No. 648,738. Patented May 1, 1900.

A. GOSS.

MACHINE FOR TWISTING IN WARP THREADS IN LOOMS.

(Application filed Aug. 15, 1899.)

(No Model.) 3 Sheets—Sheet 1.

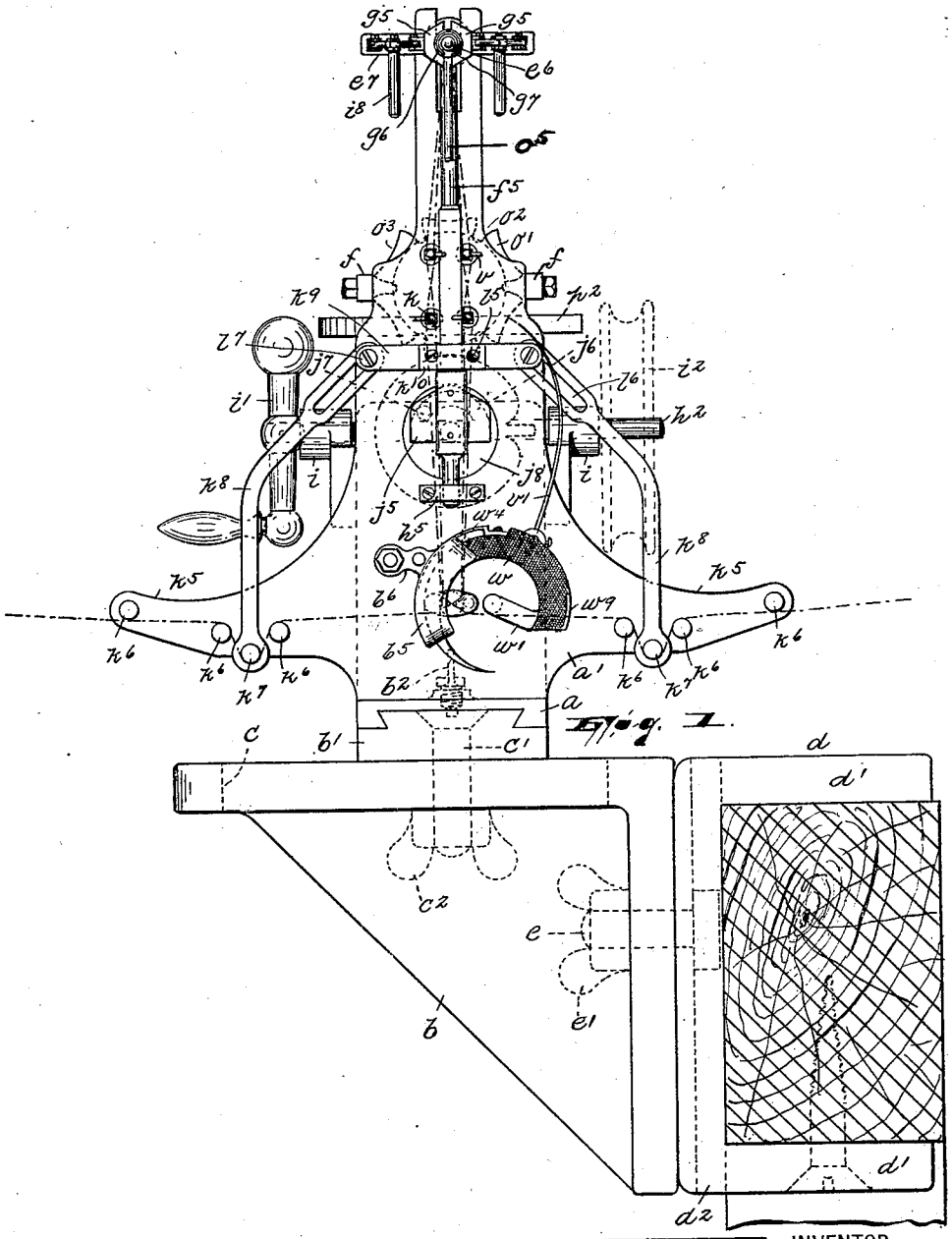

Fig. 1.

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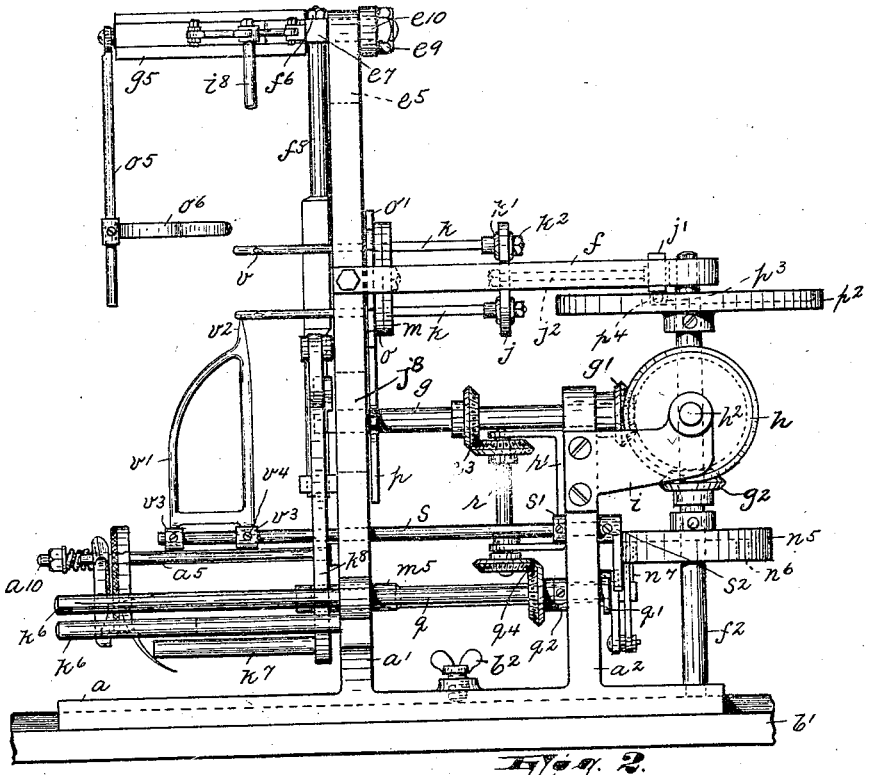

Fig. 2.

