

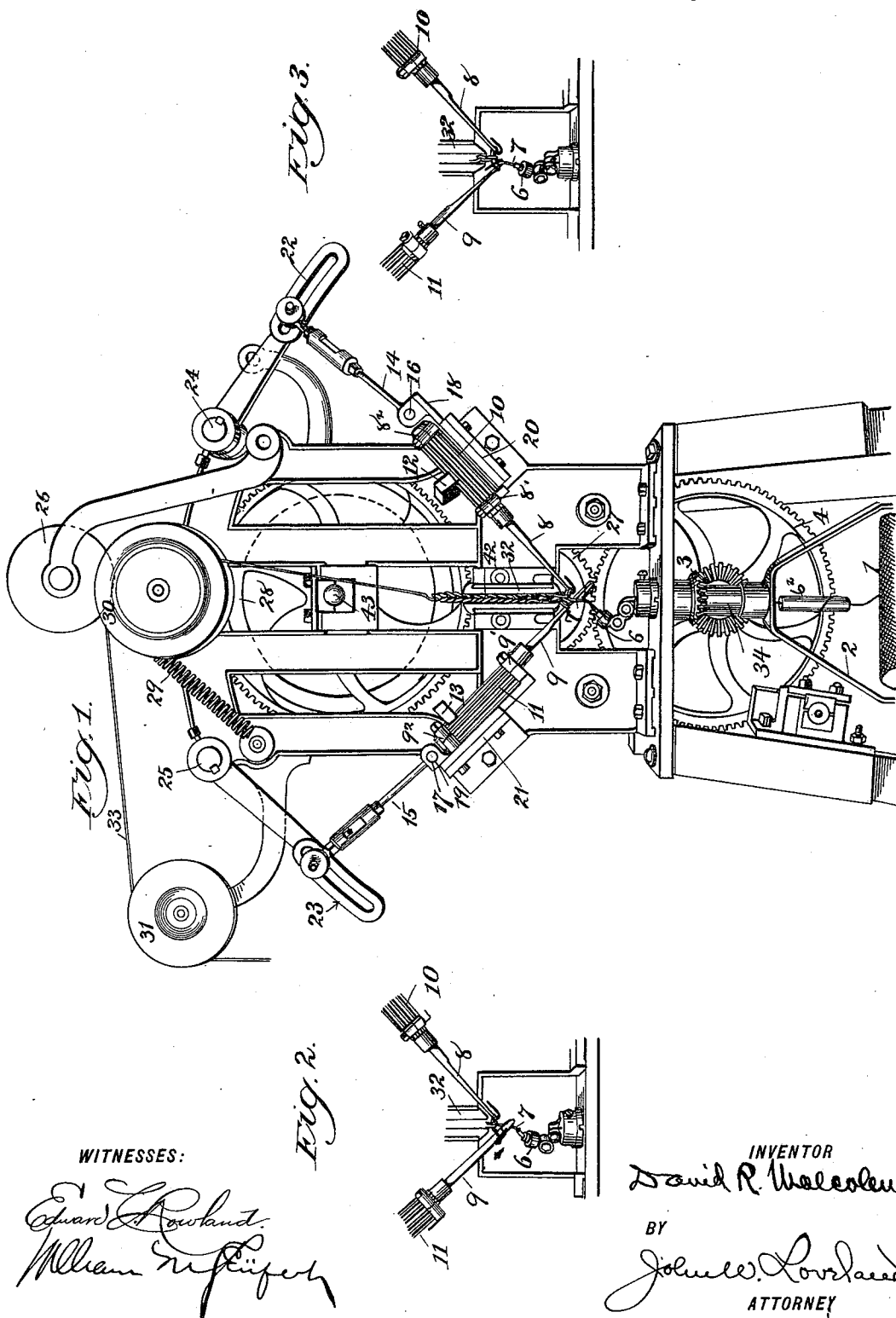
(No Model.)

3 Sheets—Sheet 1.

D. R. MALCOLM.
DEVICE FOR INTERLOOPING CORDAGE.

No. 582,658.

Patented May 18, 1897.



