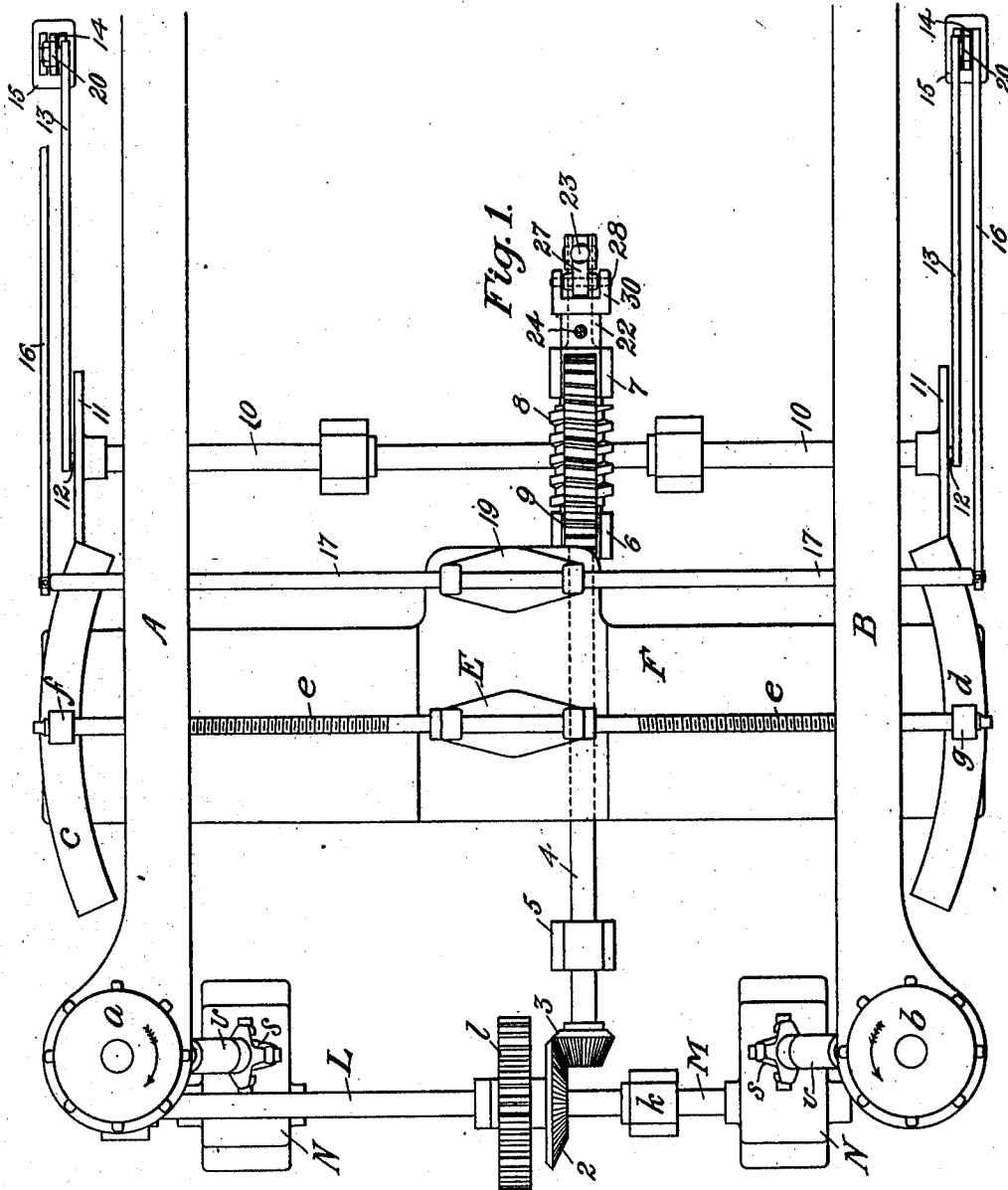


J. J. HOEY.
TENTERING MACHINE.
APPLICATION FILED OCT. 15, 1909.

974,271.

Patented Nov. 1, 1910.

