

April 17, 1945.

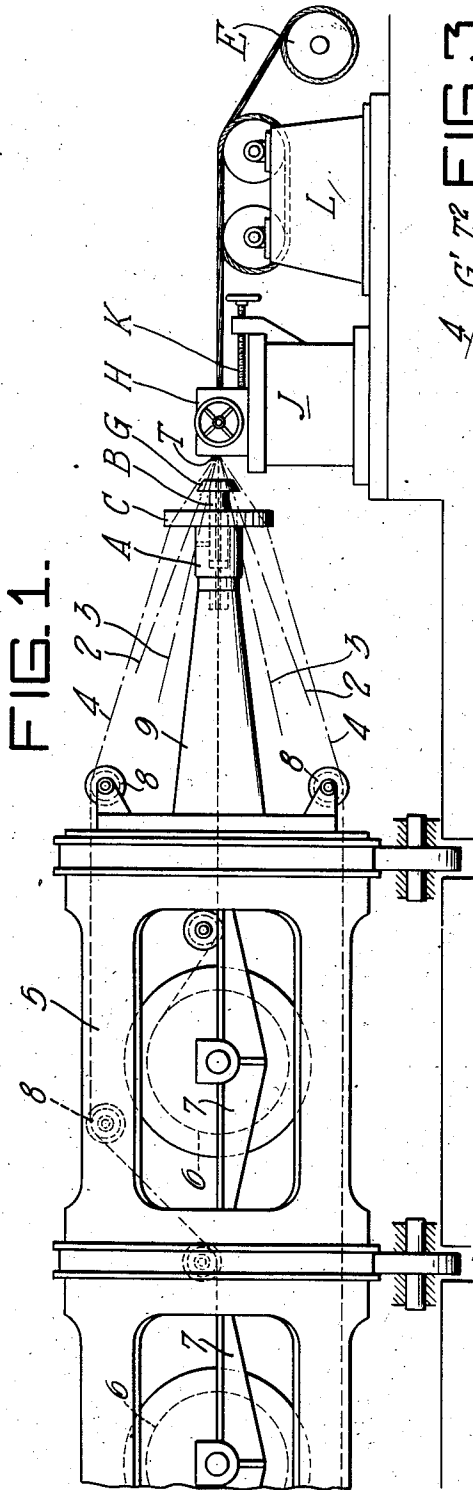
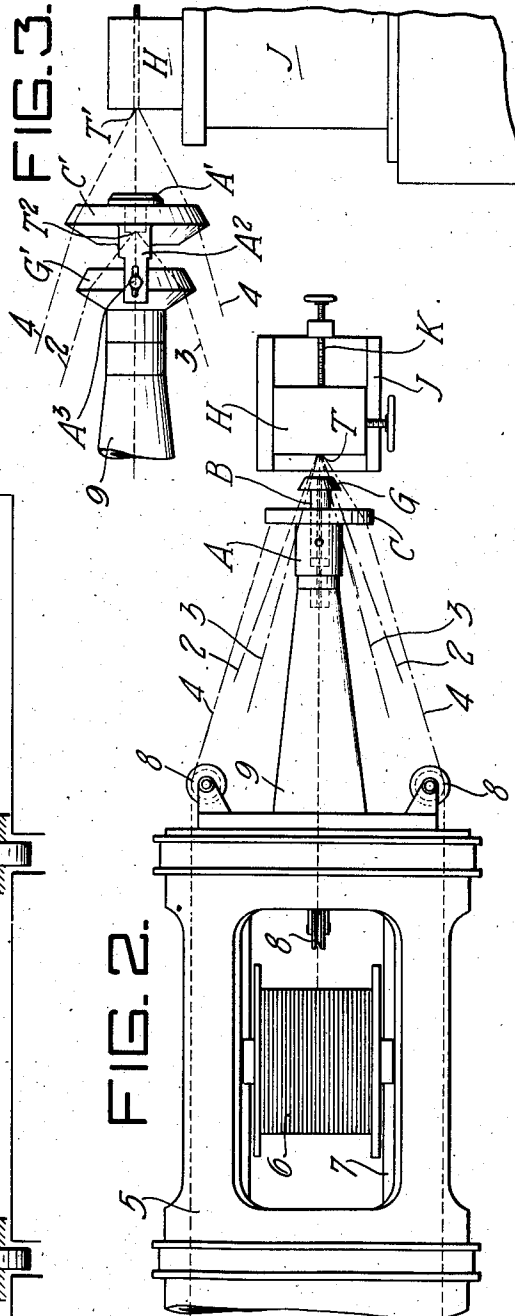
E. RAMSTEDT ET AL

2,374,133

APPARATUS FOR MANUFACTURING WIRE ROPE

Filed May 21, 1943

3 Sheets-Sheet 1



INVENTORS:
 EMIL RAMSTEDT and
 DANIEL D. SYMMES,
 BY: *John E. Jackson*
 THEIR ATTORNEY.

April 17, 1945.

E. RAMSTEDT ET AL

2,374,133

APPARATUS FOR MANUFACTURING WIRE ROPE

Filed May 21, 1943

3 Sheets-Sheet 2

FIG. 4.