WITNESSES:

Edward L. Loveland
William R. Fisher

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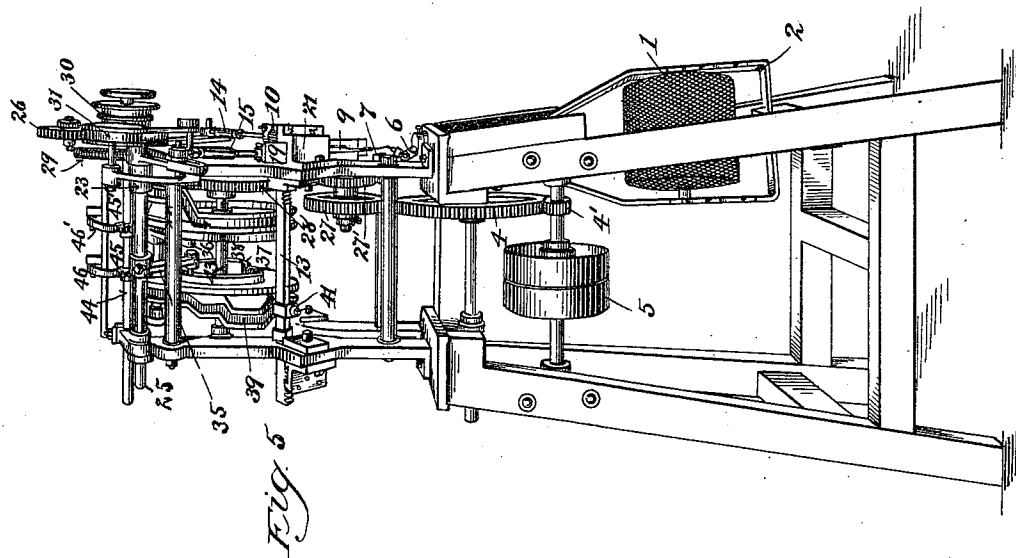
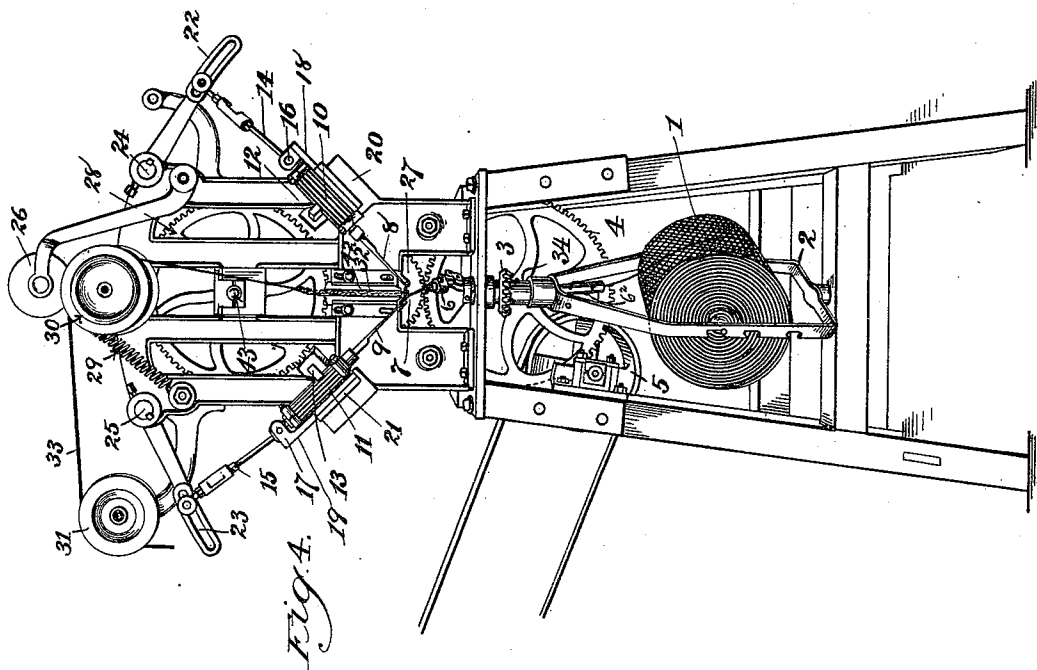
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3 Sheets—Sheet 2.

D. R. MALCOLM.
DEVICE FOR INTERLOOPING CORDAGE.

No. 582,658.