3 SHEETS-SHEET 1.



Witnesses:

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974,271.

3 SHEETS—SHEET 2.

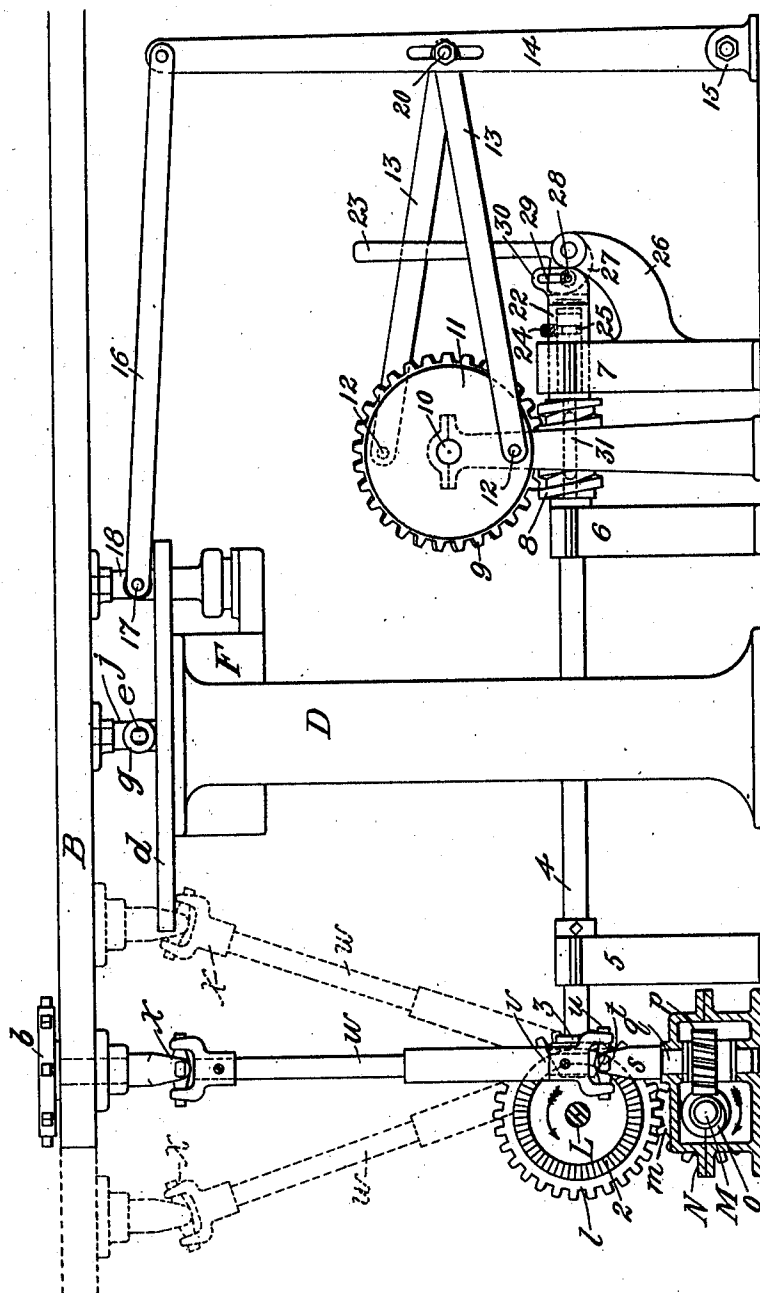


Fig. 2.

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3 SHEETS-SHEET 3.

