Aug. 23, 1927. 1,639,927

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METHOD AND MEANS FOR WARPING YARN

Filed Jan. 31 1927 2 Sheets-Sheet 1

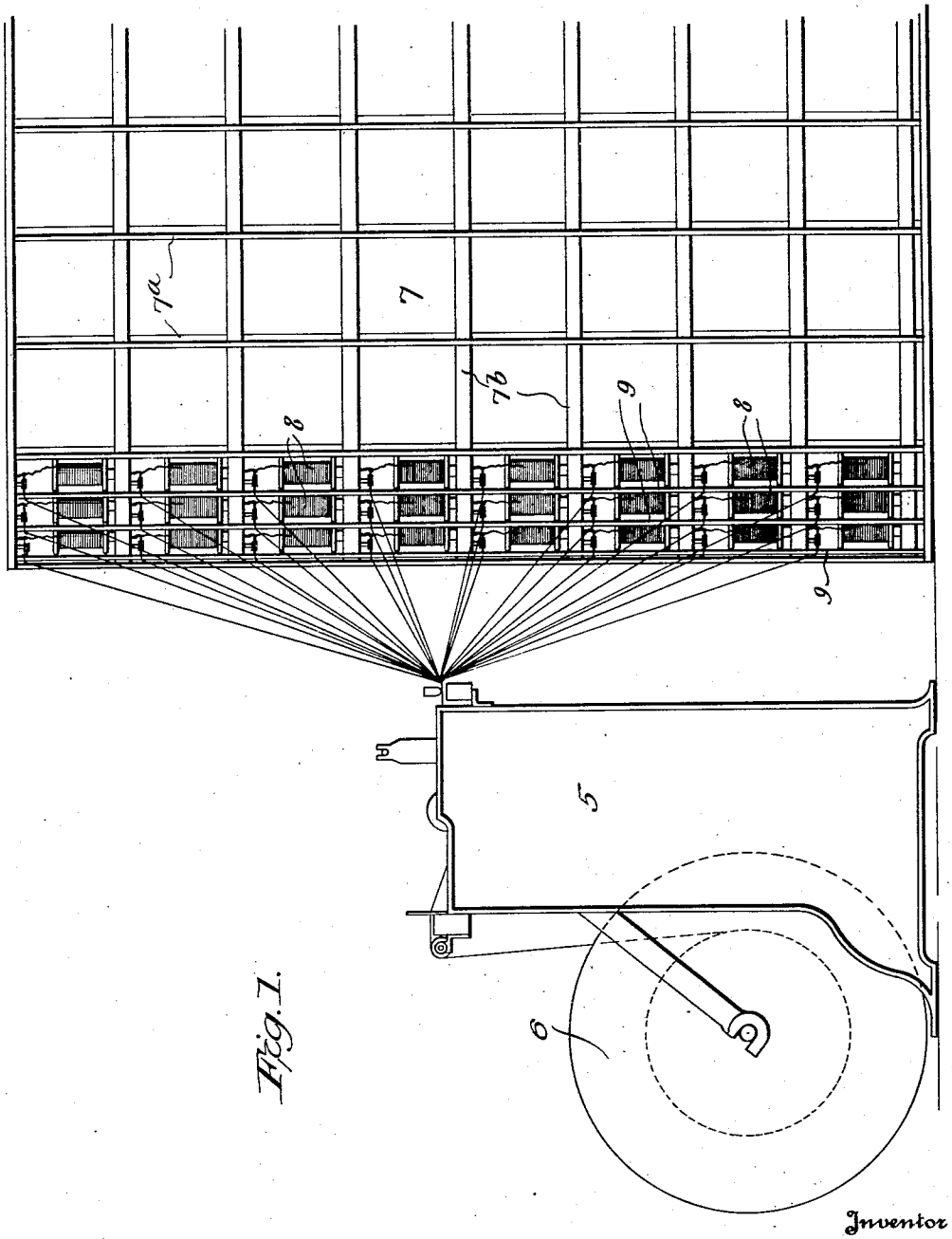


Fig. 1.

