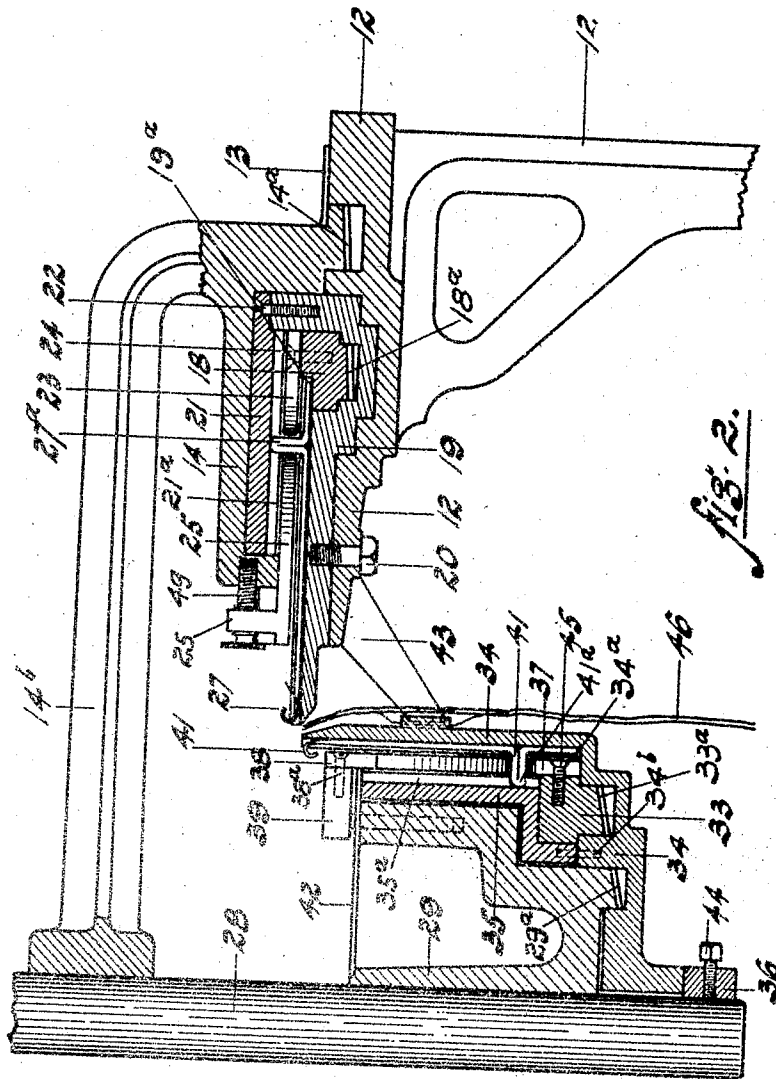
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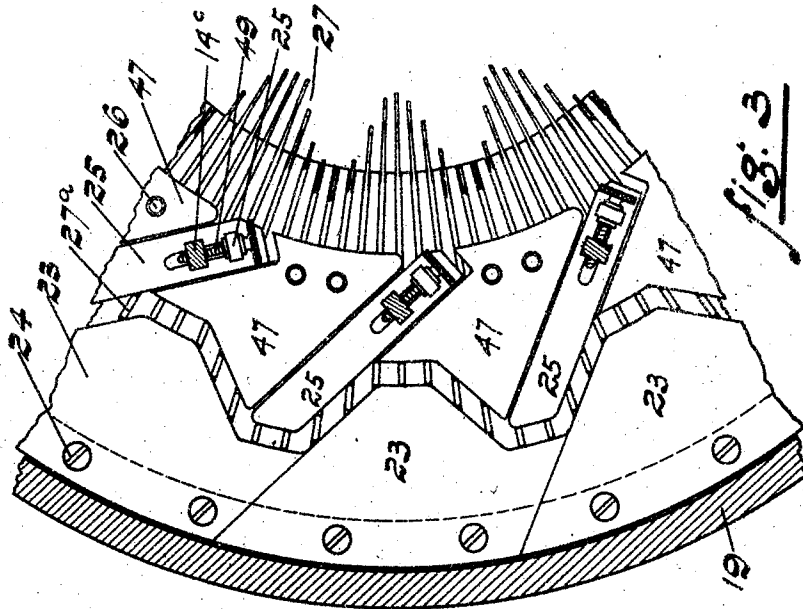
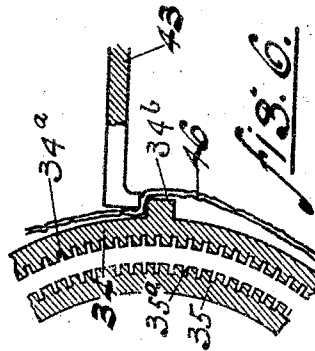
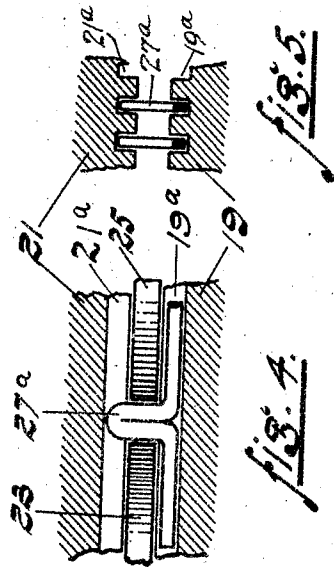
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UNITED STATES PATENT OFFICE.