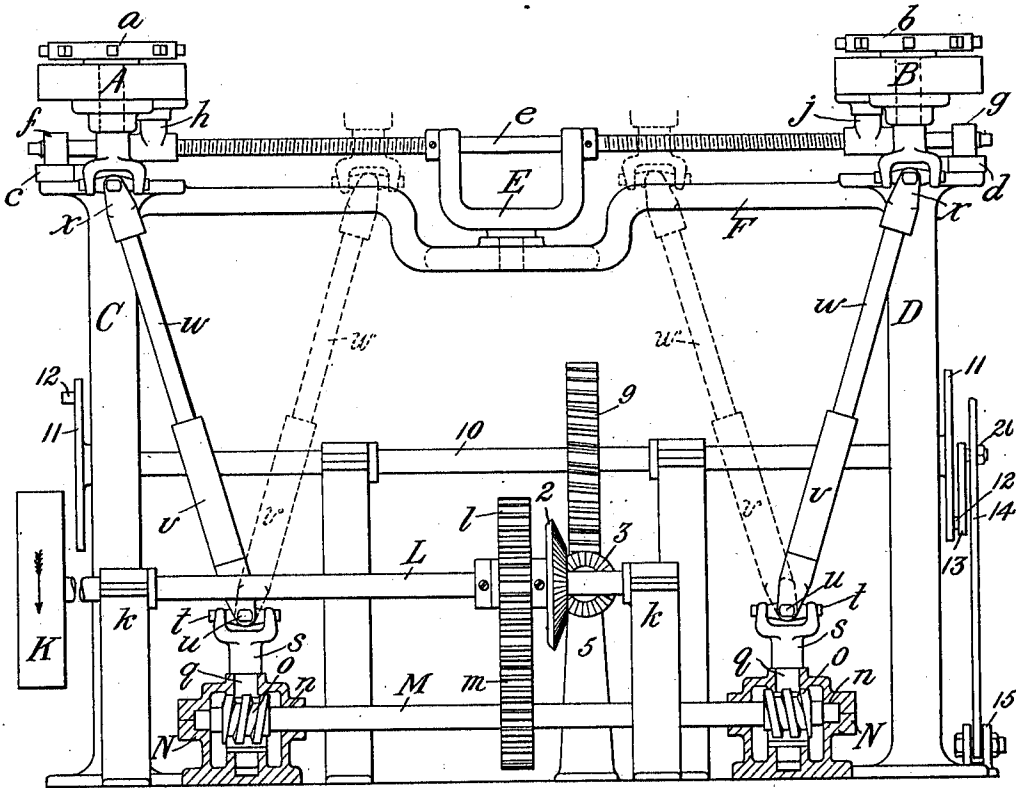


Fig. 3.

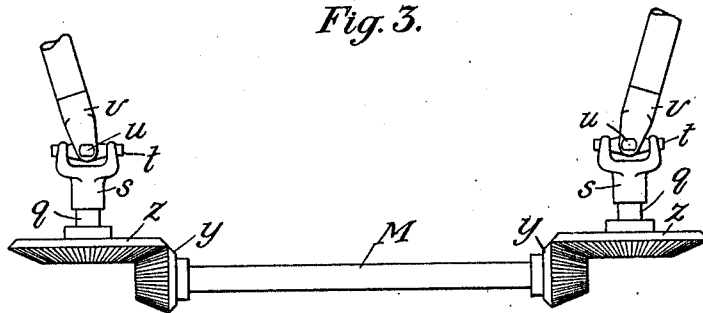


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN J. HOEY, OF PROVIDENCE, RHODE ISLAND.

TENTERING-MACHINE.

974,271.

Specification of Letters Patent.

Patented Nov. 1, 1910.

Application filed October 15, 1909. Serial No. 522,783.

To all whom it may concern:

Be it known that I, JOHN J. HOEY, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Tentering-Machines, of which the following is a specification.

My invention relates to tentering machines for use in finishing textiles and consists of improvements in the mechanism for driving the conveyer or clamp chains and in the arrangement for reciprocating the side-rails or frames on which the chains are carried.

My invention is fully set forth in the following specification, illustrated by the accompanying drawings, in which:

Figure 1 is a plan view of the driving end of a tentering machine; Fig. 2, a side elevation showing the driving mechanism in detail; Fig. 3, an elevation of the machine, as viewed from the driving end; Fig. 4, a detail view showing a modification in the arrangement of the driving mechanism for the chains.

