March 13, 1928. 1,662,649

F. C. WERBER

THREAD SPINNING AND TWISTING MACHINE

Filed Dec. 13, 1926 6 Sheets-Sheet 1

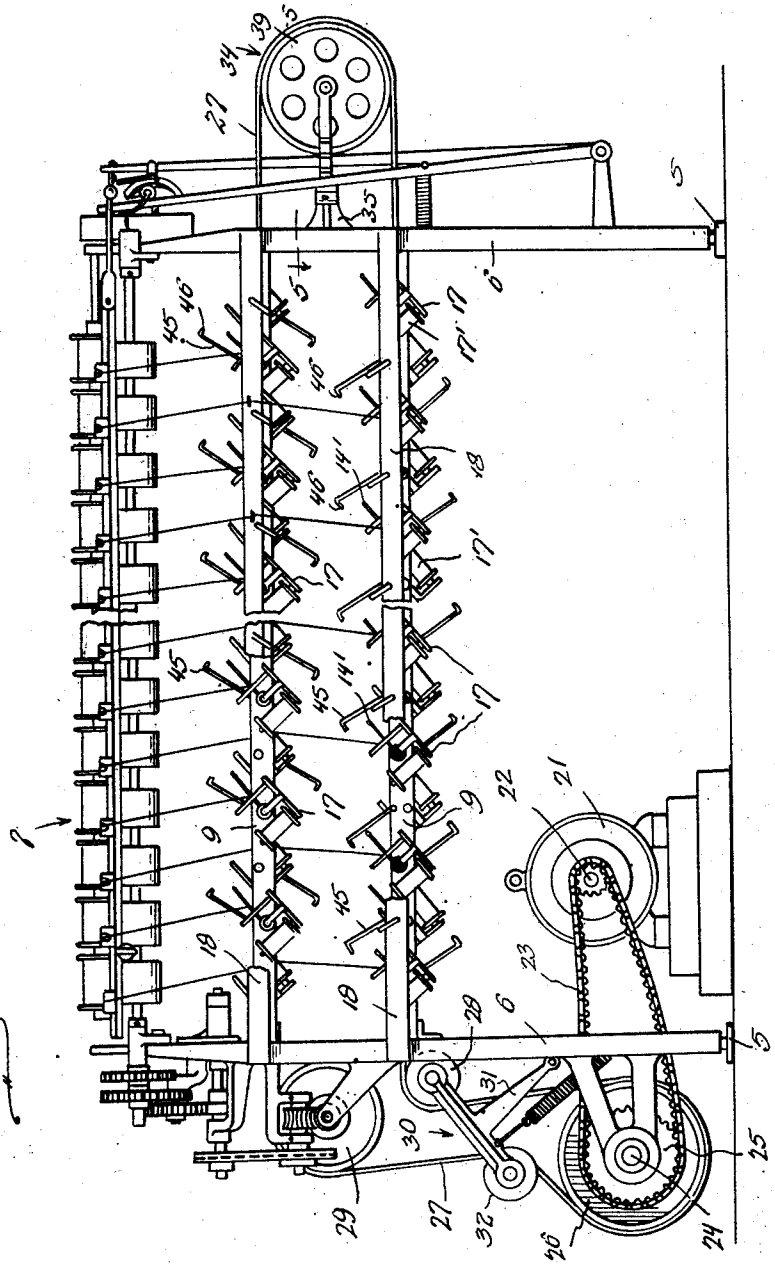


Fig. 1.