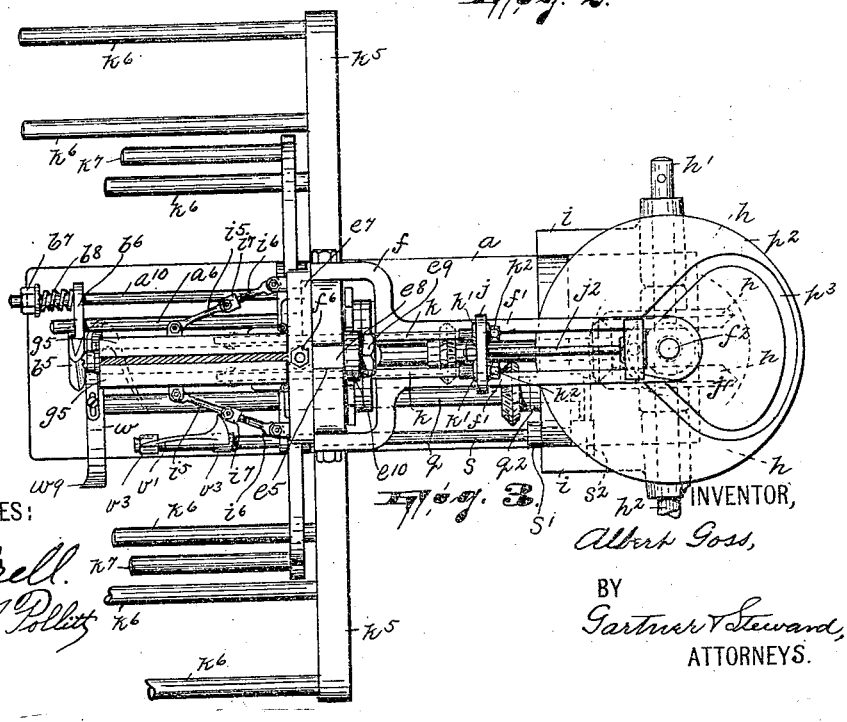

Fig. 3.

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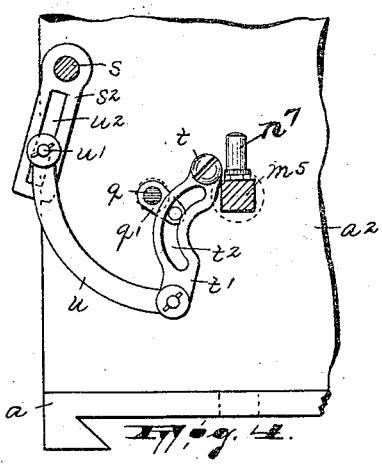

Fig. 4.

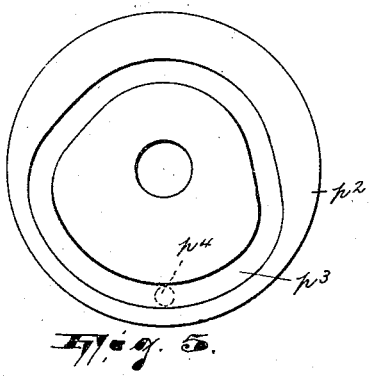

Fig. 5.

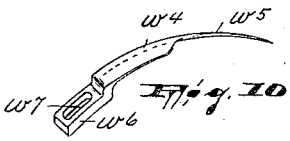

Fig. 10.

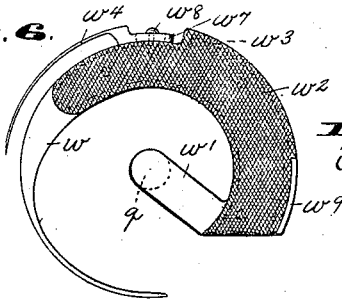

Fig. 6.

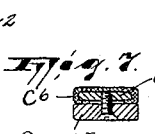

Fig. 7.

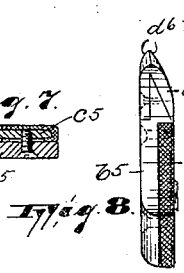

Fig. 8.

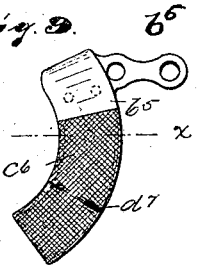

Fig. 9.

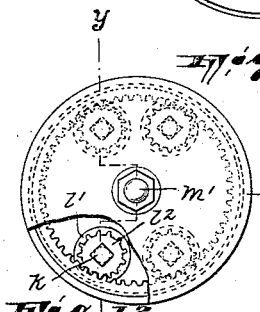

Fig. 12.

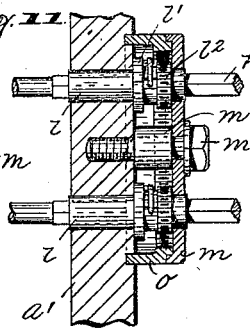

Fig. 11.

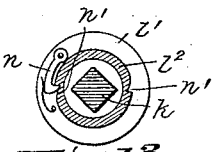

Fig. 13.

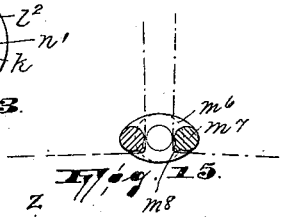

Fig. 15.

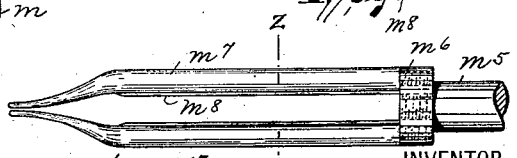

Fig. 14.

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UNITED STATES PATENT OFFICE.

ALBERT GOSS, OF LAKE VIEW, NEW JERSEY.

MACHINE FOR TWISTING IN WARP-THREADS IN LOOMS.

SPECIFICATION forming part of Letters Patent No. 648,738, dated May 1, 1900.

Application filed August 15, 1899. Serial No. 727,273. (No model.)

