

May 11, 1937.

M. W. REED

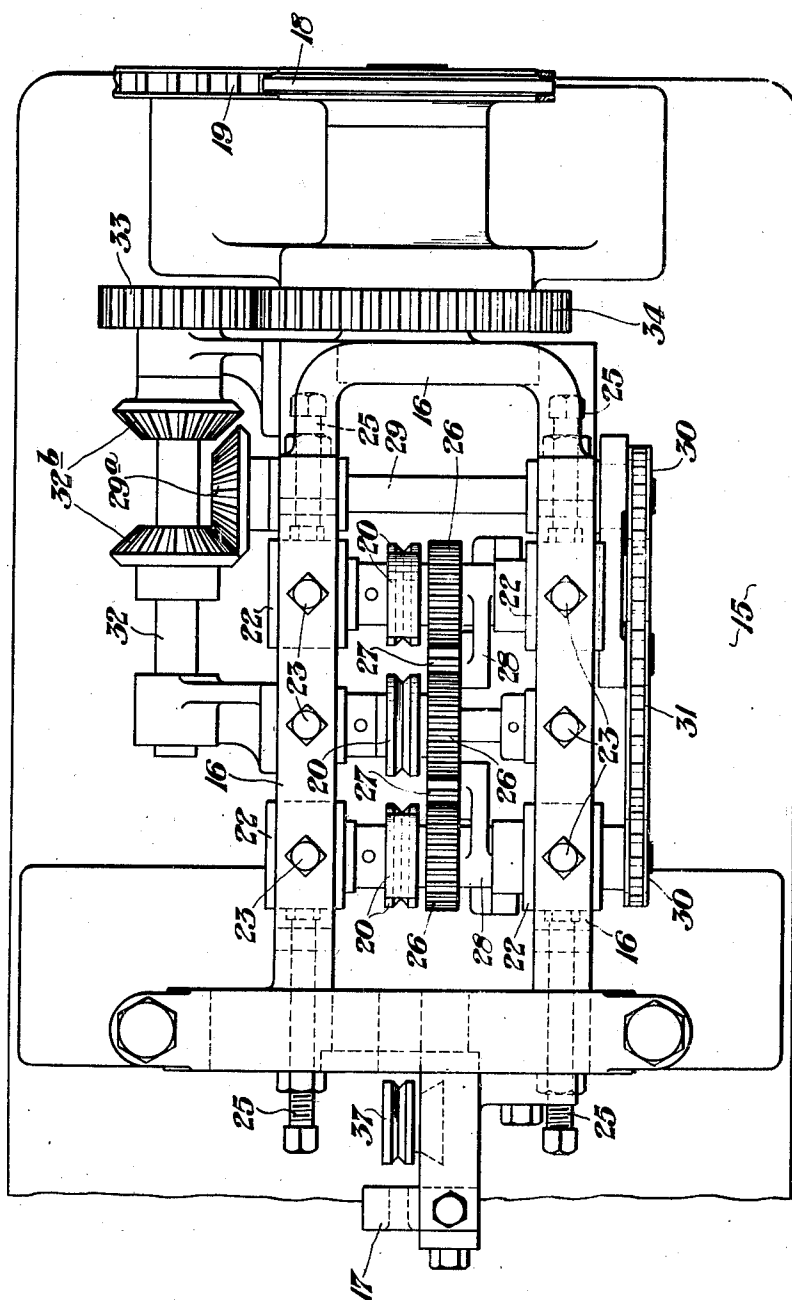
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WIRE ROPE MANUFACTURE

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3 Sheets-Sheet 2

Fig. 3.