In machines of this class the essential elements of the mechanism consist of endless chains carried on side-frames or rails and arranged to be driven continuously by sprocket-wheels. The chains carry cloth-clamps or tenter-hooks which grip the edges of the cloth to be treated and feed it through the machine. The machine is usually arranged to provide for a longitudinal, reciprocatory motion of the two side-rails in opposite directions during the travel of the chains to exert a pulling and stretching action on the fabric, and the rails are adapted to move toward and away from each other during their reciprocatory motion according to the requirements of the cloth. The rails are also adapted to be adjusted manually in lateral relation to provide for different widths of cloth held between the chains.

The essential feature of my invention is a novel and simple arrangement for connecting the sprocket-wheels to be driven from the main drive-shaft by a flexible shaft in such manner that they are free to move bodily back and forth and toward and away from each other with the movement of the side-rails. My new arrangement also provides for a constant rate of speed of rotation of the sprocket-wheels, irrespective of their

positions in relation to the driving shaft. My invention also consists further in a novel arrangement for reciprocating the side rails from the drive-shaft, adapted to provide for discontinuing this reciprocatory movement at the will of the operator and for locking the rails against movement after their disconnection.

In the drawings, A and B are the two longitudinal side-rails of the machine which support the chains of clamps, not here shown, the latter adapted to be continuously driven by the sprocket-wheels *a* and *b*. Only a portion of the length of the rails is shown in the drawings, but the machine generally extends the whole length of the "drying-room" in which it is installed and duplicate sprocket-wheels are arranged at the opposite ends of the rails to serve as idlers for the endless chains which run the full length of the machine. The rails A and B are supported on standards or columns C, D, etc., see Figs. 2 and 3, a suitable number of which are placed at intervals along the length of the machine. Preferably the rails are connected by transverse rods *e* which have rolls *f* and *g* at their outer ends, adapted to rest on suitable arc-shaped bearing plates *c* and *d* at the top of the columns C and D. The rod *e* is supported in bearings in a yoke E, see Figs. 1 and 3, which is pivoted on a cross-tie F extending between the columns C and D. This arrangement provides a swiveled bearing for the rod *e* to allow it to oscillate during the reciprocative movement of the rails A and B with the rolls *f* and *g* riding on the bearing plates *c* and *d*. The rails are supported on the rod *e* by the bearings *h* and *j*, pivoted on their under sides, as shown in Fig. 3, and formed with internally threaded hubs adapted to receive the threaded portions of the rod. The threads at the opposite ends of the rod *e* are preferably right- and left-handed so that when the rod is turned the two rails may be either coordinately drawn together or moved apart to adjust the chains to different widths of cloth. The ends of the rod are shown squared to receive crank handles for turning the rod manually, or the whole series of rods might be arranged to be turned simultaneously by a longitudinal rod carrying worms engaging gears on the rods *e*. This part of the mechanism, however, is not essential to the pres-

ent invention and therefore is not shown in detail.

The whole machine is operated by means of a driving pulley K on the horizontal drive-shaft L, the latter supported in suitable bearings $k-k$. A spur gear l , fast on the shaft L, meshes with a gear m fast on a second horizontal shaft M, the latter adapted to rotate in the bearings n, n . The shaft M carries at either end the worms o, o , one having a right-hand pitch and the other being left-handed. The worms o, o mesh with worm-wheels p , see Fig. 2, which are fast on the stud-shafts q, q . The stud-shafts q, q are journaled in bearings provided in the casing N which also forms the bearings n, n for the shaft M. The casings N completely inclose the worms and worm-wheels and can be made oil-tight so that these gears are adapted to run in oil. The driving pulley K is driven by a belt and turns the drive shaft L in the direction indicated by its arrow in Fig. 2 and the countershaft M will be driven in the opposite direction, as shown. The worms o on the shaft M being right- and left-handed their respective worm-gears will be turned in opposite directions by the rotation of the shaft M and the arrangement is such that the stud-shafts q, q turn away from each other, as viewed in Fig. 3.