To all whom it may concern:

Be it known that I, ALBERT GOSS, a citizen of the United States, residing in Lake View, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Machines for Twisting In Warp-Threads in Looms; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to twisting-machines; and its object is to provide a machine of this nature whose special adaptation is the twisting together and thus uniting of the ends of threads or other similar filaments. I have constructed such a machine with the idea mainly of applying it to the operation of "twisting in" new warps in the process of weaving, and thus employing it to supersede the usual hand operation, which is tedious and involves considerable expense in the matter of time and labor necessarily employed.

The invention consists in a machine for twisting together and thus uniting the ends of threads or other similar filaments constructed substantially as hereinafter described and embodied finally in the clauses of the claim.

I have fully illustrated my invention in the accompanying drawings, wherein corresponding letters of reference indicate like parts, and wherein—

Figure 1 is a front view of my twisting-machine shown as mounted in an operative position upon a support provided for it and secured to some suitable beam of a loom. Fig. 2 is a side view of the machine and of a portion of the support. Fig. 3 is a top plan view of the machine. Fig. 4 shows the mechanism for imparting an oscillatory movement to a certain finger that is adapted to successively pick off the threads that are to be operated upon from the main body of the threads and bring the same within the control of the twisting mechanism proper. Fig 5 is a top plan view of a certain cam which actuates a certain mechanism that coacts with the aforementioned finger to successively feed the threads into the control of the said twisting mechanism proper. Fig. 6 is a front face view of the movable member of the twisting mechanism proper. Figs. 7, 8, and 9 are views of the stationary member of said twisting mechanism proper, Fig. 7 being a sectional view on the line x x of Fig. 9, and Figs. 8 and 9 being respectively an edge and front face view of the said member. Fig. 10 is a perspective view of a cutter carried by the movable member of the twisting mechanism. Fig. 11 is a sectional view taken on the line y y in Fig. 12. Fig. 12 is a face view of a certain mechanism for imparting a rotary movement to the hook-bars comprised in the mechanism which coacts with the above-mentioned finger for successively separating the threads. Fig. 13 shows a detail in what is involved in Fig. 12; and Figs. 14 and 15 are views of a pair of reciprocating thread-guides, Fig. 14 being a view in elevation and Fig. 15 being a sectional view on the line z z in Fig. 14.

The main frame of the machine consists of a bed-plate a, upon which are disposed two uprights a' a^2, which uprights may form integral portions of the bed-plate and the one of which, a', is higher than the other.

The machine is supported in an operative position on the loom by means of a bracket or series of brackets b, upon which is secured a metallic strip b', whereon the bed-plate rests and with which it has a dovetailed tongue-and-groove connection, adjustment being effected by means of a thumb-screw b^2, which is mounted in the bed-plate and bears against the top of the strip b'. The strip b' is adjustably mounted on the bracket or brackets b by means of a bolt c', having a wing-nut c^2 and penetrating a slot c of each bracket. The bracket (or brackets) b is secured to a rest d, the same consisting of a pair of parallel plates d', adapted to receive and be secured in any desired manner to some suitable beam at the rear of the loom, said plates being connected by a pair of integral flanged and spaced strips d^2, between which a bolt e projects, said bolt being also provided with a wing-nut e' and being secured in the rear portion of the bracket b. Only one of the strips d^2 appears, owing to the position from which the view in Fig. 1 is taken; but it is thought that the construction will be fully understood without further illustration.

The adjustable support which I have provided makes it possible to adjust the machine either vertically, laterally, or to and from the loom.

f is a bracket which extends horizontally and rearwardly from the upright a', said bracket being bifurcated, so as to form a pair of parallel guides f', the extremities of said bracket being spread apart and receiving the upright, being bolted thereto. The free outer end of this bracket provides a bearing for the upper end of a vertical shaft f^2, said shaft being stepped in the bed-plate. In the two uprights is journaled another shaft g, and this shaft and the shaft f^2 carry bevel-gears g' g^2, respectively. Rotary motion is imparted to the shafts through their respective bevel-gears from either of a pair of bevel-gears h, the one of which is carried upon a stub-shaft h' and the other upon a stub-shaft h^2. Each of these stub-shafts is journaled in the free end of an arm i, which projects rearwardly from the upright a^2, and the stub-shaft h' carries a crank i', whereas the other one carries a pulley i^2. Therefore either machine or manual power may be utilized to operate the machine, it being understood, of course, that the stub-shafts h' and h^2 are the drive-shafts of the machine.

A reciprocating frame is carried by the bifurcated bracket f, being disposed between its guides f' and consisting of a plate j and a block j', connected by a rod j^2, said block and the plate having recesses in their side edges which receive the guides and which thus insure a true reciprocating movement to this frame. The plate j forms bearings for the rear ends of hook-bars k, which are truly maintained in position in said plate by means of shoulders k', which they carry, and nuts k^2. These hook-bars k penetrate sleeves l, journaled in the upright a', and for a distance corresponding to their range of movement in their reciprocations with the plate j they are preferably rectangular in cross-section, though they may be of any other cross-sectional non-circular form. It should be remarked that the inside shapes of the sleeves l, which they penetrate, correspond to their own shapes.

Each of the sleeves l is provided with a flange l', which abuts against the rear face of the upright a', and each of said sleeves is also provided with a pinion l^2, which is somewhat spaced from the flange by an integral annular projection which it carries. The several sleeves are maintained in position in their bearings in the upright a' and with their flanges l' against the face of said upright by means of a disk m, said disk being secured to the upright by means of a bolt m' and properly spaced from said upright by a collar m^2, which the bolt penetrates. In order when occasion requires, as hereinafter explained, that the hook-bars may be manually turned, each flange l' carries a spring-actuated pawl n, whose point normally engages a notch n' in the projection of the pinion, the shape of the notch being such that the pinion cannot be rotated in the proper direction without also rotating the sleeve, (and consequently the corresponding hook-bar,) and yet said sleeve may be manually rotated in the same direction free of the pinion.