Inventor
F. C. Werber,

By Clarence A. O'Brien
Attorney

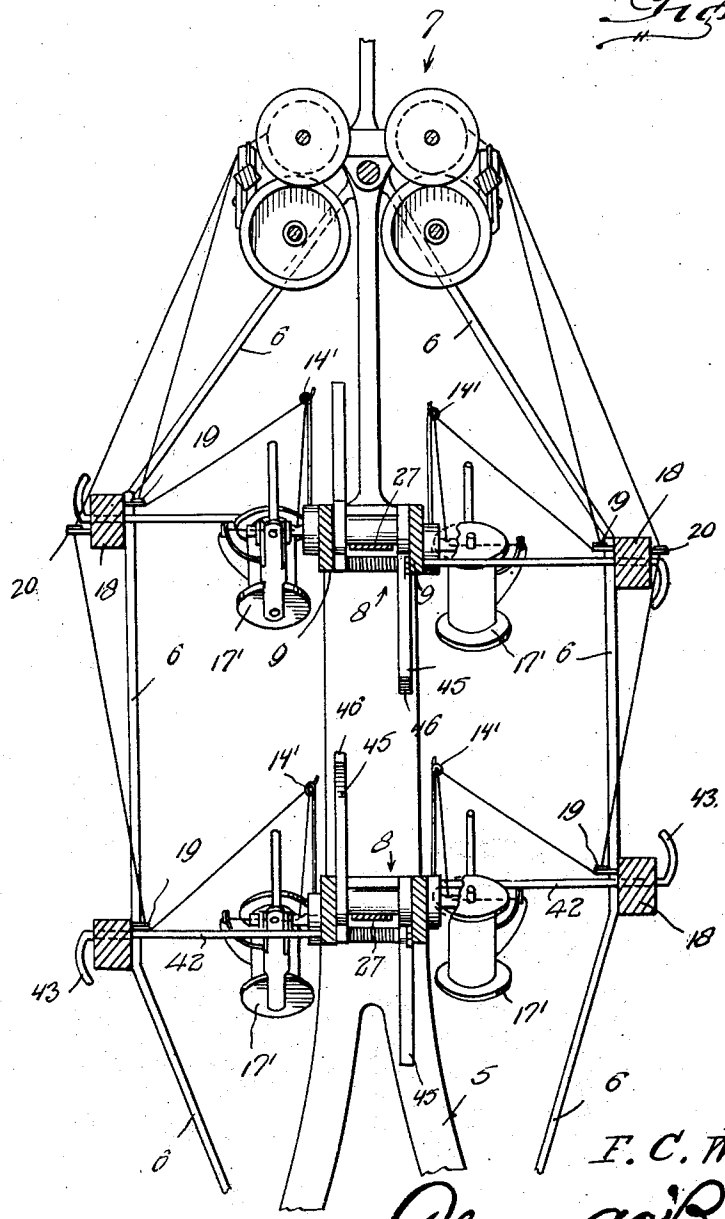
March 13, 1928. 1,662,649

F. C. WERBER

THREAD SPINNING AND TWISTING MACHINE

Filed Dec. 13, 1926 6 Sheets-Sheet 2

Fig. 2.



Inventor
F. C. Werber;
By Clarence A. O'Brien.
Attorney

March 13, 1928. 1,662,649

F. C. WERBER

THREAD SPINNING AND TWISTING MACHINE

Filed Dec. 13, 1926 6 Sheets-Sheet 3

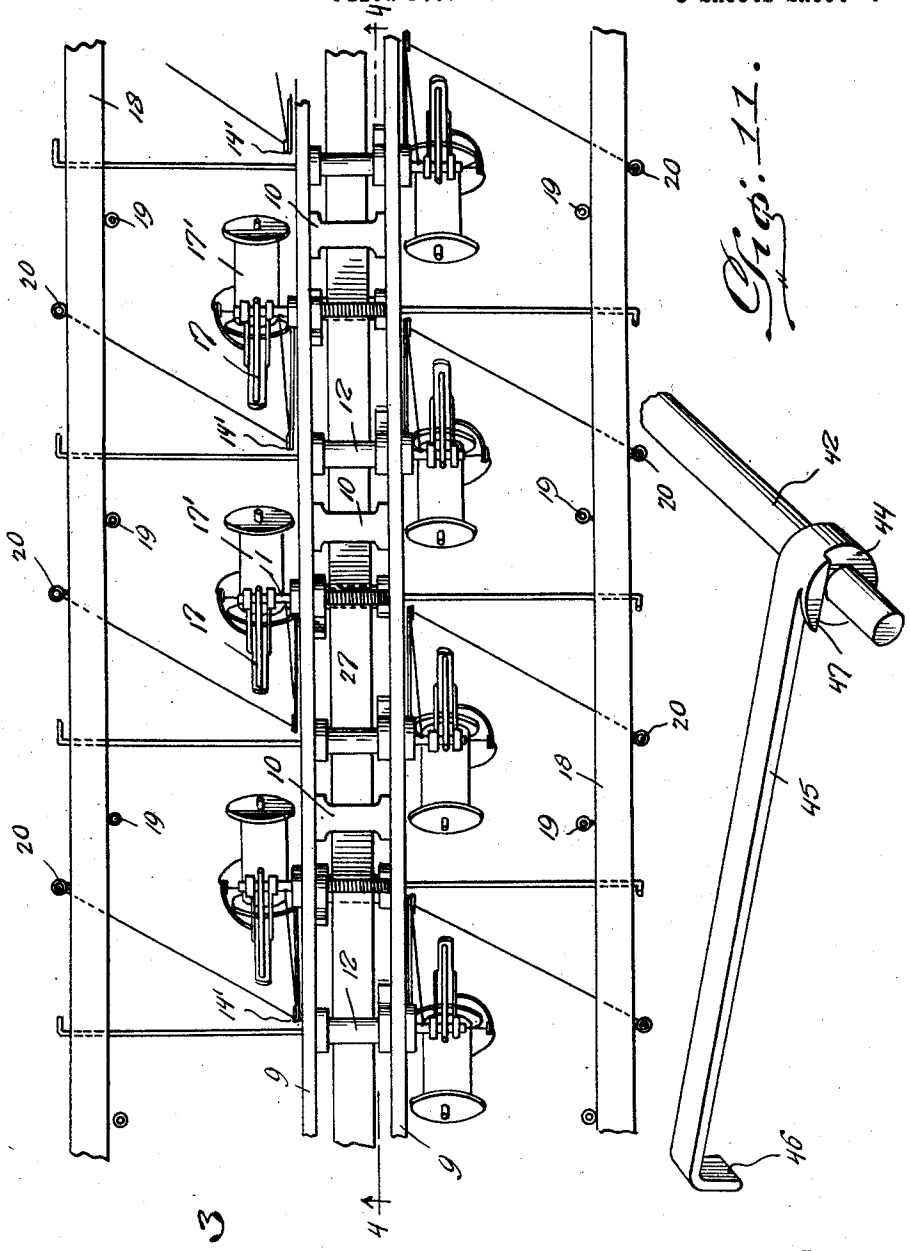


Fig. 11.

Fig. 3

Inventor
F. C. Werber,
By Clarence O'Brien
Attorney

March 13, 1928. 1,662,649

F. C. WERBER

THREAD SPINNING AND TWISTING MACHINE

Filed Dec. 13. 1926 6 Sheets-Sheet 4

Fig. 4.