The stud-shafts q, q are connected to drive the sprocket-wheels a and b by means of shafts provided with universal joints at either end. These may be of any suitable construction and are shown with the following arrangement: The stud-shafts q, q carry sleeves s, s formed at their upper ends with the usual arrangement of harp-shaped bearings for the cross-studs t, t . The studs t, t have transverse studs u, u on which are swiveled similar harp-shaped bearings which extend in the sleeves v, v . Sliding in the sleeves v, v are rods w, w which are keyed or otherwise secured to prevent their turning in the sleeves, so that the whole forms a telescopic shaft adapted to longitudinal extension or retraction, but arranged to turn as one element. The upper ends of the rods w are connected to the studs on which the sprocket-wheels a and b are mounted by universal joints x, x similar to those below. It will be seen that the rotation of the stud-shafts q, q will be transmitted to the sprocket-wheels a and b in the same directions, so that the latter will be rotated, as indicated by the arrows in Fig. 1. The chains will therefore be driven by the sprocket-wheels with their inner lengths traveling up the length of the rails away from the receiving end of the machine and toward the opposite or delivery end where the driving mechanism is located. The arrangement of universal joints between the drive-

shaft and the sprocket-wheels provides a flexible driving connection which allows the sprocket-wheels to move bodily in any direction, either backward and forward with the longitudinal reciprocation of the side rails A and B, as indicated by the dotted lines in Fig. 2, or toward and away from each other, as shown by dotted and full lines in Fig. 3. A most important result of the improvement is the effect of providing always for a constant speed of rotation of the sprocket-wheels in whatever position they may be in relation to the driving mechanism, as more fully explained hereinafter.

The method of driving the stud-shafts q from the shaft M by worm and worm-wheel connections, as above described, and illustrated in Figs. 2 and 3, is the preferable arrangement as it provides for a smooth, even drive without jar or racking. It will be obvious, however, that other arrangements of gearing might be substituted and I have shown an alternative construction in Fig. 4. In this view the shaft M carries bevel pinions y, y which mesh with the bevel gears z, z on the stud-shafts q, q and the rotation of the shaft M is thence transmitted to the sprocket-wheels in the manner before described through the flexible shafts. In place of the bevel gears y and z , friction disks might be made use of.

The mechanism for reciprocating the side rails A and B is operated from the main drive-shaft L through the following connections: Fast on the shaft L, adjacent the spur gear l , is a bevel gear 2 which meshes with a bevel pinion 3. The pinion 3 is fast on the end of a horizontal, longitudinal shaft 4 which rotates in bearings on the brackets or standards 5, 6 and 7. Between the bearings 6 and 7 a worm 8 is mounted on the shaft 4, arranged to mesh with the worm-wheel 9. The worm-wheel 9 is fast on a transverse shaft 10 which carries crank-disks 11, 11 at either end and suitable crank-pins 12 on the disks 11 are connected by links 13 to levers 14 fulcrumed in bearings 15. Links 16 connect the upper ends of the levers 14 to a cross-rod 17 by means of swiveled bearings 18 on the under sides of the rails A and B. These bearings allow the rails to slide in and out on the rod 17 and the latter is held in a yoke bearing 19, see Fig. 1, pivoted on an extension of the cross-tie F similar to the arrangement of the yoke E. The rotation of the drive-shaft L is imparted to the shaft 4 through the medium of the bevel gears 2 and 3 and the worm 8 drives the worm-wheel 9 to rotate the shaft 10. The rotation of the crank-disks 11 serves to impart a vibratory motion to the levers 14, through the links 13, and this motion is transmitted through the links 16 to reciprocate the rails A and B. The crank-

pins 12, 12 are arranged on opposite centers so that the two levers 14, 14, see Fig. 1, will be moved in opposite directions when the crank-disks rotate, and in this way the two rails A and B are reciprocated with one rail A moving toward one end of the machine while the other rail B moves toward the opposite end of the machine, and vice versa as required. The ends of the links 13 are preferably adjustable up and down on the levers 14 by means of a slot and bolt connection, as shown at 20, Fig. 2, so that the connecting points of the links can be changed to vary the range of movement of the levers. The object of this arrangement is to provide for adjusting the extent of reciprocation of the rails A and B and the same result might be effected by making the links 16, instead of the links 13, adjustable on the levers 14.