A rotary movement is imparted to the several pinions l^2 by means of a gear-wheel o, which surrounds the pinions and, together with the disk m, provides a casing therefor, said gear-wheel having its teeth on its inner periphery. This gear-wheel carries a star-wheel o', having alternate notches and shallow recesses o^2 o^3. The star-wheel is adapted to be intermittently actuated by a pin-wheel p, the curved portion of the periphery of this cam being adapted to freely work in each of the recesses of the star-wheel and its finger p' being adapted to engage the notches of said star-wheel.

A reciprocating motion is imparted to the frame carrying the hook-bars by means of a cam p^2, having a cam-slot p^3 in its upper face, said cam being suitably secured upon the shaft f^2 and its slot being adapted to receive a pin p^4, that projects downwardly from the block j'.

q is a revoluble shaft that is journaled in the uprights a' a^2, somewhat below but a little to one side of the shaft g, said shaft q being prevented from endwise movement by a crank q', secured upon its rear end, and a collar q^2, said collar and the crank abutting against the opposite sides of the upright a^2. This shaft is adapted to be rotated from the shaft g through suitable gearing, consisting of bevel-gearing q^3 and bevel-gearing q^4, one of the gears in each of these two sets being secured upon a shaft r, that is journaled in a slightly-inclined bracket r', secured to the upright a^2.

s is a rock-shaft which is also journaled in the uprights a' a^2, below and to one side of the shaft g, said rock-shaft being prevented from lengthwise movement by a collar s', which it carries, and a crank s^2, which is secured to its end, said collar and the crank abutting against the two sides of the uprights a^2, the same as the corresponding parts on the shaft q. Upon the back face of the upright a^2 is fulcrumed upon a screw t a lever t', having a curved slot t^2, which receives the crank-pin of the crank q', the free end of said lever t having pivotally secured to it one end of a pitman u, whose other end is provided with a pin u', that works in a longitudinal slot u^2 in the crank s^2. It will be seen that the rotation of the shaft s imparts, through mechanism above described, oscillations to the shaft s.

The hook-bars k are provided near their outer ends with bent spurs or hooks v. It should be remarked that there are two pairs of these hook-bars, the one being preferably disposed directly beside the other. The corresponding hooks in the two pairs project in the same direction—that is to say, they are

arranged on the bars at corresponding points thereon; but the hooks of each pair project in relatively-opposite directions.

Upon the rock-shaft *s* and near the forward end thereof is secured a spreader or finger *v'*. One side of this spreader or finger, the one adjacent the upright *a'*, is approximately straight, while the other or outer side is curved, the upper end of the spreader terminating in a sharpened point v^2, which as the shaft rocks almost approaches the hook-bars *k*. Viewing this spreader or finger edgewise, it appears as being curved to one side—that is to say, in the direction of the hook-bars. It is adjustably secured upon the rock-shaft by means of two integral sleeves v^3, which set-screws v^4 penetrate.

Upon the outer end of the shaft *q* is mounted the movable member of the twisting mechanism proper. This device consists of a curved plate *w*, constituting a hook and carried by an arm *w'*, which preferably forms an integral radial portion of said hook and projects from the shaft *q*. The free end of this hook is sharply tapered and it has a curvature to one side—that is to say, toward the upright *a'*—as well as a curvature in the direction of rotation of the hook with the shaft *q*. It should be remarked that the point of the hook extends approximately as far as the vertical plane parallel to the upright *a'*, with which the outer or curved edge of the spreader *v'* is coincident.

Upon the outer face of the plate *w* is disposed a shoe w^2, said shoe preferably consisting of a curved strip of rubber or other similar material offering a sufficient gripping-surface, which strip is secured in position by means of another plate w^3, (shown in dotted lines in Fig. 6,) around whose edges the edges of the rubber strip extend, being clamped between the two plates.

Near the forward end of the strip w^2 the edge of the plate *w* and also of the plate w^3 is cut away, and in the recess formed is secured the cutter, (shown in Fig. 10,) said cutter consisting of a curved blade w^4, that extends approximately concentrically with the plate *w* and has its free end terminating in an elongated point or spur w^5. It should be remarked that this spur does not follow the direction of the hook in so far as the lateral projection thereof hereinbefore referred to is concerned. The blade is provided with a shank w^6, having an elongated slot w^7, which a screw w^8 penetrates and whereby the blade is adjustably secured in position in the recess of the plate *w*. The edge of the blade adjacent the upright *a'* is the cutting one.

At the rear end of the plate *w* is formed a deflector w^9, which projects laterally from the plate and has an inclined edge, the plate w^3 being cut away to receive this projection. The function of this deflector will be hereinafter disclosed.

a^{10} a^6 are a pair of parallel rods which project outwardly from the upright *a'*, being disposed in a horizontal plane between that of the shaft *q* and of the shaft *s*. These two rods carry the stationary member of the twisting mechanism proper. This member consists of a curved plate b^5, having an arm b^6 which is penetrated by the two rods, there being a nut b^7 on the end of one of the rods and a spring b^8 between said nut and the arm. This spring renders the plate yielding in the direction of the length of the rods. Upon its acting face is secured, by means of another curved plate c^5, that is riveted or screwed to the plate b^5, (and in the same manner in other respects as the rubber strip is secured to the acting face of the movable member of the twisting mechanism,) a rubber strip c^6. It should be remarked that the plate b^5 is disposed substantially concentrically with reference to the shaft *q*—that is to say, so that in each revolution of the shaft *q* the movable member of the twisting mechanism will be brought into efficient operative position relatively to the stationary member. It is of course understood that the rubber strips constituting the acting surfaces of the two members of the device wipe the one upon the other, the uniformity of the contact being augmented by virtue of the yielding arrangement of the stationary member. The end of the plate b^5 toward which the movable member of the mechanism first approaches in each revolution is shod with a removable tip d^5, that fits upon the said end of the plate and has its acting edge provided with a double and curved bevel, as at d^6. It should be remarked that, for a purpose hereinafter set forth, the face of the rubber strip c^6 of the stationary member has a transverse notch d^7.