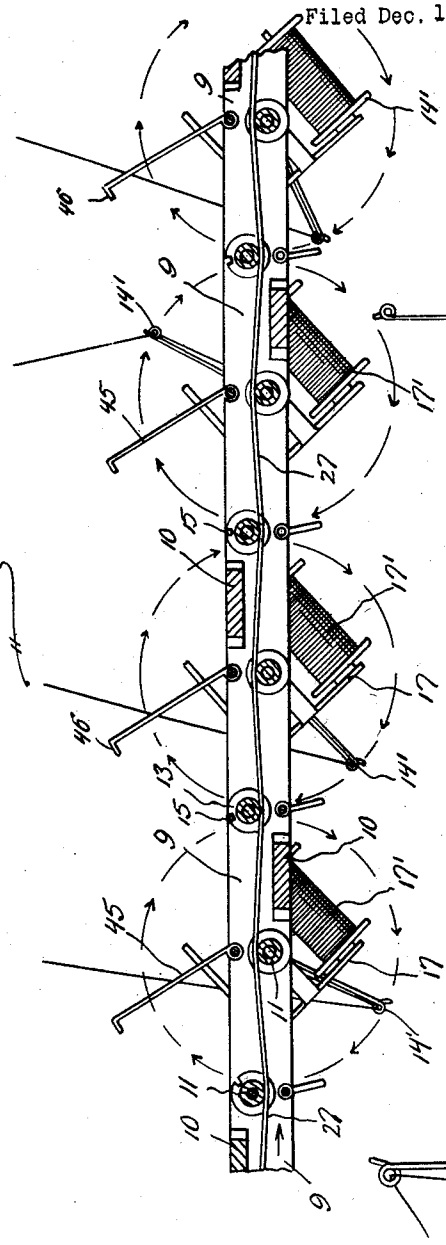


Fig. 10.

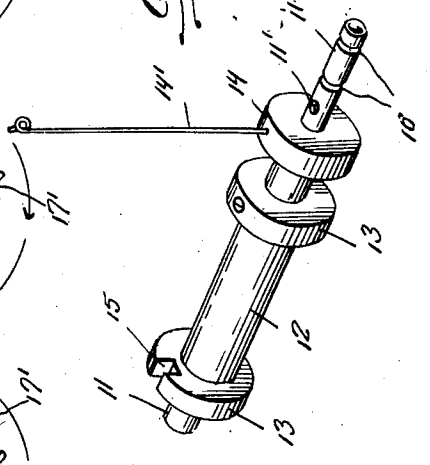
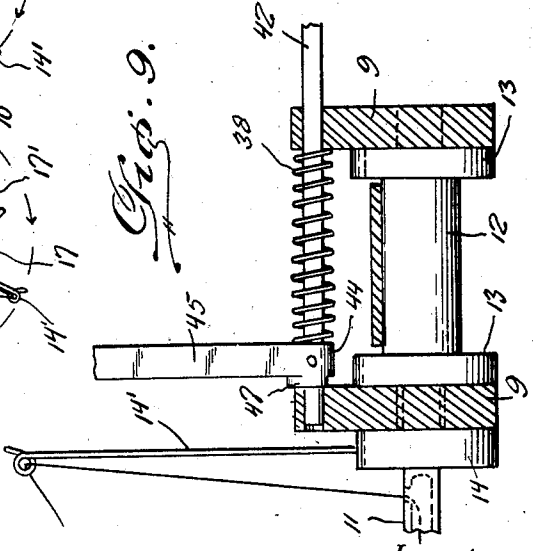


Fig. 9.



Inventor
F. C. Werber,

By Clarence A. O'Brien
Attorney

March 13, 1928. 1,662,649

F. C. WERBER

THREAD SPINNING AND TWISTING MACHINE

Filed Dec. 13, 1926 6 Sheets-Sheet 5

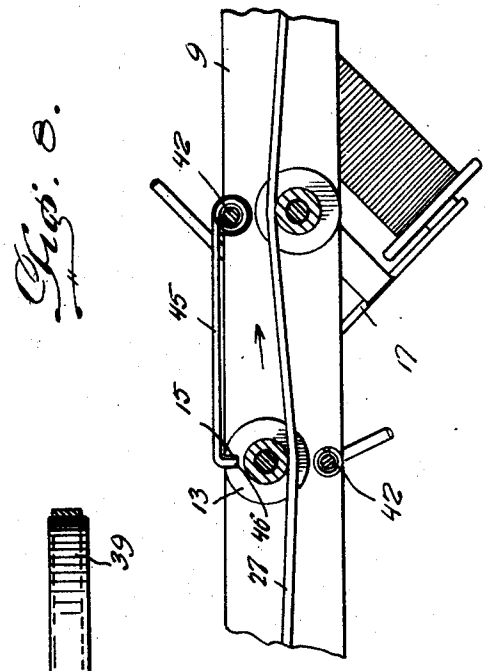


Fig. 8.