Patented May 18, 1897.



WITNESSES:

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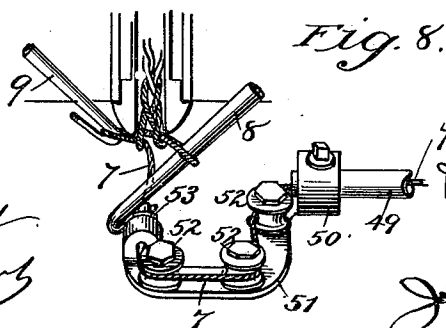
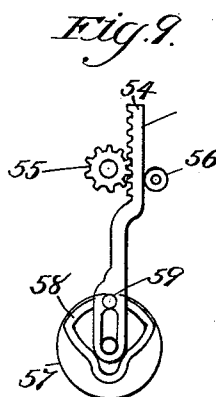
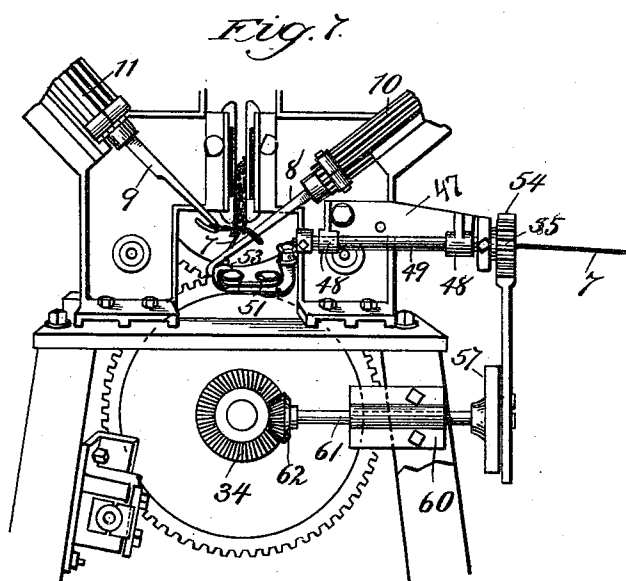
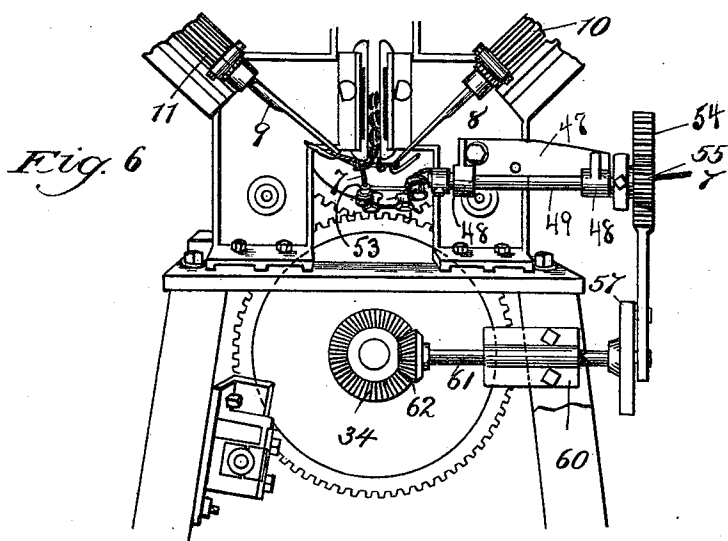
(No Model.)

3 Sheets—Sheet 3.

D. R. MALCOLM.
DEVICE FOR INTERLOOPING CORDAGE.

No. 582,658.

Patented May 18, 1897.



WITNESSES:

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UNITED STATES PATENT OFFICE.

DAVID RATTRAY MALCOLM, OF ALLENTOWN, PENNSYLVANIA.

DEVICE FOR INTERLOOPING CORDAGE.

SPECIFICATION forming part of Letters Patent No. 582,658, dated May 18, 1897.

Application filed July 7, 1896. Serial No. 598,324. (No model.)

To all whom it may concern:

Be it known that I, DAVID RATTRAY MALCOLM, a citizen of the United States, and a resident of Allentown, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Devices for Interlooping Cordage, of which the following is a specification.

My invention relates to the machinery employed in the manufacture of ropes or articles of like nature, and especially to that class of machines forming a rope or similar article of square section and of a single strand.