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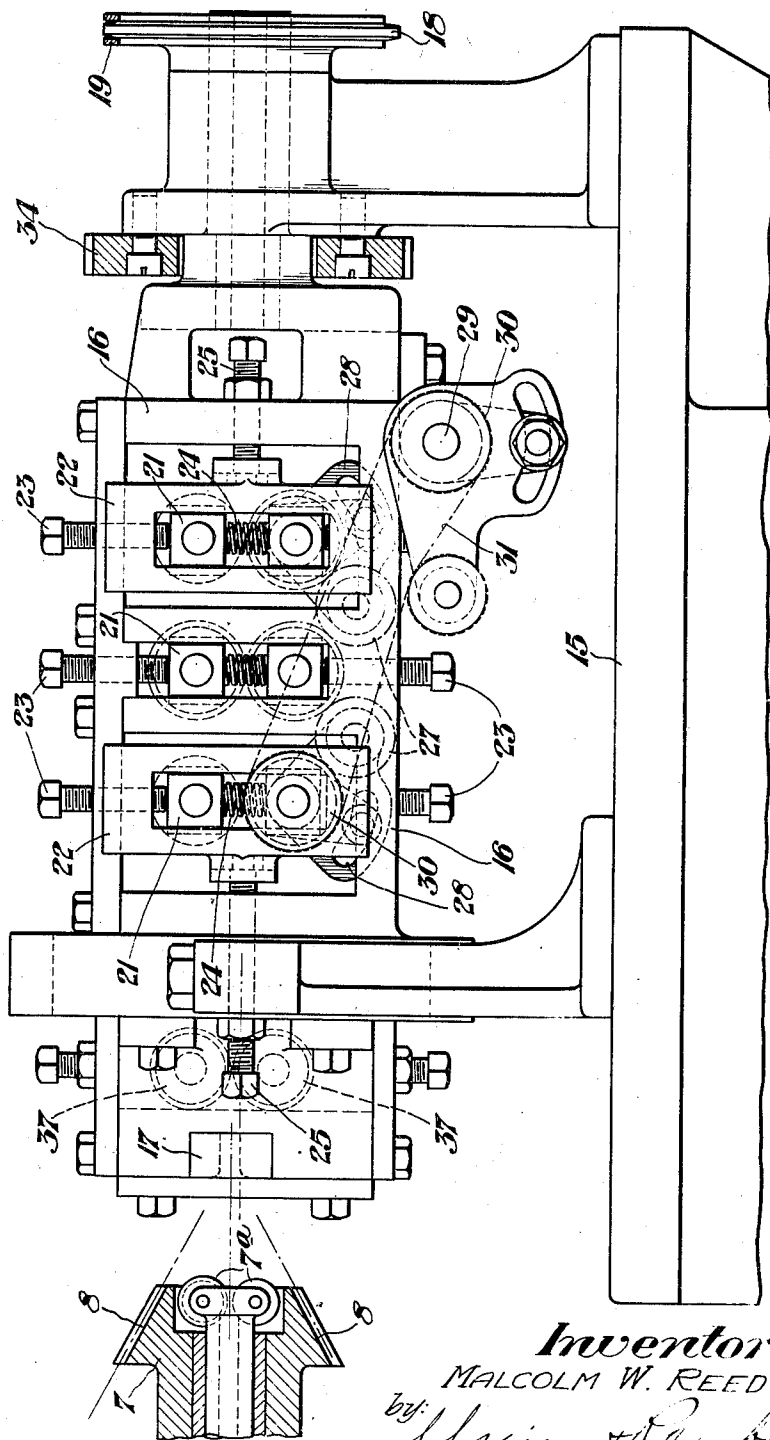
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Fig. 4.



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WIRE ROPE MANUFACTURE

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4 Claims. (Cl. 117—16.5)

The present invention relates to the manufacture of wire rope. This rope is usually made by twisting wires together to form straight strands which are subsequently twisted together into rope form. Thus the originally straight strands are eventually in the shape of helices, this unequally stressing the individual wires of which they are formed because they are forced into different relative positions from those determined by the original twisting. The wires are more seriously stressed in the case of flattened strand ropes, but the condition is more or less present in any type of rope formed from intertwisted strands.

One of the objects in the present instance is the production of better wire rope. Other objects may be inferred.

Referring to the accompanying drawings which illustrate one form of the invention:

Figures 1 and 2 are top and side views of a machine which twists wires together to form a strand.

Figures 3 and 4 are top and side views showing one form of the invention in detail, as it is applied to the machine shown by the first two figures.

Figures 5, 6 and 7 are views showing the construction of the new rope as produced according to the invention.