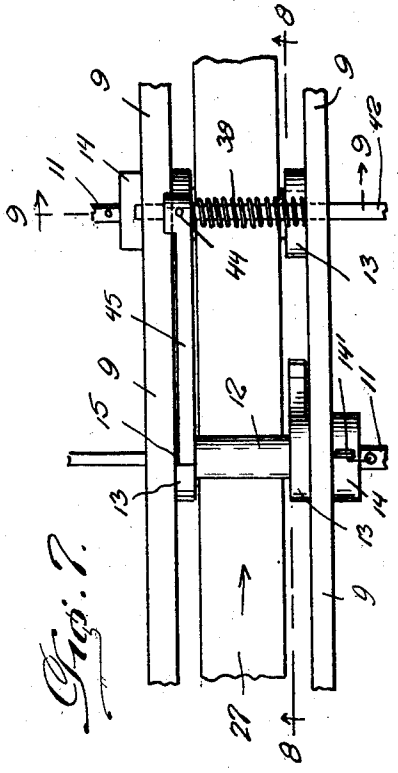


Fig. 7.

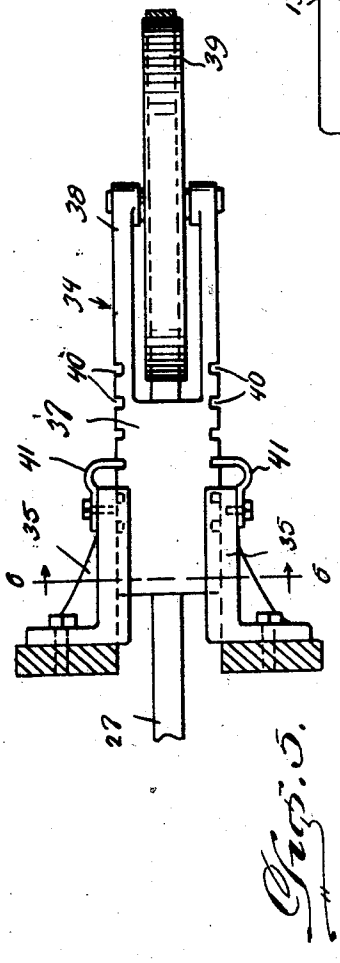


Fig. 5.

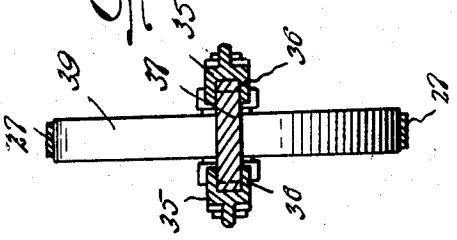


Fig. 6.

Inventor
F. C. Werber,
By Clarence A. O'Brien
Attorney

March 13, 1928. 1,662,649

F. C. WERBER

THREAD SPINNING AND TWISTING MACHINE

Filed Dec. 13, 1926 6 Sheets-Sheet 6

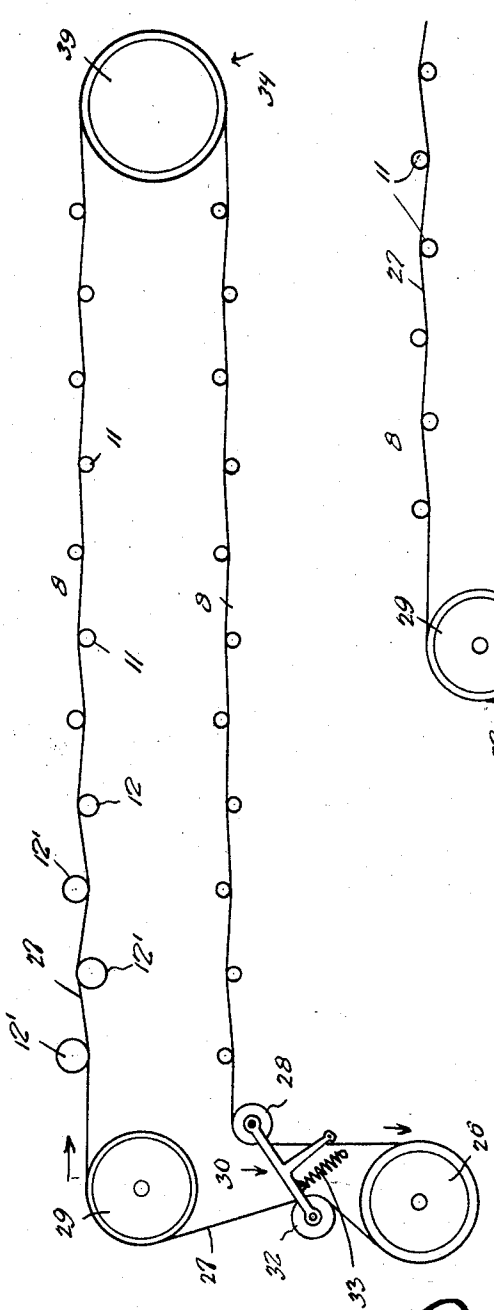


Fig. 12.

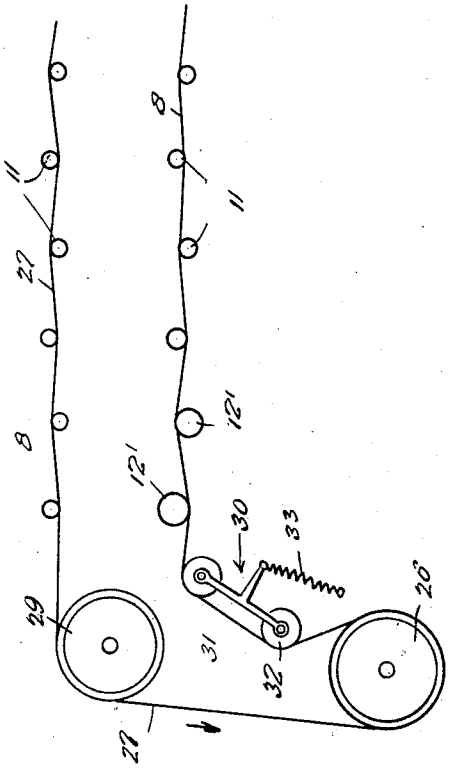


Fig. 13.