It is sometimes desirable in devices of this character to arrest the reciprocation of the side-rails during the operation of the rest of the machine. To provide for disconnecting the driving mechanism of the rails from the main drive-shaft of the machine I have devised the following novel arrangement of mechanism: The shaft 4 is arranged to slide in its bearings 5, 6 and 7 to withdraw the pinion 3 from mesh with the gear 2. The sliding movement of the shaft 4 is controlled by means of a sliding bushing 22 operated by a hand lever 23. The bushing 22 slides in the bearing 7 and the shaft 4 rotates in the bushing, but is held longitudinally in relation thereto by means of a stud 24 extending through the bushing with its end engaging a circumferential slot 25 in the shaft. The lever 23 is pivoted in a bearing on the arm 26 extending from the standard 7 and is formed with a cam-shaped extension or arm 27 which bears on the end of the bushing 22. Extending through the cam-arm 27 is a pin 28 adapted to engage slots 29 formed in the ears 30 which are either cast on, or attached to, the sides of the bushing 22. The worm 8 is held rotatively on the shaft 4 by means of a key 31 which slides in a key-way in the worm when the shaft is slid in its bearings. With the lever 23 in the position shown in Fig. 2 the shaft 4 is locked from sliding by the cam-arm 27 which acts as a dog against the end of the bushing 22 to take the end thrust of the shaft. When the lever 23 is swung to the right the cam 27 will be removed from the end of the bushing 22 and the pin 28, riding in the slots 29, will cause the bushing to be slid to the right in its bearing 7 and, through the engagement of the stud 24 with the groove 25, the shaft 4 will be slid in the same direction to withdraw the pinion 3 from mesh with the gear 2. In this way the rotation of the shaft 4 may be arrested while the drive-

shaft L continues to turn and the shaft 10 will then be locked from turning on account of the engagement of the worm-wheel 9 with the worm 8 so that the levers 14 and, through them, the rails A and B are held positively from movement.

Having now specified the preferred construction and arrangement of the mechanism its mode of operation will next be described in full: The shaft L is driven from the driving pulley K, belted to a line-shaft, motor or any other source of power, and the gear *l* meshing with the gear *m* rotates the shaft M. The rotation of the right- and left-handed worms *o, o*, fast on the shaft M, turns the worm-wheels *p*, with which they mesh, in opposite directions and this rotation is imparted to the sprocket-wheels *a* and *b* through the flexible shafts *w, w*. The rotation of the drive-shaft L is also imparted to the shaft 4 through the bevel gears 2 and 3 and the shaft 4 turns the shaft 10 through the worm 8 and worm-wheel 9. The crank-disks 11—11 on the shaft 10 oscillate the levers 14 in opposite directions, through the links or connecting-rods 13, and the levers 14, in turn, reciprocate the side-rails A and B by means of the links 16. The rails A and B are thus moved longitudinally backward and forward along the length of the machine and being held positively on the rods *e* they are caused to move toward and away from each other as the rods oscillate on their bearing yokes E. The sprocket-wheels *a* and *b* are carried by the rails A and B and therefore have a corresponding reciprocatory and in-and-out motion while being rotated to drive the conveyer chains of cloth-clamps, this motion being provided for by the flexible arrangement of the shafts connected to the sprocket-wheels and the stud-shafts *g, g* by the universal joints. If it is required to arrest the reciprocation of the side-rails during the operation of the machine the lever 23 is shifted to slide the shaft 4 to withdraw the pinion 3 from the gear 2 and the rails will then be held from movement by the worm-wheel 9 being locked in mesh with the worm 8. To continue the movement of the side-rails again it is only necessary to slide the shaft back to engage the pinion 3 with the gear 2.