The upper end of the upright *a'* is bifurcated, thereby forming a vertical slot e^5. In this slot is adapted to reciprocate vertically a horizontal spindle e^6, which penetrates a squared cross-arm e^7, the portion e^8 of the spindle which works in the slot being squared and the rear end of said spindle being reduced and threaded and carrying a nut e^9 and a washer e^{10}, spacing said nut from the rear face of the upright. f^5 is a vertically-reciprocating bar whose upper end is reduced and threaded and penetrates both the spindle e^6 and the cross-arm e^7, being provided with a nut f^6, which binds together these several parts. On both sides of the spindle grips g^5 are hinged on the cross-arm e^7, said grips being adapted to coact with the spindle to form a compound clamp and being for this purpose provided with longitudinal channels receiving the spindle. In the channels are disposed rubber strips g^6 and about the spindle is disposed a tube g^7, also of rubber.

In order to operate the grips g^5, I have connected each of them with the cross-arm e^7 by means of jointed levers i^5 i^6, the joint between these levers consisting of a coupling i^7, which is screwed upon one of them and which carries an operating-handle i^8.

The lower end of the vertically-reciprocat-

ing shaft f^5 is reduced and is guided in a block k^5, secured to the outer face of the upright a'.

The shaft f^5 carries an integral block j^5, having in its rear face an arc-shaped slot j^6, (shown in dotted lines in Fig. 1,) said slot receiving the pin j^7 on a disk j^8, that is secured upon the front end of the shaft g and provides bearings therefor in the upright a'.

The upright a' is provided with two laterally-projecting arms k^5, in each of which there are mounted three parallel rods k^6, projecting outwardly. Over one set of these rods the ends of the old warp is adapted to extend, while the ends of the new warp extend over the other one. k^7 are other rods disposed parallel to the rods k^6 and mounted in the lower ends of downwardly-projecting bars k^8, said bars being suspended from a cross-bar k^9, that is secured upon and movable with the vertical shaft f^5. The cross-bar k^9 is clamped to the shaft by virtue of a block k^{10}, set into the cross-bar and secured thereto by screws l^5, and in order to render the connection between the bars k^5 and the cross-bar k^9 adjustable the former are provided with longitudinal slots l^6, which are penetrated by screws l^7 in the cross-bar, whose ends, it may be remarked, are bifurcated to receive said bars k^8.

m^5 is a reciprocating shaft which is mounted in the two uprights a' and a^2 and whose forward end is provided with a block m^6, in which are screwed the rear ends of thread-guides m^7, whose free ends are tapered and project into approximate contact with each other. It should be remarked that these thread-guides are provided with adjacent longitudinal ribs m^8, which afford a reduced bearing-surface for the threads, as shown in the sectional view, Fig. 15. The shaft m^5 is reciprocated longitudinally by means of a cam n^5, mounted on the shaft f^2 and provided with a cam-slot n^6, receiving a pin n^7 on the rear end of said shaft.

o^5 is a rod that is suspended from the end of the spindle e^6 and carries a clip o^6, which is adjustably secured on said rod and the function of which will be hereinafter set forth in describing the operation of the machine

In order to operate this machine, the same is disposed in the most convenient position with reference to the ends of the old warp to which the new warp is to be attached, this disposition being effected by adjusting the parts of the support for the machine. The old and new warps are passed into the machine, as shown in dotted lines in Fig. 1, from opposite sides thereof, each extending under the outermost corresponding rod k^6 and then over the next two rods k^6 to the guides m^7, under which they also pass. From here they extend upwardly and are secured the one one side and the other the other side of the spindle e^6 by means of the grips g^5. It should be remarked that the threads of each warp are divided into two sets comprising the alternate threads of the warp, and that these two sets are arranged to intersect each other and are placed in the machine in this disposition, the intersection of the two sets of thread (when the warps are in position in the machine) in each warp being disposed between the upper and lower hook-bars of each pair of hook-bars which, between the guides m^7 and the clamping device, project between, and thus keep separated the two sets. This is most clearly shown in Fig. 1. Hence it will be seen that if the two sets of threads in each warp are so disposed with reference to the hooks on the hook-bars (which, it should be remembered, are in each pair of said hook-bars on relatively-opposite sides thereof) that said hooks act to hold or keep back that set of which the first or outermost thread is the second thread of the warp, while the other set, which is not engaged by said hooks, is the one having the first or outermost thread of the warp, this thread in each warp will be free to separate from the others so long as a tension that tends to dispose it in a straight line is effected and the other threads are held back by the retracted hook-bars and by virtue of their intersecting disposition relatively to each other. In other words, the hook-bars hold together one set of threads, while this set of threads holds back all the threads of the other set except the first or outermost one, which is the first or outermost thread of the entire warp. A rotary motion being imparted to the shaft g from either the crank i' or the pulley i^2 through the connecting bevel-gearing, the shaft will be driven, carrying with it in its rotations the cam p^2, which, in an obvious manner, will impart a reciprocating movement to the frame which drives and carries the hook-bars. It being assumed, therefore, that the tension on the warps is being uniformly maintained and that the rotation of the shaft g imparts, through the cam p and the star-wheel d', an intermittent semirevolution to each of the hook-bars k as they assume their most advanced positions, the outermost thread in each warp will be left separated from the others after the hooks make their semirevolutions and retract, taking with them the main body of each warp. It will be apparent in view of what has been above stated that the alternate reciprocating and rotary movements of the hook-bars effect, therefore, a successive release or separation of the threads in each warp from the main body thereof. When one thread in each warp has been thus separated, the finger or spreader v' is oscillated so as to force this thread away from the others and toward the twisting mechanism proper. It will be apparent that this oscillation of the finger v' is effected by virtue of the mechanism shown in Fig. 4, which receives its actuation through the gearing q^3 q^4, the shaft r, and the shaft q, and the crank q'. While the finger or spreader is in its lowermost or substantially-horizontal position, the hook of the movable

member of the twisting mechanism proper is brought around in the rotation of the shaft q, so as to take the separated threads and deflect them into a position where they will extend over the cutting edge of the knife or cutter w^4 and down in front of the acting face of the movable member of the twisting mechanism, which ultimately brings said threads, after a continued movement has aided the knife in cutting them, between the rubbing-faces of said movable member and the stationary member. As the movable member continues to revolve the twisting of the ends of the thread is effected.