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KNITTING-MACHINE.

1,025,470.

Specification of Letters Patent.

Patented May 7, 1912.

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To all whom it may concern:

Be it known that I, WILLIS A. INGALLS, a subject of Edward the Seventh, King of England, residing in Cleveland, Cuyahoga county, Ohio, have invented certain new and useful Improvements in Knitting-Machines; and I hereby declare the following to be a full, clear, and exact description of the same; such as will enable others skilled in the art to which it appertains to make and to use the same.

My invention relates more particularly to the mechanism for mounting and operating the needle.

In knitting machines as heretofore made the needle and the needle plate are subjected to excessive friction and consequent wear and breakage, by reason of the manner in which the needles are mounted and actuated. The needles are mounted in slots in the needle plate and the projecting shank of the needle actuated by cams suitably mounted and operated, without support for the shank of the needle except such as it receives from the side of the slot in the needle plate. In some machines the depth of the slot has been increased beyond the thickness of the needle so as to allow the side of the projecting shank of the needle to have greater bearing surface against the sides of the slots, while in other machines other devices have been resorted to in order to give greater bearing surface to the side of the needle so as to prevent the needle from yielding in the direction of the motion of the cam and binding in its slot, causing the cam to shear off the shank of the needle.

The object of my invention is to so mount and operate the needle that the bearing surface thereof and of the needle plate in which it is mounted and also that part of the needle through which motion is imparted (hereinafter referred to as its shank) shall not be subjected to the wear and strain incident to the present method of operating the needles.

My invention consists in the usual slotted or grooved needle plate in which the needles are mounted in the usual manner and an auxiliary needle plate so mounted with reference to the needle plate proper that the outer end of the projecting shank of the needle is supported by corresponding slots or grooves in the auxiliary needle plate, and in this manner held rigidly against the actuating cam, thereby obviating the strain

and resulting friction and wear in the slot of the needle plate proper, and the consequent breaking of the needle. In order to accomplish this I divide the cam plate into two parts and convey the motion to the needles in the manner hereinafter described.

In the accompanying drawings, Figure 1 shows a sectional side elevation of one side of the circular knitting machine embodying my invention. Fig. 2 represents a vertical sectional view showing the opposite side of same. Fig. 3 shows a plan view of a part of the horizontal needle plate proper and the tops of the horizontal cams, the auxiliary needle plate and the cam plate being removed. Figs. 4 and 5 are enlarged views showing detail of the needle plate, needle and cams. Fig. 6 shows a sectional detail of the vertical needle plate and its auxiliary needle plate.

Like figures indicate like parts in all of the drawings.

12 is the frame of the machine.

19 is the horizontal needle plate mounted on the frame 12 and secured thereto by cap screws 20. Mounted upon the outer side of the needle plate 19 is the auxiliary needle plate 21 secured to 19 by the screws 22.

14 is the horizontal cam plate attached to the shaft 28 by the arm 14^b. This cam plate 14 supports the adjustable cams 25 and rigid cam supports 47 which are attached thereto by the screws 26. The cams 25 are adjusted by screws 49, as shown in Figs. 2 and 3, the extent of the movement of the needle being determined by the adjustment of the cams.