Inventor
F. C. Werber,
By Clarence O'Brien
Attorney

Patented Mar. 13, 1928. 1,662,649

UNITED STATES PATENT OFFICE.

FRED C. WERBER, OF WILKES-BARRE, PENNSYLVANIA.

THREAD SPINNING AND TWISTING MACHINE.

Application filed December 13, 1926. Serial No. 154,577.

This invention relates to machines for use in the spinning and twisting of thread, and aims to provide such a machine that embodies all the broad principles of construction and operation of the textile spinning and twisting mechanism set out in my United States Letters Patent No. 1,569,831, as well as the specific principles of construction and operation of a flyer and saddle device shown and described in certain copending applications filed December 13, 1926, Serial No. 154,575 and filed December 13, 1926, Serial No. 154,576, respectively.

A main object of the invention is to provide such a machine that is equipped with a plurality of vertically spaced longitudinal decks of spinning and twisting units, each deck consisting of two series of units at opposite sides of the machine, all of which units are operated by a single, centrally disposed belt drive, the relation of the belt with respect to the unit being such that the spindles of the units are rotated in a similar direction regardless of the direction of travel of the belt runs. By reason of this relation between the belt and spindles a positive drive of all of the unit spindles is secured.

A further object resides in the provision of such a machine wherein but a single thread take up mechanism is required for the multiple series of spinning and twisting units at each side of the machine, such take up being in relatively great spaced relation with their complementary series of units thus increasing the area of the thread spinning and twisting action, it being well known that such action is performed entirely between the thread delivery bobbin and the take off spool of the take up mechanism.

The invention further aims to provide a manually and automatically controlled belt compensating mechanism at opposite ends of the machine so that unusual slack may be taken up manually, while normal slack will be automatically compensated for with the end in view that the unit spindles are positively driven at substantially the same speed. The automatic compensator is such that the position of the same may be reversed for acting upon the belt during operation thereof in different directions.

It is a still further object to provide means complementary to each spinning and twisting unit whereby the operation of any one of the units may be cut out without interfering with the other units for obviously permitting of the replenishing of the delivery thread, the removal or replacement of the unit saddle, or the reconnection of the thread with the take off should the thread become broken. The cut out mechanism of each unit is such that the spindle and its flyer in stopped position will be such as to permit of the proper disposition of the thread through the spindle and through the flyer.

An additional object resides in the provision of gradually increasing sizes of spindle drive pulleys at the let off end of the drive belt so that these spindles will be positively operated and the driving action of the belt at the let off end thereby saved.

Other objects will become apparent as the nature of the invention is better understood, the same comprising the novel form, combination, and arrangement of parts hereinafter more fully described, shown in the accompanying drawing and claimed.

In the drawing wherein like reference characters indicate corresponding parts throughout the several views:

Figure 1 is a side elevation of a thread spinning and twisting machine constructed in accordance with the present invention.

Figure 2 is an enlarged vertical section thereof.

Figure 3 is an enlarged fragmentary longitudinal horizontal section for disclosing one of the decks of spindle units in top plan.

Figure 4 is a detail longitudinal vertical section taken substantially upon the line 4—4 of Figure 3 and looking in the direction of the arrows in said figure.

Figure 5 is an enlarged fragmentary longitudinal horizontal section more clearly disclosing the manually controlled belt compensator at one end of the machine.

Figure 6 is a transverse section of said

compensator taken substantially upon the line 6—6 of Figure 5.

Figure 7 is an enlarged fragmentary plan view of the lower unit deck somewhat similar to Figure 3 disclosing one of the unit spindles in stopped condition, and this by reason of the cut out device complementary thereto.

Figure 8 is a longitudinal section taken substantially upon the line 8—8 of Figure 7.

Figure 9 is a transverse section through the deck taken substantially upon the line 9—9 of said Figure 7.

Figure 10 is a perspective of one of the unit spindles and its complementary flyer.

Figure 11 is a perspective of the stop arm end of one of the cut out devices, one of which is complementary to each spinning and twisting unit.

Figure 12 is a diagrammatic view of the unit spindles together with the central belt drive therefor, disclosing the spaced and staggered positioning of the unit spindles projecting through opposite sides of the unit decks and for disclosing the gradually increasing size or area of the spindle pulleys toward the let off side of the belt so that the driving power of the belt at its let off side will not be wasted.

Figure 13 is a fragmentary diagrammatic view similar to Figure 12 showing the positioning of the gradually increasing sizes of spindle pulleys toward the let off end of the belt when the direction of movement of the belt is the reverse from that disclosed in Figure 12, both Figures 12 and 13 disclosing the position of the automatic compensator during the operation of the belt in reverse direction.

Now having particular reference to the drawings, my novel textile spinning and twisting machine includes a frame structure generally but not specifically disclosed in the drawings. Said frame consists broadly of end supporting standards 5—5, at opposite sides of which are vertically extending strip-like metallic bars 6—6, the central portions of which are on a true vertical plane as disclosed in Figure 2, while the opposite ends thereof converge inwardly for attachment at their lower ends to said standards 5—5 and for the purpose of supporting at their upper ends a double take up mechanism indicated generally by the reference character 7, see Figures 1 and 2, said take up mechanism being of conventional construction. Extending longitudinally between the end standards 5—5 is a pair of spaced parallel decks of spinning and twisting units 8—8, the lower deck being preferably supported at its opposite ends by the end standards 5—5 while the upper deck is suspended from the take up mechanism 7. This take up mechanism is in spaced parallel relation with said decks as clearly disclosed in both Figures 1 and 2. Each deck of spinning and twisting unit is of identical construction and consequently a description of one will suffice for both.