It should be remarked at this point that while the cutting and twisting operation is progressing the guides m^7 are advanced to their extreme outward position, this being of course effected by the cam n^5, which is mounted on the shaft f^2 and rotates therewith. Thus the separated threads are kept under the control of the guides just as the main body of them are; but since the points of the guides are brought into approximate contact with each other, as shown in Fig. 14, the upwardly-deflected portions in said threads which are undergoing the twisting process are brought into effective contiguity with each other. The guides continue to hold the separated threads until the twisting operation is almost completed. As the movable member of the twisting device continues to revolve the body portion of the thread toward which it revolves is of course brought between the rubbing-faces of the device, as well as are the deflected upturned ends of the two threads; but when this thread reaches the notch d^7 in the rubber strip of the stationary member of the twisting device it ceases to move farther until said deflected ends, which are being twisted about each other, reach it, whereupon it is taken up by them and the twisting continues. The result of the twisting is that the deflected ends are twisted in with the body of one of the two threads being joined. If there is any possibility of the threads thus joined and made as one clinging to the rubber face of the movable member, this is obviated by the deflector w^9, which coacts with the tension maintained on the thread to force said thread slightly to one side.

It has been found in practice that the fibers of the threads to be separated tend to cling to the main body of threads and that this can be overcome if the threads are moved longitudinally over some stationary part—as, for instance, the hook-bars and the rods k^6 and m^7. I have therefore provided means for lowering the clamp which sustains the threads, and also, consequently, said threads. This means consists of the shaft f^5, which carries the clamp and which by virtue of the block j^5, having the curved slot j^6, which receives the pin j^7 on the disk j^8, carried by said shaft, can be lowered as the shaft g rotates. Of course the dropping of the clamp tends to reduce the tension on the threads; but I have provided means for compensating for this, which consists of the rods k^7, carried on the arms k^8, that project from the shaft f^5, said rods being movable vertically, as shown in Fig. 1, between two of the rods k^6.

That portion of the extremities of the threads which is cut and left suspended in the clamp is fed into the clip o^6 by the action of the outer or curved face of the finger or spreader v' and there maintained until the uniting of all the threads has been effected, whereupon these ends may be discarded.

It has been hereinbefore remarked that the hook-bars are so arranged that they can be turned in one direction independently of that portion of their actuating means which tends to rotate them. This provision is mainly made so that when the threads are arranged with reference to the hook-bars previously to starting the machine said hook-bars can be manually manipulated to facilitate the arrangement.

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

1. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, of a twisting mechanism comprising two members of which one is movable against the other, and has an outwardly-deflected projection and a vibratory element adapted to deflect the threads to be united from the main body of threads into the control of said projection, substantially as described.

2. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, of a twisting mechanism comprising two members of which one is movable against the other, and has an outwardly-deflected projection, a vibratory and tapering finger interposable between and adapted to spread apart the threads, said finger being movable into operative proximity to said projection, and means for actuating the movable member of said twisting mechanism and said finger, substantially as described.

3. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, of a twisting mechanism comprising two members of which one is revoluble and movable against the other, a shaft journaled in said frame and carrying the movable member of said twisting mechanism, a rock-shaft mounted in said frame, operative connecting means between said shafts, a tapering finger or spreader carried by said rock-shaft and adapted to deflect the threads to be united from the main body of threads into the control of said twisting mechanism, substantially as described.

4. In a machine for twisting together end to end, and thus uniting, threads or other fila-

ments, the combination, with a frame and with thread-sustaining means, of a twisting mechanism comprising two members of which one is revoluble and movable against the other, a shaft journaled in said frame and carrying the movable member of said twisting mechanism, a rock-shaft mounted in said frame, operative connecting means between said shafts, a tapering finger or spreader carried by said rock-shaft and adapted to deflect the threads to be united from the main body of threads into the control of said twisting mechanism, the edge of the finger or spreader adjacent said twisting mechanism being curved outwardly and its other edge being approximately straight, substantially as described.

5. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, of a twisting mechanism comprising two members of which one constitutes a curved revoluble hook movable against the other, a shaft journaled in said frame and carrying said hook, a rock-shaft mounted in said frame, operative connecting means between said shafts, the threads being adapted to be sustained adjacent the hook, and a vibratory and tapering finger or spreader mounted on said rock-shaft adjacent the hook and adapted to deflect the threads to be united from the main body of threads into the control of said twisting mechanism, substantially as described.

6. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, of a twisting mechanism comprising two members of which one constitutes a curved revoluble hook movable against the other, the threads being adapted to be sustained adjacent the hook, a shaft journaled in said frame and carrying said hook, a rock-shaft mounted in said frame, cranks carried by said shafts, a lever fulcrumed in said frame and having a curved slot, a pitman connecting said lever and the crank carried by said rock-shaft, the crank on the revoluble shaft having a crank-pin engaging said slot, and a vibratory and tapering finger or spreader mounted on said rock-shaft adjacent the hook and adapted to deflect the threads to be united from the main body of threads into the control of said twisting mechanism, substantially as described.

7. In a mechanism for separating threads or other filaments, the combination, with a frame and with thread-sustaining means, the threads being adapted to be disposed in two series of which the threads of the one intersect those of the other at predetermined intervals, of a revoluble hook-bar or hook-bars spacing, and adapted to alternately hold back the one and then the other of, said series of threads and thus successively free the intersecting threads, and means for imparting intermittent semirevolutions to said hook-bar or hook-bars, substantially as described.

8. In a mechanism for separating threads or other filaments, the combination, with a frame and with thread-sustaining means, the threads being adapted to be disposed in two series of which the threads of the one intersect those of the other at predetermined intervals, of a revoluble hook-bar or hook-bars adapted to alternately hold back the one and then the other of said series of threads and thus successively free the intersecting threads, and means for intermittently actuating said hook-bar or hook-bars, a separating-finger interposable between the released thread or threads and the main body of threads, and means for actuating said finger, substantially as described.

9. In a mechanism for separating threads or other filaments, the combination, with a frame and with means for vertically suspending the threads, the threads being adapted to be disposed in two series of which the threads of the one intersect those of the other at predetermined intervals, of a pair of revoluble hook-bars having their hooks on relatively-opposite sides and spacing, and adapted to hold back alternately the one and then the other of, said series of threads and thus successively free the intersecting threads, intermittently-acting means for imparting partial revolutions to each hook-bar, a rock-shaft having bearings in said frame, a separating-finger carried by said rock-shaft and interposable between the released thread or threads and the main body of threads, and means for actuating said rock-shaft, substantially as described.

10. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, the two sets of threads to be united being each adapted to be disposed in two series of which the threads of the one intersect those of the other series at predetermined intervals, of a thread-releasing mechanism consisting of a movable detent or detents adapted to alternately hold back the one and then the other of said series of threads in each set of threads, a twisting mechanism comprising two members of which the one is movable against the other, a separating-finger interposable between the released thread or threads of each set of threads and the main body thereof, said finger being operatively disposed between said releasing mechanism and the twisting mechanism and adapted to deflect the released threads from the one into the control of the other thereof, means for intermittently actuating the detent or detents, means for vibrating said finger, and means for actuating the movable member of the twisting mechanism, substantially as described.

11. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, the two sets of threads to be united being each adapted to be disposed in two series of which the threads

of the one intersect those of the other at predetermined intervals, of a thread-releasing mechanism consisting of revoluble and longitudinally-movable hook-bars adapted to deflect out of their normal line of maintenance the one and then the other of said series of threads in each set of threads, a twisting mechanism comprising two members of which the one is movable against the other, a separating-finger interposable between the released thread or threads of each set of threads and the main body thereof, said finger being operatively disposed between said releasing mechanism and the twisting mechanism and adapted to deflect the released threads from the one into the control of the other thereof, means for alternately reciprocating and imparting semirevolutions to said hook-bars, means for vibrating said finger, and means for actuating the movable member of the twisting mechanism, substantially as described.

12. In a machine for securing together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, the two sets of threads to be secured together being each adapted to be disposed in two series of which the threads of the one intersect those of the other at predetermined intervals, of a thread-releasing mechanism consisting of a revoluble hook-bar or hook-bars adapted to hold back the one and then the other of said series of threads, and means for intermittently actuating said hook-bar or hook-bars, a movable separating-finger interposable between the released thread or threads and the main body of threads, means for actuating said finger, and a thread-uniting mechanism disposed in operative contiguity to said separating-finger, substantially as described.

13. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, said thread-sustaining means comprising a suspending device and rods disposed beneath said suspending device and coacting therewith to maintain the extremities of the two sets of threads approximately parallel, both sets of threads to be united being each adapted to be disposed in two series of which the threads of the one intersect those of the other at predetermined intervals, of a thread-releasing mechanism consisting of revoluble and longitudinally-movable hook-bars disposed between said suspending device and the rods and spacing, and adapted to deflect out of their line of normal maintenance the one and then the other of, said series of threads in each set of threads, a twisting mechanism comprising two members of which the one is movable against the other, a separating-finger interposable between the released thread or threads of each set of threads and the main body thereof, said finger being operatively disposed between said releasing mechanism and the twisting mechanism and adapted to deflect the released threads from the one into the control of the other thereof, means for alternately reciprocating and imparting semirevolutions to said hook-bars, means for vibrating said finger, and means for actuating the movable member of the twisting mechanism, substantially as described.

14. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, said thread-sustaining means comprising a vertically-movable suspending device, parallel rods disposed beneath said suspending device, some of said rods being operatively connected to said suspending device for vertical movement therewith, and longitudinally-movable guides disposed between and parallel with said rods and adapted to coact with said suspending device to maintain the extremities of the two sets of threads approximately parallel, means for reciprocating said suspending device and the rods connected therewith, both sets of threads to be united being each adapted to be disposed in two series of which the threads of the one intersect those of the other at predetermined intervals, of a thread-releasing mechanism consisting of revoluble and longitudinally-movable hook-bars disposed between said suspending device and the rods and spacing, and adapted to deflect out of their line of normal maintenance the one and then the other of, said series of threads in each set of threads, a twisting mechanism disposed in alinement with said guides and comprising two members of which the one is movable against the other, a separating-finger interposable between the released thread or threads of each set of threads and the main body thereof, said finger being operatively disposed between said releasing mechanism and adapted to deflect the released threads from the one into the control of the other thereof, means for alternately reciprocating and imparting semirevolutions to said hook-bars, means for vibrating said finger, means for actuating the movable member of the twisting mechanism, and means for reciprocating said guides, substantially as described.

15. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, said thread-sustaining means comprising a vertically-movable suspending device, parallel rods disposed beneath said suspending device, some of said rods being operatively connected to said suspending device for vertical movement therewith, longitudinally-movable guides disposed between and parallel with said rods and adapted to coact with said suspending device to maintain the extremities of the two sets of threads approximately parallel, and means for reciprocating said suspending device and the rods connected therewith, both sets of

threads to be united being each adapted to be disposed in two series of which the threads of the one intersect those of the other at predetermined intervals, of a thread-releasing mechanism consisting of revoluble and longitudinally-movable hook-bars disposed between said suspending device and the rods and spacing, and adapted to deflect out of their line of normal maintenance the one and then the other of, said series of threads in each set of threads, a twisting mechanism disposed in alinement with said guides and comprising two members of which the one is movable against the other, a cutter carried by said movable member of the twisting mechanism, a separating-finger interposable between the released thread or threads of each set of threads and the main body thereof, said finger being operatively disposed between said releasing mechanism and the twisting mechanism and adapted to deflect the released threads from the one into the control of the other thereof, means for alternately reciprocating and imparting semirevolutions to said hook-bars, means for vibrating said finger, means for actuating the movable member of the twisting mechanism, and means for reciprocating said guides, substantially as described.

16. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with a frame and with thread-sustaining means, of parallel guides disposed beneath said sustaining means, a twisting mechanism disposed near one end of said guides, thread-separating means disposed between the sustaining means and said guides, means for actuating said thread-separating means, means for actuating the twisting mechanism, said thread-guides being movable to and from the twisting mechanism, and means for reciprocating said thread-guides, substantially as described.