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Fig. 2.

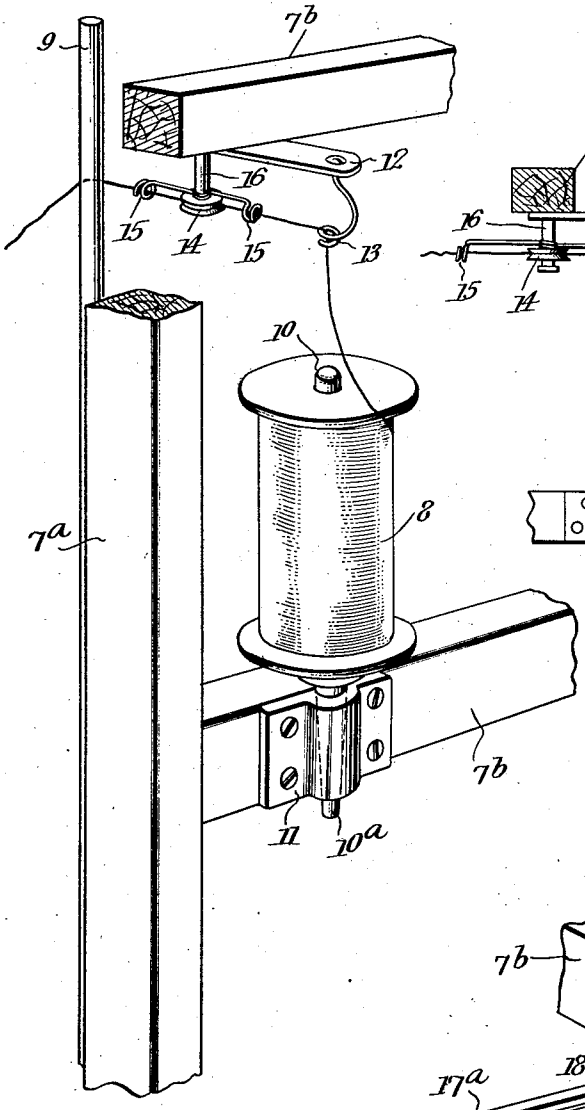


Fig. 3.

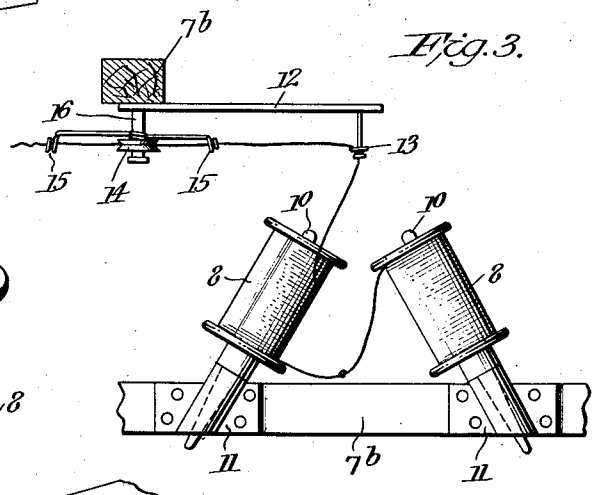
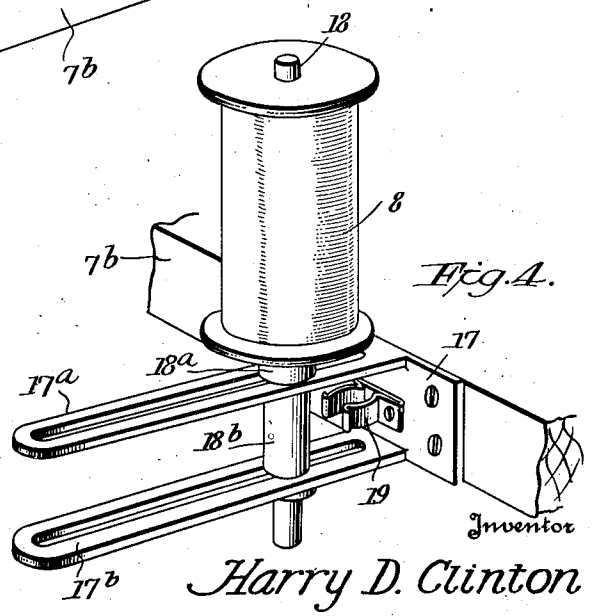


Fig. 4.