18 is a cam ring let into an annular ring in the needle plate 19 and supporting the cams 23 which are attached thereto by the screws 24. The lower surface of the cam plate 14 and the cam ring 18 are provided with teeth 14^a and 18^a which engage with gears 15 and 17 respectively as shown in Fig. 1.

27 are needles mounted in the slots or grooves 19^a of the horizontal needle plate 19. The needles 27 are bent double forming a shank 27^a, the upper end or outer extremity of the shank 27^a being adapted to fit into the groove or slot 21^a in the lower surface of the auxiliary needle plate 21, as shown in Figs. 4 and 5.

34 is a vertical needle plate mounted on the central shaft 28. It rests upon collar 36 secured by screw 44. Needle plate 34 is pro-

vided with the slots and grooves 34^a in which are mounted needles 41.

35 is an auxiliary vertical needle plate mounted in the needle plate 34 and attached thereto by pins 34^b. The outer surface of the needle plate 35 is provided with slots or grooves 35^a corresponding in number and location to the grooves 34^a of the needle plate 34 as shown in Fig. 6.

29 is a vertical cam plate mounted on shaft 28 and is provided on its lower side with toothed surface 29^a. The cam plate 29 supports dog 39 which in turn supports cams 38, the latter being attached to the head 39 of the dog 40 by screws 38^a, the object of the dog being to permit adjustment of the cams.

33 is a cam ring for operating the vertical needles 41 through cams 37 (Fig. 1) which are attached to the cam ring 33 by screws 45 (Fig. 2).

33^a indicates teeth on the lower surface of the cam ring 33. The toothed surface of cam plate 29 and cam ring 33 engage the pinions 30 and 32 respectively, the pinions being attached to spindle 31, thereby causing the cam ring and the cam plate to revolve in unison.

A driving pulley 10 is mounted on the shaft 11 to which are also attached the gears 15 and 17, Fig. 1. The revolving of the shaft 11 and pinion 15 rotates the cam plate 14 causing its adjustable cams 25 to impinge against the front side of the shank 27^a of needle 27 forcing the needle outward. At the same time the rotation of gear 17 revolves cam ring 18 and cams 23 the latter being so adjusted that the revolving of the cam ring forces the needle 27 through its shank 27^a inwardly or toward the center of the machine until it has reached the limit of its inward stroke when it is again forced outward by cams 25. The corresponding movement is imparted to the cams of the vertical needle plate 29, through the arm 14^b of the needle plate 14, secured to the shaft 28, upon which the inner cam plate 29 is firmly mounted. The toothed surface 29^a of needle plate 29 imparts motion to the gear 30 and through the spindle 31 to gear 32, which in turn imparts motion to the cam ring 33. As the cam ring 29 revolves its cams 38 coming in contact with the upper side of the shank 41^a of the needle 41 forces the needle downward while the cams 37 of the cam ring 33 coming in contact with the shank of the needle force it upward. The length of the stroke or movement of the needles may, of course, be determined by the form and adjustment of the cams in accordance with requirements.

The vertical needle plate 34 is held in position and prevented from rotating by the arm 43 projecting downward and inwardly from the frame of the machine and being

adapted to engage the lug 34^b as shown in Figs. 2 and 6, there being only sufficient space between the arm 43 and the lug 34^b to permit the material 46 to pass down between them.

The mechanism herein described is particularly efficient in doing very fine work. In this character of work the points of the needles are necessarily very close together, and when the slot and needle have become worn, even a slight twist in the needle is sufficient to cause the latch of the needle to come in contact with the opposing needle, breaking the needles. More frequently the material is cut by the contact of the needles, causing the machine to drop stitches and make holes in the garment and resulting in a great amount of waste. With my invention the needle is held rigidly in position and the point of the needle may come in very close proximity to the opposing needle without danger of coming in contact with it, or near enough to it to injure the material.

From the foregoing specifications and drawings it will be readily understood that my invention may be applied to so-called flat knitting machines as easily as it is to circular machines, and the necessary mechanical changes will readily suggest themselves to any person skilled in the art to which it appertains.

Having described my invention, I claim:

1. In a knitting machine, the combination with a needle plate having slots or grooves for the reception of needles, of an auxiliary needle plate mounted opposite thereto and provided with slots or grooves corresponding to those of the needle plate proper, needles mounted in the grooves of said needle plate proper and having shanks projecting into and adapted to engage the corresponding grooves in said auxiliary needle plate, cams mounted between said needle plate proper and the auxiliary needle plate and adapted to force said needles forward and back, cam holders or plates supporting said cams, and means for imparting motion to said cams for the purpose specified.