Each deck consists of a pair of laterally spaced longitudinally extending and parallel flat-like rails 9—9 interconnected at their upper and lower edges by spacing blocks 10, said spacing blocks at the upper and lower edges of said rails being in staggered relation as clearly disclosed in Figure 4. Journaled through registering openings in said rails 9—9 adjacent the upper and lower edges thereof are transversely extending spinning and twisting unit spindles 11, the hollow thread receiving ends of said spindles at the upper edges of the rails 9—9 of said deck extending through the rail at one side of the machine, while such ends of the lower spindles project through the other rail at the opposite side of the deck, see Figures 2 and 3. Keyed to all of said spindles 11 within the rails 9—9 are belt pulleys 12 formed at their opposite ends with circular flanges 13—13 for the purpose of preventing any longitudinal movement of the spindles by reason of their contact with the rails 9—9 as in the cross sectional view, Figure 9. At the inner end of the portion of each spindle 11 that projects through the adjacent rail 9 there is rigidly mounted a flyer unit 14 preferably though not necessarily of the construction shown and described in my copending application, Serial No. 154.575, filed December 13, 1926.

The innermost flange 13 of each spindle pulley 12 is formed at its edge with a notch 15 that is in direct longitudinal alignment with the vertical thread supporting wire 14' of said flyer 14, see Figure 10.

Furthermore, the projecting end of each spindle 11 is formed with the usual pair of spaced circumferential channels 16—16 for the purpose of supporting the delivery bobbin carrying saddles 17 in such a manner as to prevent longitudinal movement of the saddles with respect to the spindles. These saddles 17 may be of the general construction shown herein, but are preferably of the construction shown and described in another of my copending applications, Serial No. 154.576 filed December 13, 1926.

Secured to the outer sides of the vertical portions of the frame bars 6—6 are guard rails 18, those at opposite sides of the machine frame being directly in front of the projecting ends of the spindles 11 at that particular side of the machine, see Figure 2. Complementary to each spinning and twisting unit of the pair of decks 8—8 at both sides thereof are pig tails 19 upon the inner sides of the guard rails 18, each pig tail being in substantially horizontal alignment

with its respective spindle, see again Figure 2.

As clearly shown and described in my Patent No. 1,569,831 and as suggested herein, the thread from each delivery bobbin 17' is arranged within the hollow end of its respective spindle 11 and thence extracted through an opening 11' in the spindle directly in front of its flyer 14'. The thread is thence extended upwardly and passed through the pig tail at the upper end of the flyer wire 14'. From this point the thread is led through the adjacent pig tail 19 upon the guard rail 18 for that particular series of spinning and twisting units. After passing through the guard rail pig tail the thread is then extended upwardly to its respective spool of the double take up mechanism 7, which take up mechanism consists of two series of spools at opposite sides of the machine frame, each series including spools of a number equivalent to the number of the spinning and twisting units at that particular side of the machine, see Figure 1.

For facilitating the proper extension of the thread strands from the lower series of spinning and twisting units at opposite sides of the machine, the uppermost guard rails 18—18 are provided at their outer surfaces with pig tails 20, the threads being led from the pig tails 19 of the lower guard rail outwardly between the guard rails at opposite sides of the machine and then through the pig tails at the upper rails, and from there to their respective spools of the double take up mechanism. By reason of the relatively great distance between the take up mechanism and the decks of spinning and twisting units, particularly those of the lower deck, a great spinning area is provided for the reason that, as previously stated, the twisting action occurs between the point of take off from the delivery bobbin to the receiving spool of the take up mechanism.

In carrying out the principle of operation of all of the units simultaneously, and this by reason of a single mechanism there is provided an electric motor 21, see Figure 1 disposed preferably between the end standards 5—5 one end of the armature shaft thereof being provided with a small sprocket gear 22 over which is trained an endless sprocket chain 23. Mounted within supporting brackets at the outer side of the adjacent end standard 5 is a stub shaft 24 provided with a larger sprocket gear 25, and a large pulley wheel 26. Said sprocket chain 23 is also trained over said larger sprocket wheel 25 for the purpose of driving the belt pulley carrying shaft 24. Trained over this belt pulley 26 is an endless belt 27, the runs of which extend upwardly for engagement over a small and large pulley wheel 28 and 29 respectively mounted at the end of the frame and slightly beneath the pair of spindle unit carrying decks 8—8. As clearly disclosed in Figures 2, 3, 4, 7, 8, 12, and 13, the upper and lower runs of this belt are extended longitudinally between the rails 9—9 of the respective decks 8—8, while said runs are arranged between and have frictional contact with the spindle pulleys 12 at the upper and lower edges of the rail of the decks so as to positively drive all the spindles simultaneously and in a similar direction regardless of the direction of travel of the belt. Located above the main drive pulley 26 of the belt power mechanism is an automatic belt slack compensator 30. This compensator consists of a T-shaped arm 31, one end of the cross member of which is pivoted to the shaft supporting the small frame attached belt pulley 28, while mounted upon the opposite end of said cross member is a pulley 32. When the belt 27 is traveling in the direction of the arrows in Figure 12, the arm will be so arranged that its associated pulley 32 will contact the outer surface of the outer belt stretch or runs, and pull inwardly thereon by reason of a coil spring 33 connected at its opposite ends to the cross member directly in back of the pulley 32 and to the adjacent end standard, see Figures 1 and 12. When the belt is operating in a reverse direction, as indicated by the arrow in Figure 13 the T-shaped arm 31 will be swung inwardly upon its pivot so that its associated pulley 32 will frictionally engage the inner run of the belt by reason of the same coil spring 33 interconnecting the end of the central member of the arm, and the supporting bracket for the pulley and sprocket gear carrying shaft 24.