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UNITED STATES PATENT OFFICE.

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METHOD AND MEANS FOR WARPING YARN.

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This invention relates to the art of warping, i. e., the operation of simultaneously winding a multiplicity of yarn strands onto a beam cylinder or ball warp from warping spools arranged on a creel, preparatory to weaving fabrics. It aims to provide an improved method and means for warping at high speed.

An important object of the invention is to provide an improved method of high speed warping from ordinary flat-headed yarn spools, which will eliminate the necessity for costly special machinery or apparatus and equipment required in high speed warping according to the particular methods heretofore known.

A further object of the invention is to provide simplified and inexpensive means for carrying the improved method into practice, which may readily be applied to or substituted for a part of the ordinary mill equipment at very moderate cost.

In warping from yarn spools by the old method which is commonly adopted in preference to purchasing the costly equipment for high speed warping according to known methods, the operation is restricted to comparatively low speeds because of the danger of yarn breakage under the increased frictional factors and tensional strains resulting in unwinding or unloading from the spools at higher speeds. In this ordinary method of low speed warping, a series of spools (in number depending upon the number of strands to be wound onto the beam cylinder) are revolubly supported on a creel-rack where they are unwindingly rotated by the pull of the yarn strands drawn therefrom onto the rotatably driven beam-cylinder. Even in low-speed operation, the frictional factors and pulling strains on the yarn constantly increase with the acceleration of spool rotation as the diameters of yarn windings thereon decrease in unloading onto the beam cylinder and such strains on the yarn must be continuously relieved or operation must be retarded in order to reduce the breakage factor. In spite of such precautions, breaks in the yarn frequently result, making it necessary repeatedly to stop the warper and mend the breaks in order to avoid the occurrence of loose ends on the warper beam. The speed of operation according to the ordinary method is therefore limited to the critical speeds at which the yarn will tend to break and warping by such method has necessarily been restricted to about seventy-two yards per minute.

Only two methods of high-speed warping have heretofore met with any appreciable success commercially, but each of these methods requires the use of costly apparatus or special machinery, rendering them objectionable or commercially impracticable from the economic standpoint.

One of said methods covers the operation of spooling as well as warping. In the warping operation, the spools are anti-frictionally supported on a specially constructed creel enabling the yarn to be drawn therefrom at a rate of approximately three hundred yards per minute, but special automatic braking mechanism is required for immediately stopping the warper and spool rotation in event of breakage of the yarn and the method is open to much the same objection as the ordinary low-speed method commonly in use, since the spools must be rotated in order to draw the yarn therefrom and the speed of operation with such apparatus is likewise limited to a rate at which the yarn will tend to break under frictional factors and tensional strains in unwinding from the spools. The cost of the specially constructed creel and appurtenant equipment for warping according to this method renders it commercially impracticable.

The other of said methods calls for a peculiar preliminary winding of yarn onto specially constructed cones, from the apexes of which the yarn is drawn during the warping operation without effecting rotation of the cones. The preliminary winding operation embodying this method requires special machinery for the purpose, and while the warping operation may be accomplished at a high rate of speed approximating 225 yards per minute, the expense of such operation is greatly increased by the cost of the special machinery for first winding the yarn onto the cones, so that this method also is commercially impracticable.

The present invention provides an improved method and means for high-speed warping of yarn from the ordinary flat-headed yarn spools with which most textile mills are fully equipped, i. e., from the spools which are commonly used in the usual low speed warping operations. According to this method, warping may be accomplished at very little expense and at a rate

of speed substantially twice as great as that at which it is accomplished by either of the aforementioned high-speed methods, i. e., at a rate of speed approximating 600 yards per minute.