It will be seen that my invention provides a simple and direct means for driving the sprocket-wheels from the main shaft without the use of intermediate gearing arranged to slide on shafts to adapt it to follow the movement of the side-rails. Heretofore in machines of this character the usual arrangement has been to employ bevel gears sliding on an oscillating shaft and meshing with bevel gears on the shafts of the sprocket-wheels. The oscillating shaft is usually driven by a spur-gear mounted on

a rockable bearing on the shaft, to allow the latter to swing with the longitudinal movement of the rails, and the bevel gears slide in and out on the shaft as the rails move toward and away from each other. This form of mechanism is not only cumbersome and complicated with many friction-producing, engaging elements; but, besides this, the peculiarities of its operation result in an irregular and halting drive being imparted to the conveyer chains. As the rotating shaft which drives the bevel gears oscillates about its central pivot there will be lost motion between the gear at one end meshing with the gear on one of the sprocket-wheels and the gear at the opposite end meshing with the other sprocket-wheel. This causes the rate of movement of the chain on one side of the machine to be accelerated while the speed of the chain on the other side is correspondingly decreased, so that the chains run sometimes slower and sometimes faster. This lacking in uniformity of drive between the two chains gives a halting, jerky action to the cloth-clamps, which causes an uneven tension or strain on the material and frequently results in puckering the surface and damaging the selvage. This condition is well known and appreciated by cloth manufacturers and various expedients have been devised to overcome it. Previously to this invention, however, these arrangements have only added to the complication of the machine and the herein described device is, I believe, the first effective, simple and practical mechanism for accomplishing the result desired. The flexible shafts between the drive-shaft and the sprocket-wheels provide for a smooth even drive without play or backlash and, as particularly pointed out, without lost motion, so that both chains are driven at a uniform and constant rate of speed. Besides this improvement my invention also provides a simple and effective means for reciprocating the side-rails of the machine, adapted to allow the disconnection of the mechanism to arrest this reciprocation and lock the rails in position.

My invention is shown as applied to a machine in which the side-rails have both a longitudinal reciprocatory motion and a side motion toward and away from each other. This is the most common form of mechanism but tentering machines are also made in which the side-rails have only a lateral motion without reciprocating up and down the frame. It is obvious that my improved driving mechanism for the sprocket-wheels is applicable to either of the above devices and, furthermore, the machine described herein may be arranged to operate in either manner described.

Various modifications might be made in

the structure and arrangement of the mechanism described without departing from the scope of my invention.

Therefore, without limiting myself to the exact form shown, what I claim is:—

1. The combination in a tentering machine with side-rails adapted to be moved laterally and longitudinally in relation to each other during the operation of the machine, of sprocket-wheels rotatively mounted on the side-rails, a driven shaft, means to drive said shaft, and flexible shafts having universal joints connecting the driven shaft with the sprocket-wheels to rotate the latter during their movement with the side-rails.

2. The combination in a tentering machine having side-rails adapted to be moved laterally and longitudinally in relation to each other during the operation of the machine, of rotatable conveyer-chain wheels, driving means, and flexible shafts having universal joints connecting the driving means with the chain-wheels to rotate the latter during their movement with the side-rails.

3. The combination in a tentering machine with chain-driving wheels adapted to be moved laterally and longitudinally of the machine during its operation, of a driven shaft, and flexible shafts having universal joints connecting the driven shaft with the chain wheels to rotate the latter during their movement on the machine.

4. The combination in a tentering machine with chain-driving wheels adapted to be moved laterally and longitudinally on the machine, a horizontal shaft on the machine, vertical stud-shafts, gears for driving said stud-shafts from the horizontal shaft, and flexible shafts having universal joints connecting the stud-shafts with the chain-wheels to allow the movement of the chain-wheels during their rotation.

5. The combination in a tentering machine with chain-driving wheels arranged to move laterally and longitudinally on the machine, of a horizontal driven shaft, vertical stud-shafts, gears to rotate the stud-shafts from the driven shaft, telescopic shafts for driving the chain-wheels, and universal joints connecting the telescopic shafts with the chain-wheels and stud-shafts.

6. The combination in a tentering machine with chain-driving sprocket-wheels, of rotatable studs for said wheels mounted to move laterally and longitudinally on the machine, a drive-shaft, a driven shaft rotated from the drive-shaft, vertical stud-shafts, gears for driving the stud-shafts from the driven shaft, universal joints on the stud-shafts and sprocket-wheel studs and telescopic shafts connecting said universal joints.