This automatic compensator takes care of the normal slack in the belt 27, while provided for the purpose of compensating for unusual slack in the belt there is provided at the opposite end of the machine frame, a manually adjustable compensator designated generally by the reference character 34. This compensator consists of a pair of transversely aligned spaced L-shaped brackets 35—35, see Figures 5 and 6 that are anchored to the adjacent end of the machine frame directly between the spaced decks 8—8 and at opposides sides of the power belt 27. The horizontal portions of these brackets 35—35 are formed at their inner surfaces with longitudinal slots 36 within which are guided the opposite edges of a flat horizontally extending plate 37, the outer end of which is bifurcated as at 38 to permit of the attachment of a large belt pulley 39 to said plate 37 between its furcations, and over which is trained said belt 27. The opposite edges of the plate 37 are formed with longitudinally spaced notches 40 for receiving the ends of spring fingers

41—41 anchored to the ends of the brackets 35—35 for obviously maintaining the belt pulley carrying plate 37 in adjusted extended position. By releasing the spring fingers 41—41, the belt pulley carrying plate 37 may be pulled outwardly to the desired extent for applying the proper tension to the power belt 27.

In order that the operation of any predetermined one of the spinning and twisting units may be cut out, there is provided a stop mechanism complementary to each unit. Each of said stop devices consists of an elongated rod 42, the inner end of which is journaled through registering openings in the rails 9—9 of the particular deck 8. The rod 42 of the stop mechanism for a particular unit is journaled through openings in the rails directly above or beneath the spindle of the next adjacent unit as clearly disclosed in Figures 4 and 8. The outer end of the rod 42 extends through an opening in the adjacent guard rail 18, while the extreme outer end thereof projecting through said guard rail is provided with a right angular arcuate shaped turning handle 43 Figures 1 and 2. Rigidly mounted or formed upon the end of the bar 42 directly inwardly of the adjacent deck rail 9 is a circular head 44, Fig. 11, from the surface of which tangentially extends an elongated bar-like arm 45 that normally extends upwardly in an inclined manner in a direction toward the spindle of the particular unit the operation of which is to be cut out by reason of the particular stop device. The extreme outer end of the arm 45 is bent inwardly at right angles to provide a stop lug 46 for engagement within the notch 15 of the pulley flange 13 of that particular spinning and twisting unit. The inner surface of the head 44 is formed integrally at its periphery with a laterally extending lug 47 of segmental formation as disclosed in Figure 11. Surrounding the rod 42 between the head 44 and the remote deck rail 9 is an expansible coil spring 48, Fig. 9, that will cause the head 44 or lug 47 to frictionally engage the inner surface of the adjacent deck rail 9. Obviously, when the stop arm 45 of the particular unit is in elevated position as in Figures 4 and 9 the segmental lug 47 is in back of the adjacent guard rail 9 and maintained in such position by reason of the expansible spring 38. In order to swing the stop arm 45 from a spindle stop position as disclosed in Figures 7 and 8 to a spindle released position as disclosed in Figures 4 and 9 it is necessary for the operator of the machine to pull slightly outwardly upon the rod 42 against the action of the coil spring 38 so as to disengage the plane under surface of the lug 47 from the upper edge of the adjacent deck rail 9. In actual practice, the operator first breaks the rotation of any desired spindle by grasping the same with his fingers. The particular operating rod 42 of that spindle's cut out mechanism is then so turned as to swing the stop arm 45 in the direction of the spindle so that the end 46 of the arm will engage within the notch 15 of the pulley disposed upon the particular spindle being stopped. Immediately upon the engagement of the stop lug 46 of the particular arm within the notch 15, the lug 47 of the bar head 44 will be forced over the upper edge of the adjacent deck rail 9 by the expansion of the spring 38 and consequently the rod 42 as well as the arm 45 will be locked in spindle stopping position.

In order to employ to the greatest extent possible the power of the belt at the take off side of the belt, be it from the pulley 29 when the belt moves in the direction of the arrows in Figure 12 or from the pulley 28 when the direction of travel of the belt is as indicated by the arrow in Figure 13 I provide pulleys 12' for the spindles 11, preferably four in number and of gradually increasing diameter toward the let off side of the belt as in Figures 12 and 13. Of course the particular spindles with which said increased sizes of pulleys are associated will not rotate at the same rate of speed as the other spindles, but nevertheless the power of the belt at the take off side will be utilized to a certain degree for the production of a product different in character from that produced where the pulleys are of even diameter. In other words the thread acted upon by the flyer unit in connection with the pulleys of uniform diameter will be given a certain number of twists per predetermined length, while the threads acted upon by the flyer unit in connection with the pulleys of larger diameter will be given a less number of twists per predetermined length.