A base 1 mounts vertical members 2 in which a horizontal hollow shaft 3 is journaled. This shaft carries three spaced wheels 4 between which spools 5 are swung on gimbals 6. These spools carry wires which are fed to a hollow head 7 mounted on one end of the shaft 3. This head has slots 8 which receive the various wires and keep them separated.

A second base 1^a mounts upright supports 2^a between which spools 5^a are swung on a frame 6^a. The pivot for the end of this frame toward the shaft 3 is formed by a hollow shaft 3^a. The shafts 3 and 3^a register. Wires are carried by the spools 5^a and are fed through the shafts 3^a and 3 and out through the hollow head 7. This head is provided with guiding rollers 7^a which keep these wires centered respecting those coming from the spools 5.

Drive shafts 9 and 9^a are intergeared for opposite rotation. The shaft 9^a is geared to the shaft 3^a by sprockets 10 and a chain 11. This rotates the frame 6^a. The shaft 9 is geared to the shaft 3 by a pinion 12 and gear 13. The gimbals 6 revolve about the shaft 3 in the same direction as the frame 6^a rotates. A pulley 14 is fixed to the shaft 9 so that it may be belted to a suitable power source.

The machine so far described is substantially the same as all stranding machines, that is to say, it is the same as the usual machines that twist wires into strands which will be fashioned into finished ropes. The wire or wires from the spool or spools 5^a form a core over which the wires from the spools 5 are twisted. This is ordinarily done by a die which is located adjacent the head 7 in axial alinement therewith. In the case of a flattened strand, this die will be shaped accordingly and the wires from the spools 5 will be laid up in suitable numbers and sizes to most effectively secure the desired shape. Such an arrangement produces the straight strands which cause the described unequal stressing when twisted into helices.

The present invention is particularly characterized in that the die revolves eccentrically or, in other words, that its axis of revolution is alined with the rotary axis of the head 7 but that its center line is offset from this axis. Thus, the various wires are twisted together and simultaneously set or preformed in the shapes of helices having a substantially common helical axis. The die is offset a distance proportioned to cause this helical axis to coincide with the shapes the strands will take when laid together in rope form, the individual wires being thereby initially laid in the positions they will then occupy. Consequently, they are all equally stressed because their relative positions are unchanged when the strands are twisted together. Any stresses are caused by the twisting of the wires into the strand and not by the twisting of the strands into the rope.

A further characteristic of the invention is that the strand is pulled through the die by a means which engages it at points coinciding with its helical shape. This is important because if the strand was pulled through the die in the usual manner there might be danger of changing the relative positions of the wires by the tensions applied.

Referring again to the drawings, the end of the base 1 mounts a table 15 on which a horizontal rotary frame 16 is journaled. One end of this frame carries the die 17 which may be conventional except that its center line is offset from the rotary axis of the frame 16. The frame is driven by the shaft 9, sprockets 18 and a chain 19 gearing the two together.

The frame 16 mounts a plurality of driven rollers 20. These rollers are carried by bearings 21 which slide in side-frames 22. Screws 23 force the rollers together and also serve to adjust their

passes respecting the center line of the die 17, springs 24 keeping the bearings 21 pressed against these screws. Thus, there is provided a plurality of adjustable roller-sets. Alternate ones of the side-frames 22 are slidably mounted on the frame 16 and are horizontally adjusted by screws 25. The adjustment of these roller-sets is such that they engage the strand coming from the die at points coinciding with the wires' shapes, which will be in the shapes of helices having a helical axis. Therefore, the various roller-sets must engage the strand of wires at points corresponding to its helical axis. In the present instance the rollers are all aligned and they are alternately made flat and grooved whereby a helical path is formed by their respective passes. If the rollers provide the same diameters, the screws 23 may be used to bring them into proper engagement with the helical strand. The screws 25 adjust the two outer roller-sets to accord with the helical length required.

The various roller-sets are intergeared by gears 26 and 27, the latter being in each instance mounted on swinging brackets 28 so that interengagement with the other gears may be maintained when the screws 25 are operated. One of the roller-sets is connected to a cross-shaft 29 by sprockets 30 and a chain 31. This shaft 29 is geared by bevel pinions 29^a and 32^b to a longitudinally extending shaft 32 which carries a pinion 33 engaging a stationary gear 34. There are two pinions 32^b so that reversal of the strand's lay is possible.