The objects of my invention are to provide a machine capable of producing rapidly, easily, and economically a product of the nature described, and to provide a machine capable of producing a better and more simple product of this nature. I attain these objects by the means illustrated in the accompanying drawings, in which like figures of reference refer to like parts throughout the several views.

Figure 1 is a front elevation showing the needles in the first position preparatory to interlooping the strand on the left-hand needle. Fig. 2 is also a front elevation of the needles, showing the second position of the needles in which the left-hand needle is partly turned and the strand partly interlooped thereon. Fig. 3 is a similar elevation showing the left-hand needle turned back and in the act of drawing the strand through the loop. Fig. 4 is a similar elevation of the whole machine, showing the needles in the final position, the left-hand needle having completed the loop upon itself and the right-hand needle about to repeat the operation. Fig. 5 is a perspective side view of the machine. Fig. 6 shows another form of guide laying said strand on left needle. Fig. 7 shows the same laying on right needle. Fig. 8 is an enlarged view of Fig. 7. Fig. 9 is a portion of the connecting mechanism.

Heretofore square rope has been usually formed of several strands plaited or braided generally and with an ordinary braiding plait, which very easily becomes unlaidd. Such rope is also loose and easily disturbed, thus losing certain advantages of the square section. Moreover the existing methods are complicated, slow, and comparatively expensive.

In the majority of machines used in the manufacture heretofore the individual ends required to be wound on spools, and these

spools were placed in shuttles or carriers, which have a motion each one around all the others, so as to make a regular plait. This plait being formed around a square core takes a semisquare form and is afterward squeezed into approximately square form.

In many instances to avoid making the machine too large and consequently slow and heavy in its movements the spools require to be made small and contain consequently little of the cord. Therefore much attention is required from the attendant and many stoppages are necessary to put in fresh spools. I avoid these and other objections by the use of my improved mechanism, as hereinafter described.

Referring to Figs. 1, 4, and 5, 1 is the reel, supported in the frame 2, on which is wound the substance to be fed to the machine.

6³ is a device whose function is to apply a certain tension to the strand.

34 is a hollow spindle through which the strand passes from the reel. This spindle is rotated by means of the miter-gear 3, itself driven by the wheel 4, meshing into the pinion 4' on the shaft driven by the band-wheel 5, (see Fig. 5,) and terminates at the top in a strand-guide 6, whose function it is to lay the strand properly upon the needles.

8 9 are the needles, which terminate in hooks of suitable size and shape to hold the strand. These needles are free to rotate in bearings 8' 8² and 9' 9², and these bearings themselves are borne on the sliding carriages 18 19, which move in chamfered guides 20 21, the carriages being actuated longitudinally by means of the connecting-rods 14 15, pivoted at 16 17, and adjustably fastened in the slotted arms 22 23, whose axes are at 24 25, forming a system of levers, the other arms 35 36 of which engage in cams 37 38, as shown in Fig. 5.

The upper portions of the needles 8 9 are pinions 10 11, in which engage racks 12 13, which racks are actuated by studs 41, projecting into grooves of peripheral cams 39 40, (see Fig. 5,) the cams thus imparting a longitudinal motion to the racks 12 13, which results in a partial rotation of the pinions and needles 10 11 8 9.

32 is a guide for the finished product. This guide is removable, and is made of varying dimensions, so as to fit different sizes of the finished product.

The cams 37 38 39 40 are fixed upon the

shaft 43, which is driven by the gear-wheel 28, meshing into the system of idle-wheels 27 27', which in turn derive their motion from gear-wheel 4, driven, as already explained, by the band-wheel 5.

30 is a pulley over which the strand or finished product is led and on which the milled wheel 26 is constantly pressed by means of the spring 29, the object being to maintain a constant tension on the product as it is produced. To this end the shaft 44, which bears the pulley 30, has two ratchet-wheels 45 45' on which the pawls 46 46' play, thus preventing any backward motion of the pulley 30. From this pulley 30 the strand 33 or finished product ultimately is conveyed over the pulley 31 to a reel or other receptacle.

It will be evident that the apparatus, while it only illustrates the working parts of a single device, is capable of being fitted with duplicate parts, as indicated in Fig. 5, by means of which just double the production is possible on the one machine.