2. In a circular knitting machine, the combination with a needle plate having slots or grooves for the reception of the needles, of an auxiliary needle plate mounted opposite thereto and provided with slots or grooves corresponding to those of the needle plate, needles mounted in grooves in said needle plate and having shanks projecting into and adapted to engage the grooves in said auxiliary needle plate, a cam plate and cam ring provided with cams adapted to engage the shanks of the needles at a point between the needle plate and the auxiliary needle plate and to force said needles forward and back and means for imparting motion to said cam plate and cam ring, substantially as and for the purpose specified.

3. In a circular knitting machine, the combination with a needle plate having slots or grooves for the reception of the needles, of an auxiliary needle plate mounted opposite thereto and provided with slots or grooves corresponding to those of the needle plate, needles mounted in grooves in said needle plate and having shanks projecting into and adapted to engage the grooves in said auxiliary needle plate, a cam plate provided with cams mounted between the needle plate and the auxiliary needle plate and adapted to force said needles outward from the center of the machine and means for adjusting said cams, a cam ring provided with cams mounted thereon between the needle plate and the auxiliary plate and adapted to force said needles toward the center of said machine, and means for imparting motion to said cam plate and cam ring, substantially as and for the purpose specified.

4. In a circular knitting machine the combination of a horizontal dial needle plate having slots or grooves for the reception of the needles, an auxiliary horizontal dial needle plate mounted opposite thereto and provided with slots or grooves corresponding to those of the needle plate, needles mounted in said needle plate and having shanks projecting into and adapted to engage the grooves of the auxiliary needle plate, a circular cam plate 14 mounted above said needle plates with its inner edge projecting downward and adapted to support cams 25, cams 25 secured to the inner edge of the circular cam plate 14 and adapted to force the shank of the needles outward, an annular cam plate 18 mounted in the needle plate 19, and adapted to support cams 23, cams 23 secured to the upper side of the annular cam ring and adapted to force the shank of the needles inward, gears 15 and 17 mounted on a driving shaft 16 and adapted to respectively engage the toothed lower surfaces of the cam plate 14 and the annular cam ring 18 and to rotate them in unison substantially as and for the purpose specified.

5. In a circular knitting machine the combination of a cylindrical needle plate 34 having in its inner surface vertical slots or grooves for the reception of needles, an auxiliary cylindrical needle plate 35 mounted inside of the needle plate 34 and having in its

outer surface vertical slots or grooves corresponding to those in the needle plate 34, needles mounted in the slots or grooves of cylinder 34 and having shanks adapted to engage the slots or grooves in cylinder 35, a cylindrical cam plate 29 adapted to support at its upper end cams 38, cams 38 mounted on the upper end of cam plate 29 and adapted to force the shank of the needles downward, an annular cam ring 33 mounted between the needle plates 34 and 35, cams 37 mounted on the outer surface of cam ring 33 and adapted to force the shank of the needle upward, gears 30 and 32 rigidly mounted on shaft 31 and respectively engaging the toothed lower surfaces of cam rings 29 and 33 and adapted to rotate them in unison, substantially as and for the purpose specified.

6. In a circular knitting machine the combination of a cylindrical needle plate 34 having in its inner surface vertical slots or grooves for the reception of needles, an auxiliary cylindrical needle plate 35 mounted inside of the needle plate 34 and having in its outer surface vertical slots or grooves corresponding to those in the needle plate 34, needles mounted in the slots or grooves of cylinder 34 and having shanks adapted to engage the slots or grooves in cylinder 35, a cylindrical cam plate 29 adapted to support at its upper end cams 38, cams 38 mounted on the head 39 of the dog 40, the latter being adjustably mounted in the upper end of cam plate 29 said cams being adapted to force the shank of the needles downward, an annular cam ring 33 mounted between the needle plates 34 and 35, cams 37 mounted on the outer surface of cam ring 33 and adapted to force the shank of the needle upward, gears 30 and 32 rigidly mounted on shaft 31 and respectively engaging the toothed lower surfaces of cam rings 29 and 33 and adapted to rotate them in unison, substantially as and for the purpose specified.

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

WILLIS A. INGALLS.

Witnesses:

L. BERNARD WARE,
EDITH PETERS.