The specific operation and construction of the invention will be readily apparent to those skilled in the art when considering the accompanying drawings in association with the present specification, and even though I have herein shown and described the invention as consisting of certain detail structural elements, it is nevertheless to be understood that minor changes may be made therein without affecting the spirit and scope of the appended claims.

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

1. In combination, supporting means, a plurality of spaced, transversely arranged, horizontal belt pulleys carried by said supporting means, flyer units carried by the ends of certain of said pulleys and alongside one side of the supporting means, flyer units carried by the opposite ends of the alternate pulleys and alongside the other

side of the supporting means, and a belt stretch or run movable at right angles to and contacting with said pulleys.

2. In combination, supporting means, a plurality of spaced transversely arranged, horizontal belt pulleys carried by said supporting means, flyer units carried by the ends of certain of said pulleys and alongside one side of the supporting means, flyer units carried by the opposite ends of the alternate pulleys and alongside the other side of the supporting means, and a belt stretch or run movable at right angles to and contacting with said pulleys; the first mentioned pulleys or certain of the pulleys being arranged at one side of said belt stretch or run and the alternate pulleys being arranged at the opposite side of the belt stretch or run.

3. In combination, supporting means, a plurality of spaced, transversely arranged, horizontal belt pulleys carried by said supporting means, flyer units carried by the ends of certain of said pulleys and alongside one side of the supporting means, flyer units carried by the opposite ends of the alternate pulleys and alongside the other side of the supporting means, and a belt stretch or run movable at right angles to and contacting with said pulleys; with pig tails at opposite sides of and spaced from the two series of flyers, and a double take-up mechanism spaced above and arranged in substantially the same plane as the two sets of flyer units.

4. In combination, supporting means, a plurality of spaced, transversely arranged, horizontal belt pulleys carried by said supporting means, flyer units carried by the ends of certain of said pulleys and alongside one side of the supporting means, flyer units carried by the opposite ends of the alternate pulleys and alongside the other side of the supporting means, and a belt stretch or run movable at right angles to and contacting with said pulleys; the certain mentioned pulleys being arranged at one side of said belt stretch or run and the alternate pulleys being arranged at the opposite sides of said stretch or run, with pig tails at opposite sides of and spaced from the two sets of flyer units, and a double take up mechanism spaced above and arranged in substantially the same vertical plane as the two sets of flyer units.

5. In combination, lower and upper supports spaced apart, lower and upper sets of belt pulleys, the pulleys of each set being horizontal and spaced apart and arranged transversely of said supports, flyer units carried by the ends of certain of said pulleys of each set and alongside of one side of the adjacent support, flyer units carried by the opposite ends of the alternate pulleys of each set and arranged alongside the other side of the adjacent support, and a supported and driven belt with stretches or runs spaced apart and movable at right angles to and contacting pulleys of the two sets.

6. In combination, lower and upper supports spaced apart, lower and upper sets of belt pulleys, the pulleys of each set being horizontal and spaced apart and arranged transversely of said supports, flyer units carried by the ends of certain of said pulleys of each set and alongside of one side of the adjacent support, flyer units carried by the opposite ends of the alternate pulleys of each set and arranged alongside the other side of the adjacent support, and a supported and driven belt with stretches or runs spaced apart and movable at right angles to and contacting pulleys of the two sets; the alternate pulleys of each of said sets of pulleys being arranged at one side of the adjacent belt run or stretch and the other pulleys of each of said sets of pulleys being arranged at the opposite side of the adjacent belt run or stretch.

7. In combination, lower and upper supports spaced apart, lower and upper sets of belt pulleys, the pulleys of each set being horizontal and spaced apart and arranged transversely of said supports, flyer units carried by the ends of certain of said pulleys of each set and alongside of one side of the adjacent support, flyer units carried by the opposite ends of the alternate pulleys of each set and arranged alongside the other side of the adjacent support, and a supported and driven belt with stretches or runs spaced apart and movable at right angles to and contacting pulleys of the two sets, with lower and upper pig tails at opposite sides of and spaced from the flyer units, and a double take up mechanism spaced above and arranged in substantially the same vertical plane as the flyer unit.

8. In combination, lower and upper supports spaced apart, lower and upper sets of belt pulleys, the pulleys of each set being horizontal and spaced apart and arranged transversely of said supports, flyer units carried by the ends of certain of said pulleys of each set and alongside of one side of the adjacent support, flyer units carried by the opposite ends of the alternate pulleys of each set and arranged alongside the other side of the adjacent support, and a supported and driven belt with stretches or runs spaced apart and movable at right angles to and contacting pulleys of the two sets; the alternate pulleys of each of said sets of pulleys being arranged at one side of the adjacent belt run or stretch and the other pulleys of each of said sets of pulleys being arranged at the opposite side of the adjacent belt run or stretch, with lower and upper pig tails at opposite sides of and spaced from the flyer units, and a double take up mechanism spaced above and ar-

ranged in substantially the same vertical plane as the flyer unit.

9. In a thread spinning and twisting machine, spaced series of spinning and twisting units, each unit including a driven spindle, and an endless driven belt the runs or stretches of which are in driving engagement with the respective series of unit spindles; the belt contacting surfaces of spindles adjacent to the let off side of the belt being increased in diameter as they approach the let off for compensating for the belt slack at said let off sides and for the production of a product different in quality from the product of the spindle with belt contacting surfaces of uniform diameter.

In testimony whereof I affix my signature.

FRED C. WERBER.