In operation, the shaft 9 rotates the wheels 4 and the frame 6^a and wires are fed from the spools 5^a and 5. The wires from the spools 5^a constitute the core of the strand being made, and the wires from the spools 5 are laid over this core according to the geometrical pattern demanded by the particular strand being made. In the illustrated form this necessitates the shaft 3 being driven faster than the shaft 3^a, and the shaft 3^a at the same speed as the rotary frame 16. The die 17 receives the wires delivered by these spools and twists them into the strand desired. As it does this it simultaneously sets the individual outer wires in the shapes of helices having a common helical axis, and sets the core wires in the shape of a helix coinciding with this helical axis. This results because of the eccentricity of the die 17.

The strand is engaged by the rollers 20 at points which do not destroy its helical shape. As the frame 16 revolves the stationary gear 34 drives the gear 33 and so, through the other connecting gearing, drives the rollers 20 so that they pull the strand through the die 17. The pulling speed must, of course, be properly proportioned to the rotary speeds. The part of the frame 16 to which the sprocket 18 is fixed is hollow and therefore provides an outlet for the strand. This strand is wound on a drum and is ready for manufacture into rope form.

As the frame 16 revolves rather rapidly it is desirable to support the strand between the die 17 and the first of the rollers 22. This may be done by a set of idle rollers 37 which are adjusted by screws 38 and are generally similar to the other rollers. This will prevent the strand thrashing about as the frame revolves. The strands are laid together so that their helical axes and cores are substantially concentric with the center line of the resulting rope.

The rope which is produced by strands made according to the present invention is characterized in that all its individual wires are equally stressed. This is not so in the case of ropes made from straight strands, because the individual wires must then slip and pull as they are forced into the helical shapes necessary. The wires in the new strands may be laid up according to any pattern and the strands themselves may be laid into rope form in any manner. Usually the wires in the strands are numbered and sized to follow geometrical patterns, and the strands themselves are laid up over hemp cores. However, no matter what pattern or type of rope is to be made, the invention is applicable in that the strands may be produced with their individual wires initially laid into the proper positions which they must occupy in the final rope.

Figures 5, 6 and 7 show a completed rope A made from a number of the strands, one of which is indicated as B with one of its wires C projecting from one end. This wire is in the shape of a helix having a helical axis, in other words, a helix superimposed on a helix. This shape is imparted during manufacture as described, and is not the result of twisting a straight strand.

Although a specific example of this invention has been shown and described in accordance with the patent statutes, it is not intended to limit the scope of the invention exactly thereto, except as defined by the following claims.

I claim:

1. In a stranding machine, the combination of a revoluble frame, a die mounted by said frame with its center line offset from the latter's axis, a plurality of roller-sets mounted by said frame behind said die, means for intergearing said roller-sets and a stationary gear mounted adjacent said frame, said means for intergearing said roller-sets including a gearing element which engages said stationary gear.

2. In a stranding machine, the combination of a revoluble frame, a die mounted by said frame with its center line offset from the latter's axis, a plurality of adjustable roller-sets mounted by said frame behind said die, means for intergearing said roller-sets, a stationary gear arranged adjacent said frame, said means for intergearing said roller-sets including a gear element engaging said stationary gear, and means for adjusting said roller-sets so that their respective passes may be offset from one another.

3. In a stranding machine, the combination of an eccentrically revoluble die, means for eccentrically revolving said die, means for feeding a plurality of wires to the front of said die, a plurality of driven roller-sets for pulling said wires from the back of said die, the latter forming said wires into a helical strand and said roller-sets being constructed and arranged to engage said strand at points substantially corresponding to its helical shape, and means for interassociating said die and said roller-sets so as to effect a constant ratio between the eccentrically revolving speed of the former and the peripheral speeds of the latter.

4. A method of pulling a helical strand without destroying its shape which includes applying pulling force to said strand only at points substantially coinciding with its helical shape.

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