17. In a thread-releasing mechanism for twisting-machines, the combination, with a frame including an upright, a bracket projecting from said upright, a reciprocating frame guided in said bracket, a revoluble shaft journaled in said bracket and the frame, a cam carried by said shaft, means for rotating the shaft, operative connection between said reciprocating frame and the cam, hook-bars revolubly mounted in said upright and the reciprocating frame, and means for imparting semirevolutions to said hook-bars, substantially as described.

18. In a thread-releasing mechanism for twisting-machines, the combination, with a frame including uprights, a bracket projecting from one of said uprights, shafts, the one journaled in the bracket and the frame and the other in the uprights, driving means for said shafts, a cam carried by the first shaft, a reciprocating frame guided in said bracket and controlled by the cam on said first-named shaft, hook-bars journaled in said reciprocating frame and one of the uprights, and gearing controlling said hook-bars and adapted to impart semirevolutions thereto, said gearing being operatively connected to the other of said shafts, substantially as described.

19. In a thread-releasing mechanism for twisting-machines, the combination, with a suitable support, of reciprocatory and revoluble hook-bars mounted in said support, an internally-toothed revoluble gear surrounding said hook-bars, pinions penetrated by the hook-bars and meshing with said gears, operative connection between said hook-bars and the pinions, and means for longitudinally reciprocating the hook-bars, substantially as described.

20. In a thread-releasing mechanism for twisting-machines, the combination, with a suitable support, of reciprocatory and revoluble hook-bars penetrating said support, an internally-toothed revoluble gear surrounding said hook-bars, pinions penetrated by the hook-bars and meshing with said gear, sleeves journaled in said support and also penetrated by said hook-bars, said sleeves having non-circular orifices and the hook-bars being shaped to fit the same, operative connection between said pinions and the sleeves, and means for longitudinally reciprocating said hook-bars, substantially as described.

21. In a thread-releasing mechanism for twisting-machines, the combination, with a suitable support, of reciprocatory and revoluble hook-bars penetrating said support, an internally-toothed revoluble gear surrounding said hook-bars, pinions penetrated by the hook-bars and meshing with said gear, sleeves journaled in said support and also penetrated by said hook-bars, said sleeves having non-circular orifices and the hook-bars being shaped to fit the same, a notch-and-pawl connection between each pinion and the corresponding sleeve, and means for longitudinally reciprocating said hook-bars, substantially as described.

22. In a thread-releasing mechanism for twisting-machines, the combination, with a suitable support, of reciprocatory and revoluble hook-bars penetrating said support, an internally-toothed and revoluble gear surrounding said hook-bars, a disk also penetrated by said hook-bars, said gear being disposed between the support and the disk and forming with them a casing, pinions also penetrated by the hook-bars and meshing with said gear, sleeves journaled in said support and penetrated by the hook-bars, said sleeves having non-circular orifices and the hook-bars being shaped to fit the same, a notch-and-pawl connection between each pinion and the corresponding sleeve, a star-wheel carried by said gear, and a cam engaging said star-wheel, substantially as described.

23. In a twisting mechanism for twisting-machines, the combination with a thread-holding means, of two members one of which is yieldingly mounted and the other of which consists of a curved hook having its point de-

flected outwardly toward said holding means, said last-named member being revoluble against the other, substantially as described.

24. A twisting mechanism for twisting-machines consisting of two members the one of which is yieldingly mounted and the other of which consists of a curved hook revoluble toward the other, and rubber strips carried by said members and adapted to wipe against each other, each member comprising plates clamped together and receiving the edges of said strip between them, substantially as described.

25. In a twisting-machine, the combination, with a frame including an upright, of a clamp mounted in said upright and comprising a spindle and hinged grips adapted to coact therewith, a cross-arm penetrated by said spindle, jointed levers connecting said cross-arm and each grip, a rod suspended from the end of said spindle, and a clip adjustably mounted on said rod, substantially as described.

26. In a twisting-machine, the combination, with a frame including an upright, of a spindle adapted to reciprocate in said upright, hinged grips coacting with said spindle to form a clamp, a reciprocating shaft connected to said spindle, a disk journaled in said upright and carrying a pin, a block carried by said shaft and having a curved slot receiving the pin, and means for rotating said disk, substantially as described.

27. In a machine for uniting threads or other filaments end to end, the combination, with a frame, of parallel guides mounted in said frame in proximity to each other, the two sets of threads being adapted to extend from opposite directions to and in engagement with said guides and from thence in approximately the same direction, a twisting mechanism disposed in operative proximity to said guides and comprising two members of which the one is movable against the other, said first-named member being movable in a plane substantially parallel to the plane common to the deflected and main portions of each thread, and means for forcing the threads into the control of the twisting mechanism, substantially as described.

28. In a machine for uniting threads or other filaments end to end, the combination, with a frame, of parallel guides mounted in said frame in proximity to each other, the two sets of threads to be united being adapted to extend from opposite directions to and in engagement with said guides and from thence in approximately the same direction, a twisting mechanism disposed in operative proximity to the guides and comprising a stationary member and a revoluble member, said revoluble member being movable against the stationary member, and in a plane substantially parallel to the plane common to the deflected and main portions of each thread, and said stationary member having a notch in the acting portion of its surface, means for forcing the threads into the control of the twisting mechanism, and a knife or cutter carried by said movable member, substantially as described.

29. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination, with the frame and a twisting mechanism, of means for successively releasing the threads from the main body thereof, stationary elements with which said threads are adapted to contact, and a movable sustaining means for said threads, substantially as described.

30. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination with the frame and a twisting mechanism, of means for successively releasing the threads from the main body thereof, a thread guide or guides, and a vertically-movable thread-sustaining means, substantially as described.

31. In a machine for twisting together end to end, and thus uniting, threads or other filaments, the combination with the frame and a twisting mechanism, of hook-bars for successively releasing the threads from the main body thereof, a thread guide or guides, and a vertically-movable thread-sustaining means, said hook-bars being disposed between said sustaining means and the guides, substantially as described.

32. A twisting mechanism for twisting-machines consisting of two members the one of which is stationary and the other of which is revoluble, and flexible strips carried by said members and adapted to wipe against each other, each member comprising plates clamped together and receiving the edges of its respective strip between them substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 27th day of July, 1899.

ALBERT GOSS.

Witnesses:
JACOB SCHAUB,
JOHN W. STEWARD.