The invention will be best understood by further reference to the accompanying drawings illustrating simplified means and modifications thereof for carrying the improved method into effect.

In said drawings:

Fig. 1 is a side elevation of a warper machine and associated creel-rack, illustrating the disposition of yarn spools on the latter with the yarn being drawn off the spools according to the improved method embodying this invention;

Fig. 2 is an enlarged perspective fragmentary view of a portion of the creel-rack showing a single spool with means for drawing the yarn therefrom according to my improved method;

Fig. 3 is a perspective view illustrating a novel arrangement of spools with means for effecting a continuous feed of yarn in warping according to the method embodying this invention; and

Fig. 4 is a perspective view of a modified form of means for supporting a spool on a creel-rack.

Referring to the drawings, 5 denotes a warper machine having a rotatably driven beam-cylinder 6 onto which the desired number of ends or strands of yarn from yarn spools on a creel-rack are to be wound. Said machine may be of any suitable type and construction, no particular type being required, although a machine equipped with beam-doffer, stop-motion mechanism, breakage-recorder, etc., is preferred.

In combination with the warper 5 is represented a creel-rack 7 in this instance comprising open sections arranged in V-shaped relation and having yarn spools 8 shown supported thereon in tiered series, together with means for effecting high-speed warping from the spools according to the improved method embodying this invention. The illustrated creel-rack sections comprise vertical and horizontal frame members 7^a and 7^b respectively in number depending upon the size and construction of the rack. Angle-brackets or other means (not shown), may be used for reinforcing the structure. At suitable intervals along each section of the rack, the usual bars or rods 9 are spaced for tensioning and guiding the yarn strands in converging lines from the spools to the back comb-member of the warper in a manner well known to those familiar with the art.

In practicing the improved method of high-speed warping embodying this invention, it is contemplated that the ordinary or commercial yarn spools will be used, that is, yarn spools of the type having hard flat heads of substantially greater diameter than the barrels, as distinguished from bobbins having cone-shaped or beveled heads of only slightly greater diameter than the barrels. While no special type of spool other than of standard dimensions (i. e., a head of 4 inch and a barrel of 1½ inch diameter respectively) is required for the effective practice of the improved method, yarn spools having flat hard-fibre heads of diameter exceeding that of the barrel by only two and a half inches are preferred, as they afford better results and will not tend to tension, snag or catch the yarn upon frictioning thereover.

In the present instance, the warping spools are shown disposed in vertical tiers running longitudinally of the rack sections and in fixable relation to associated means adapting the yarn to be drawn off the ends of the spools over the heads thereof substantially in the direction of their length or along lines substantially in the line of their axes, rather than at right angles to their axes as in the ordinary method requiring rotation of the spools in order for the yarn to be drawn therefrom.

One form of simplified means for supporting the spools on the creel-rack, and associated means for drawing the yarn therefrom according to this invention is represented on an enlarged scale in Fig. 2. In said figure, an ordinary flat-headed yarn spool 8 filled with yarn from the spooling operation, is shown slipped over one of the axis-pins 10 by which a plurality of such spools are individually and idly supported in spaced relation on the creel-rack. Said axis-pins are formed with peripheral enlargements providing base rests for the spools and are designed for interchangeable engagement with means fixed on the said rack for rigidly holding the pins with the spools in position thereon. In this instance, said pins are formed with tapered shank-portions 10^a adapted to snug fit in appropriate holding means therefor.

Holding means for said axis-pins is represented by a bracket-member 11 having an enlarged body-portion taperingly recessed to receive the correspondingly tapered shank-portions 10^a thereof, which preferably extend through said brackets sufficiently to be tapped out of place in the event of becoming too firmly seated therein. The stationary axis-pins and holding means therefor, provide rigid non-rotating supports for the spools which may readily be removed therefrom along lines substantially in alinement with the lines along which the yarn is drawn from the spools during the warping operation.