7. The combination in a tentering ma-

chine with chain-driving sprocket-wheels arranged to move laterally and longitudinally on the machine, of a driven shaft, worms on said driven shaft, worm-gears driven from said worms, and flexible shafts connecting the sprocket-wheels to be driven by the worm-gears.

8. The combination in a tentering machine with side-rails adapted to be moved laterally and longitudinally in relation to each other, of studs mounted rotatively on the rails, sprocket-wheels carried by said studs, a drive-shaft, a driven shaft, gears connecting the drive-shaft and driven shaft, worms mounted on the drive shaft, stud-shafts mounted in bearings adjacent the driven shaft, worm-gears on said stud-shafts meshing with the worms, universal joints at the ends of the stud shafts, extensible shafts connected at one end to said universal joints, and universal joints connecting the opposite ends of the extensible shafts to the studs of the sprocket-wheels.

9. The combination in a tentering machine with side-rails carrying rotatable sprocket-wheels, said rails adapted to be reciprocated longitudinally of the machine, of a drive-shaft L, a driven shaft M rotated thereby, flexible shafts connecting the driven shaft with the sprocket-wheels, a shaft 4, gears to rotate said shaft 4 from the drive-shaft, means to disengage said gears to discontinue the rotation of the shaft 4, and means operated by said shaft 4 to reciprocate the side-rails of the machine.

10. The combination in a tentering machine with longitudinally reciprocating side-rails, of means to reciprocate said side-rails including a shaft 10, a worm-wheel 9 on said shaft, a worm 8 engaging said worm-wheel, a shaft 4 to rotate the worm, a drive-shaft L for the machine, gears connecting the shaft L and shaft 4, and means to slide the shaft 4 to disengage said gears to arrest the reciprocation of the side rails.

11. The combination in a tentering machine with the longitudinally reciprocating side-rails, of a transverse drive-shaft L, a bevel gear 2 on said shaft, a longitudinal shaft 4 arranged to slide in bearings, a bevel pinion 3 on said shaft 4 adapted to mesh with the bevel gear 2 on the drive-shaft, a worm 8 held against rotation on the shaft 4

but arranged to allow the shaft to slide in the worm, a worm-wheel meshing with the worm, means to reciprocate the side-rails from the worm-wheel and means adapted to lock the shaft 4 in position with the gears 2 and 3 in mesh.

12. The combination in a tentering machine with the longitudinally reciprocating side-rails, of a transverse drive-shaft L, a bevel gear 2 on said shaft, a longitudinal shaft 4, a bevel pinion 3 on said shaft 4 adapted to mesh with the gear 2, bearings 6 and 7 for the shaft 4, a worm 8 on the shaft 4 between the bearings 6 and 7, a transverse shaft 10, a worm-wheel 9 on the shaft 10 meshing with the worm 8, means to reciprocate the side-rails from the shaft 10, a bushing at the end of the shaft 4 arranged to be held against longitudinal movement on the shaft, and a lever adapted to lock the bushing in one position to hold the shaft with the gear 3 in mesh with the gear 2 to slide the bushing to withdraw the gear 3 from engagement with the gear 2.

13. In a tentering machine the combination with the reciprocating side-rails, of means to reciprocate said rails, a shaft 10 to drive said means, a longitudinal sliding shaft 4, worm and worm-wheel connections between the shaft 4 and shaft 10, a drive-shaft L, gear-connections between the shaft 4 and shaft L, means to slide the shaft 4 to disconnect it from the shaft L comprising a bushing held against longitudinal movement on said shaft, and a lever to slide said bushing, a cam carried by said lever and adapted to engage the end of the bushing to take the end thrust of the shaft.

14. The combination in a tentering machine having side-rails adapted to be adjusted laterally in relation to each other for different widths of fabric, of rotatable conveyer-chain wheels, driving means, and flexible shafts having universal joints connecting the driving means with the chain wheels to rotate the latter in whatever position they may be adjusted.

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

JOHN J. HOEY.

Witnesses:

GRACE W. BROWN,
ARTHUR A. HOEY.