The operation of the device is as follows, referring to Fig. 1: The reel of material 1 is placed in the frame 2 and the end brought up through the spindle 34 and out through the guide 6, where a series of loops is formed by hand upon the strand and placed properly upon the needles. The loose end is then led up through the guide 32 and over the wheels 30 31, and thence off to a reel or other suitable receptacle. Motion is then communicated to the belt and band-wheel 5, when the spindle is at once revolved by means of the gears 3. The guide 6, rotating with the spindle, carries the strand 7 with it, laying it successively in a position to be engaged by the needles 8 9 as they are successively reciprocated and rotated by means of the cams and connecting mechanism, as hereinafter more explicitly shown. Referring now to Fig. 5, the simultaneous revolution of the wheel 4 is communicated by means of the idle-wheels 27 27' to the shaft 43, bearing the cams 37 38 39 40. Considering first the results of the revolution of cams 37 38, it will be evident that the levers 35 36 on the shafts 24 25, having studs moving in the cam-grooves, will receive an impulse which, transmitted to the arms 22 23, will produce a reciprocating motion in the carriages 18 19, on which are mounted the pinioned needles 8 9 10 11. At the same time the rack 13 receives through the stud 41 and the rack 12 through its stud (not shown, but corresponding to 41, both of which studs bear in the grooves of the cams 39 40) a longitudinal motion, which is converted into rotary motion in the pinions 10 11, which are made long to allow for reciprocal motion in the bearings 20 21. The consequence of these motions is as follows: Referring now particularly to Fig. 1, the needle 9—*i. e.*, the left-hand needle looking at the figure—is forced down through the loop in the strand, so that the revolution of the guide 6 lays the strand 7 against the shank. At this point the pinion is

rotated, thus bringing the needle into the position shown in Fig. 2, where the strand is shown in the hook of the needle. The continual movement of the mechanism now continues the rotation of the pinion, so that the needle assumes the position shown in Fig. 3, where it has been partly drawn up through the loop, while still holding the strand 7 in its hook. In Fig. 4 this reciprocation is completed. The hook still holding the strand 7 is drawn quite through the original loop, which has now been drawn tight about the new loop just formed on the needle. The needle itself has been rotated and reciprocated to its first position and has returned downward again sufficiently to slacken this new loop upon itself. This slight retraction is of vital importance, as it is the means by which the strand is tightened, so as to form a compact and firm product, for at the moment of retraction the wheels 30 26 draw up the finished product and the needle 8, in coming down and engaging the new portion of strand 7, draws the loop tight. In order to allow the needle to pass easily through the tightened loop, it is made broad and thin, the greatest breadth of the shaft, as will be seen on reference to Fig. 2, being the same or a little greater than the width of the hook, as shown in the other figures. Meantime the second or right-hand needle 8 has been stationary during all this process, though the guide 6 has been revolving and has now laid a new portion of the strand 7 in such a position as to be engageable by the said needle 8. (See Fig. 4.) This needle now is reciprocated in the same way that the left-hand needle was in the above description, being forced down, then rotated, during which rotation it engages the strand 7, then redrawn through the loop on itself, still retaining the strand, at which time it tightens the loop previously made on the left-hand needle when after having been entirely redrawn through the original loop and in its turn retracted slightly. The latter is tightened by means of the tension-wheels 26 30 and the motion of the opposite needle in the succeeding stitch and leaves the new loop on the needle ready for a repetition of the operation. Thus the two needles alternately form successive interloopings of the strands, finally forming a compact rope of square section formed of a single strand.

Figs. 6, 7, 8, and 9, as has been already said, show a modification of the guide.

Referring more particularly now to Figs. 6 and 7, 47 is a bracket adapted to be secured to the frame of the machine proper, provided with bearings 48, in which rotates the hollow spindle 49. This spindle ends in a U-shaped portion 51, provided with small pulleys 52 and a tubular guide 53. The other end of the spindle is provided with a gear-wheel 55, which meshes into the rack 54. This rack (see also Fig. 9) is held in place by the small wheel 56, and by means of the pin 59 derives a peculiar reciprocating motion from the grooved cam 57 58, which in turn is rotated

by means of the shaft 61, operating in the gears 34 62.