Opposing the projected end or head of each of the spools as supported on the rack, is provided means represented by the bracket or arm 12 carrying a pig-tail eyelet or

porcelain guide 13, through and from which the yarn is drawn directly from the spool, said means or arm being adjustable to position for holding said eyelet in line with the spool axis and in spaced relation to the spool head, the distance between the eyelet and head being preferably about six inches.

Adjacent the eyelet 13 associated with each spool and preferably in the same horizontal plane therewith, is provided a tensioning device 14, shown in this instance comprising opposed disc members yieldingly pressed together under variable weight or tension, between which the yarn strand is passed and slightly tensioned as it is drawn from the spool to the beam-cylinder through the "take-off" eyelet 13.

Shown in alinement on opposite sides of each of the tensioning devices 14, are provided pig-tail guides or porcelain eyelets 15 through which the yarn strands are guided in passing to and from said tensioning devices.

In the present instance, the yarn tensioning devices 14 and eyelets 15 are supported on screw-bolts or pins 16 by which the arms or brackets 12 with eyelets 13 are held adjustably in position in spaced relation to the respective spool heads.

Simplified means for the high-speed warping of yarn off of the ends of yarn spools in the direction of their length or along lines substantially in line with their axes is thus provided, the leading ends of the yarn strands on the respective spools in position on the creel being passed through their associated "take-off" eyelets 13 and tensioning means 14 between the guides 15 and thence around an adjacent one of the series of spaced guide-bars 9 in proper relation to and through the comb-members of the warper machine 5, where they are then connected to the beam-cylinder 6 for warping thereonto in the well known manner.

As the yarn strands are drawn rapidly from the spools through the eyelets 13 to the beam-cylinder, they describe globular cones around the ends or heads of the spools with the eyelets 13 at the apexes thereof and do not touch the peripheries of the spool heads, except when drawing the yarn from the extreme outer ends of the spools. In this manner the yarn may be continuously drawn from the spools with materially less tension on the yarn than when drawing it from rotating spools. Furthermore, the tension on the yarn does not materially increase as the spools are exhausted, so that the tension thereon remains substantially constant. For such reason, it is sufficient to place merely a slight tension upon the yarn by tension means such as 14 before the yarn passes around the guide-bars 9 to the warper machine. The tension once set, will not vary materially in operation as would be the case in warping from revolving spools, wherein the spools impose a substantially greater and steadily increasing tension upon the yarn. Therefore, the tension means 14 should be adapted to adjustment for varying the tension on the yarn according to working requirements, in order merely that it may be drawn taut from around the bars 9 to the warper machine.

By the improved method and means herein described, the operation of warping yarn from yarn spools may be accomplished at such a high rate of speed that the spools will be quickly exhausted of their yarn, making it necessary periodically to stop the warper in order to "tie-in" replacement spools of yarn unless means is provided for effecting a continuous feed of the yarn from the spools.

One form of arrangement of means for continuously feeding the yarn from the spools to the beam-cylinder according to the method embodying this invention is illustrated in Fig. 3. In this figure, a pair of warping spools 8 are shown supported on axis-pins 10 inclined with their axes extending along lines converging to a common point at which a "take-off" eyelet or guide 13 is held in position by an arm 12, together with associated tensioning and guiding means 14 and 15 such as previously described. The terminating end of the yarn on one spool is shown connected to the leading end of the yarn on the other spool, while the leading end of the yarn on the first mentioned spool is shown extending through the eyelet 13 and tensioning means 14 between the guides 15 from which it passes around one of the guide-bars 9 and then to the warper machine for connection to the beam-cylinder as hereinbefore described. By such arrangement of the described means, the yarn may be drawn off the ends of the spools successively from a common point, that is, through the "take-off" eyelet 13 to the beam-cylinder of the warper according to the improved method of high-speed warping embodying this invention. Since the terminating end of the yarn on one spool is connected with the leading end of the yarn on the other, it is obvious that when the yarn from the one spool is exhausted, the supply will be transferred and continued from the other, whereupon the exhausted spool may be replaced with a full spool of yarn, the leading end of the yarn on the replacement spool being connected with the terminating end of the yarn on the supplying spool.

If desired, a plurality of yarn spools in series may be similarly arranged with their axes extending to a common eyelet 13, the terminating end of the yarn on the first spool of the series being connected with the leading end of the yarn on an adjacent spool and so on successively through the

series, while the leading end of the yarn on the spool first in series is extended through said common eyelet and connected to the beam-cylinder as previously stated, thus providing what may appropriately be called a "magazine-feed." Obviously the yarn will be drawn continuously off the ends of the series of spools from said eyelet 13 successively as the yarn from a preceding spool in the series is exhausted. A novel and simple arrangement of means for continuously feeding yarn for high-speed warping from spools according to the herein described method is thus provided.

In some cases, it may be convenient to have the yarn spools engageable over and removable from their axis-pins at points off-set or remote from the "take-off" eyelets 13, rather than from points below or in line with said eyelets as in the case of the particular form of holding means for said pins hereinbefore described. In Fig. 4 a modified form of holding-means for the axis-pins is illustrated. In said figure, a bracket-member 17 is shown comprising a main body portion having substantially parallel slotted arm-portions 17^a and 17^b extending therefrom. Movable along and between said slotted arm-portions of the bracket-member is shown a modified form of axis-pin 18 having annular enlargements or sleeve members 18^a and 18^b provided on the lower shank portion thereof to prevent vertical displacement in the bracket. Axis-pins movable longitudinally along slotted arm-portions of holding means of the form of the brackets 17, provide supporting means for the spools movable along lines substantially at right angles to the direction in which the yarn is drawn from the spools. Fixed to the main body-portion of the bracket 17 is shown a spring-clamp 19 for releasably engaging and holding the pin with yarn spool in fixed position in alinement with the eyelet 13 through which the yarn is drawn from the spool. Obviously, in the use of supporting means of this character, the spools may be removed from or placed on the axis-pins at points off-set or remote from the "take-off" eyelets 13 simply by drawing the spools away from position in alinement with the eyelets, thus assuring against striking or pressing the latter out of place, and the convenience of such an arrangement will be readily appreciated.

The value and importance of the herein described improved method and means for high-speed warping of yarn from flat-headed spools and the advantages over various methods and means heretofore known and used, will be readily appreciated. Numerous experiments have shown that by the improved method and means disclosed, yarn may be drawn from the spools at a rate of speed approximating 600 yards per minute without causing any breaks in the yarn, whereas the methods and means for high-speed warping heretofore known and used have not successfully accomplished the warping operation at greater speeds than approximately 300 yards per minute. High-speed warping according to this method may therefore be accomplished with great saving in time, labor and expense, apart from the fact that the cost of the equipment for practicing the same is negligible in comparison with the cost of equipment for practicing the high speed methods heretofore known.

The improved method and means embodying this invention is shown and described with reference to warping onto a beam cylinder, but is applicable also to warping onto a ball warp or chain warp. Therefore, the words "beam cylinder" as used in the following claims, are intended to include also the operation of warping onto ball warps or chain warps, or other warping element.

Further, the improved method and means embodying this invention for drawing yarn from ordinary warping spools is claimed with reference to the operation of warping only, as distinguished from unrelated practices of unwinding twine or thread from supply bobbins or spools, wherein the feeding strand is passed over a guide or through a "flyer" intermediately of the point where it leaves the loaded barrel and the point at which it is drawn from the latter.

While the yarn spools have been illustrated in both vertical and inclined disposition on the creel-rack with the "take-off" eyelets 13 spaced thereabove, they may be arranged horiontally or held dependingly from the rack with said eyelets and associated guide and tensioning means placed in similar relation thereto, permitting warping off the ends of the spools in other positions with equal facility. Obviously the invention is not limited to the specific arrangement shown and described, since various arrangements or combinations and sub-combinations of elements and equivalents thereof may be employed without departing from the spirit and scope of the invention. Therefore, it is not intended that the invention shall be limited by the appended claims to the specific construction and arrangement shown and described.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. The improved method of high speed warping onto a beam cylinder from ordinary warping spools having flat heads, characterized by drawing the yarn directly off of the spools past fixed points spaced from the spools without rotating the latter.