The function of the modification is similar to that of the guide already described—i. e., to alternately lay the strand into the needles. The operation, however, is different, and is as follows: By means of the rotation of the spindle 49, the strand 7, passing through the spindle and around the wheels 52 on the U-frame 51, is laid after passing through the tubular guide 53 first upon the needle 9, as is shown in Fig. 6. After the looping then performed the guide is rotated to a similar angle upon the other side and lays the strand then upon the needle 8, as shown in Fig. 7, and in larger detail in Fig. 8, and so indefinitely continues. These needles are reciprocated and rotated independently of each other, in the sense that they do not reciprocate and rotate in the same way at the same time, but are given one a retrograde while the other is given the forward or other motion, and vice versa, although both are driven primarily by the same element, which in this case is a cam, which in its revolution alternately drives one needle while the other is at rest. Their independence consists, therefore, in their separation and alternation, but is not meant to imply any lack of coöperation.

I do not claim, broadly, the combination of reciprocating and rotating needles, as I am aware that this feature has been embodied in devices for forming netting, but

What I do claim, and desire to secure by Letters Patent, is—

1. In a machine for interlooping cordage, the combination of a plurality of independently reciprocating and rotating needles; with means for reciprocating and rotating the same alternately, and means for laying the strand upon the needles consecutively, substantially as described.

2. In a machine for interlooping cordage, the combination of a plurality of reciprocating and rotating needles with a strand-guide, and means for reciprocating and rotating the needles alternately with respect to the strand.

3. In a machine for interlooping cordage, the combination of a plurality of separately reciprocating and rotating needles, set at an angle to each other, and means for reciprocating and rotating the same, and means for laying the strand upon said needles consecutively, substantially as and for the purposes herein set forth.

4. In a machine for interlooping cordage, the combination of a plurality of reciprocating and rotating needles, with a strand-guide, and means for reciprocating and rotating the needles alternately with respect to the strand-guide, and means for operating the strand-guide.

5. In a machine for interlooping cordage, the combination of a plurality of reciprocating and rotating needles, with a strand-guide, with means for reciprocating and rotating the needles alternately with respect to each other,

a guide for the finished product, and a take-up device.

6. In a machine for interlooping cordage, the combination of a plurality of alternately reciprocating and rotating needles set at an angle to each other, with a strand-guide, and a guide for the finished product; means for reciprocating and rotating the needles, and means for operating the strand-guide, so as to guide the strand into the needles, and means for applying tension to the finished product.

7. The combination of a plurality of needles reciprocating and rotating alternately with respect to each other; with a strand-guide, and guide for the finished product; means for reciprocating and rotating the needles, and means for operating the strand-guide, so as to guide the strand into the needles, and means for applying tension to the finished product.

8. The combination in a device for interlooping cordage, of a plurality of separate needles, means for reciprocating and rotating the same, and a rocking strand-guide, and means for rocking the strand-guide, substantially as and for the purposes set forth.

9. In a device for interlooping cordage, a plurality of independent needles, rotating in bearings, carriages bearing said needles, pinions secured to said needles and means to drive said pinions, and means to reciprocate the carriages longitudinally and independently.

10. The combination of a plurality of independent needles, means for revolving and reciprocating the same alternately, with a strand-guide provided with means for moving it back and forth to feed the strand to each needle successively.

11. In a machine for interlooping cordage, the combination of needles, set at an angle with respect to each other, with slotted levers and cams operating the same, connected to said needles, and said cams adjusted for reciprocating said needles alternately, with pinions on the needles, and cams controlling racks meshing into said pinions so as to rotate the same alternately, a strand-receptacle, a strand-guide adapted to lay the strand alternately upon said needles, with means for driving said strand-guide, a guide for the finished product, a wheel continually pressing the finished product upon a rotating tension-wheel provided with pawls and ratchets.

12. In an organized device for interlooping cordage, the combination of a plurality of independent needles, racks and pinions for rotating the same, and means to reciprocate the same longitudinally and independently.

Signed at Allentown, in the county of Lehigh and State of Pennsylvania, this 2d day of July, A. D. 1896.

DAVID RATTRAY MALCOLM.

Witnesses:

M. S. WEIDNER,
JOHN SPENCE.