2. The improved method of high speed warping onto a beam cylinder from ordinary warping spools having flat heads, char-

acterized by drawing the yarn off of the spools directly over the heads thereof along lines substantially in line with the axes of the spools past points spaced from the ends of the spools.

3. The improved method of high speed warping onto a beam cylinder from ordinary warping spools having flat heads of substantially greater diameter than the spool barrels, which consists in drawing the yarn off of the spools directly over the heads thereof along lines substantially in line with the axes of the spools by points spaced from the ends of the spools.

4. The improvement in the art of high speed warping of yarn onto beam cylinders from ordinary warping spools having flat non-beveled heads of substantially greater diameter than the spool barrels, which consists in drawing the yarn off of the spools directly over the heads thereof past points spaced from the ends of the spools and substantially in line with the axes of the spools.

5. The method of continuously feeding yarn in a high speed warping operation from ordinary warping spools according to claim 1, characterized by arranging a plurality of such spools so that their axes extend along lines converging to a common point, connecting the terminating end of the yarn on one spool with the leading end of the yarn on another spool and connecting the leading end of the yarn on the first named spool through said common point with means whereby the yarn is drawn off the ends of the spools successively from said common point.

6. The method of continuously feeding yarn in a high speed warping operation from ordinary warping spools according to claim 2, characterized by arranging a plurality of such spools so that their axes extend along lines converging to a common point and with the heads thereof substantially equi-distant from said point, connecting the terminating end of the yarn on one spool with the leading end of the yarn on another spool and connecting the leading end of the yarn on the first named spool through said common point with means whereby the yarn is drawn off the ends of the spools successively from said common point.

7. The method of continuously feeding yarn in a high speed warping operation from ordinary warping spools according to claim 2, characterized by arranging a plurality of such spools so that their axes extend along lines converging to a common point and with the heads thereof substantially equi-distant from said point, connecting the terminating end of the yarn on the first in series of the plurality of spools with the leading end of the yarn on an adjacent spool and so on successively through the series, and connecting the leading end of the yarn on said first spool of the series through said common point with means whereby the yarn is drawn off the ends of the series of spools successively from said common point as the yarn from a preceding spool in the series is exhausted.

8. In combination with a creel board and warper machine for warping yarn onto a beam cylinder from ordinary warping spools having flat heads, means for drawing the yarn off of the spools directly over the heads thereof along lines substantially in line with the axes of the spools past points spaced from the ends of the spools.

9. In combination with a creel-rack and warper machine for warping yarn onto a beam cylinder from ordinary warping spools having flat heads of substantially greater diameter than the spool barrels, means for drawing the yarn off of the spools directly over the heads thereof along lines substantially in line with the axes of the spools past points spaced from the ends of the spools.

10. In combination with a creel-rack and warper machine for the high speed warping of yarn onto a beam cylinder from ordinary warping spools having flat non-beveled heads, the improvement which consists in means for drawing the yarn off of the spools directly over the heads thereof past points spaced from the ends of the spools and substantially in line with the axes of the spools.

11. In combination with a creel board and associated means according to claim 8 for warping yarn from warping spools, means for removably supporting the spools upon non-rotating axis pins movable with the spools along lines substantially at right angles to the direction from which the yarn is drawn from the spools.

12. In combination with a creel board and associated means according to claim 8 for warping yarn from warping spools, means for supporting the spools upon non-rotating axis pins permitting removal thereof along lines substantially parallel with the lines along which the yarn is drawn from the spools supported thereon.

13. In combination with a creel board and associated means according to claim 8 for warping yarn from warping spools, the improved means for carrying axis pins for supporting the spools, comprising brackets having substantially parallel extended slotted arm-portions between which the pins are movable longitudinally thereof, and releasable means for holding the pins in fixed position on said brackets.

In testimony whereof I affix my signature.

HARRY D. CLINTON.