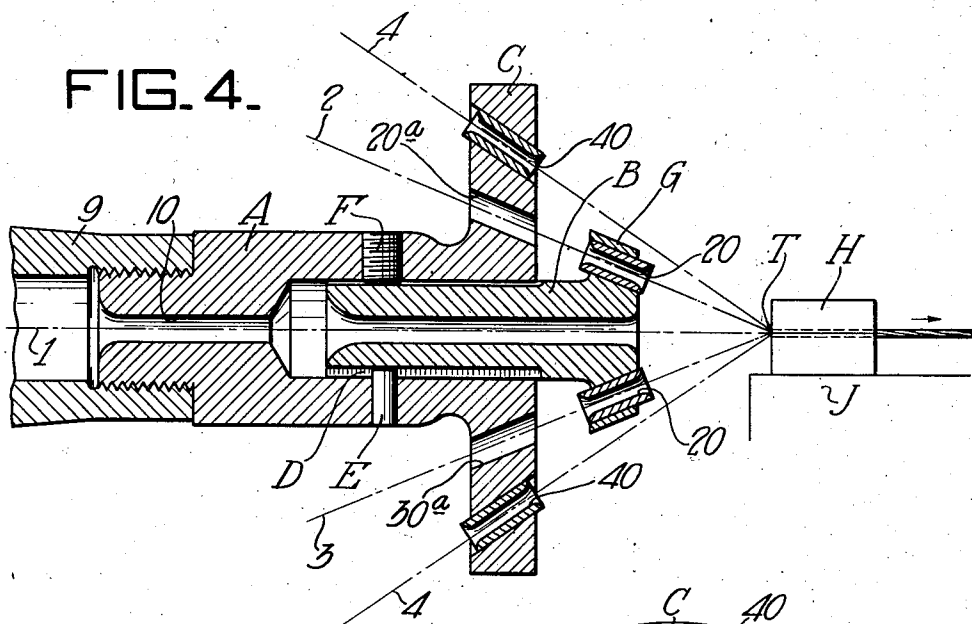


FIG. 5.

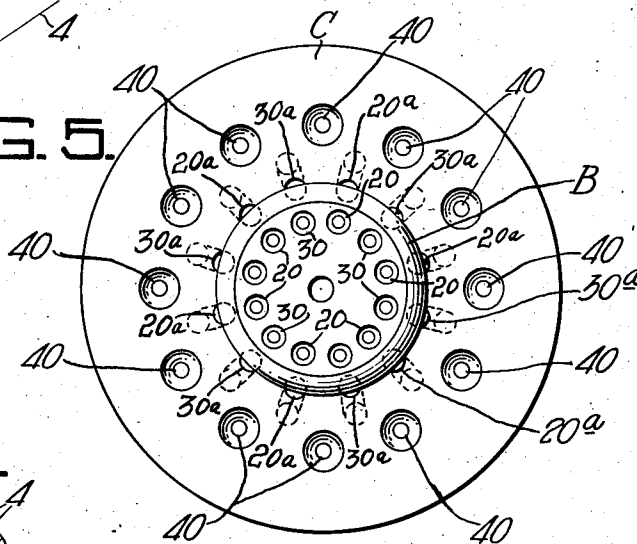
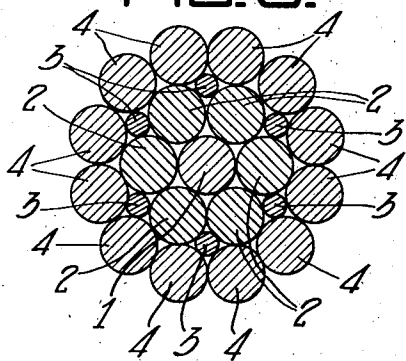


FIG. 9.



INVENTORS:
EMIL RAMSTEDT and
DANIEL D. SYMMES,
BY *John E. Jackson*
THEIR ATTORNEY.

April 17, 1945.

E. RAMSTEDT ET AL

2,374,103

APPARATUS FOR MANUFACTURING WIRE ROPE

Filed May 21, 1943

3 Sheets-Sheet 3

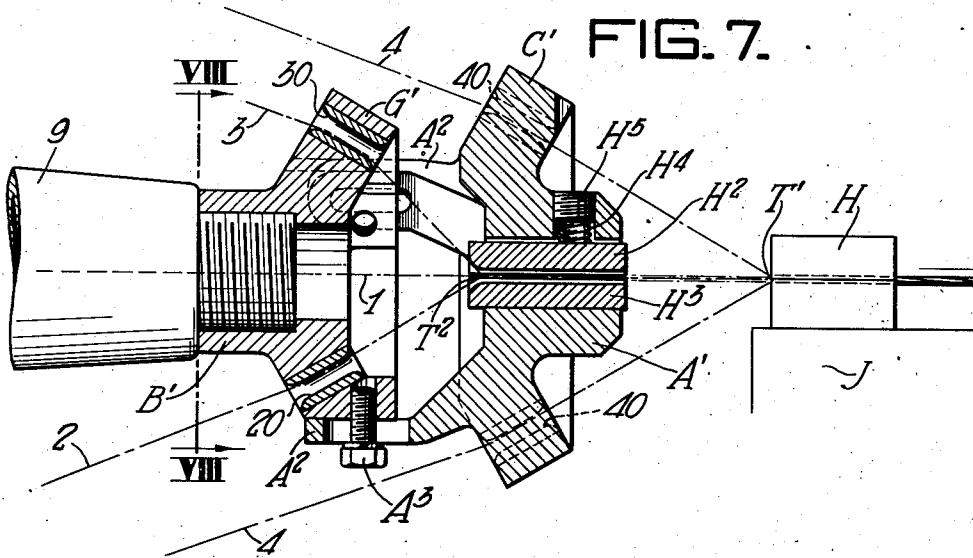


FIG. 6.

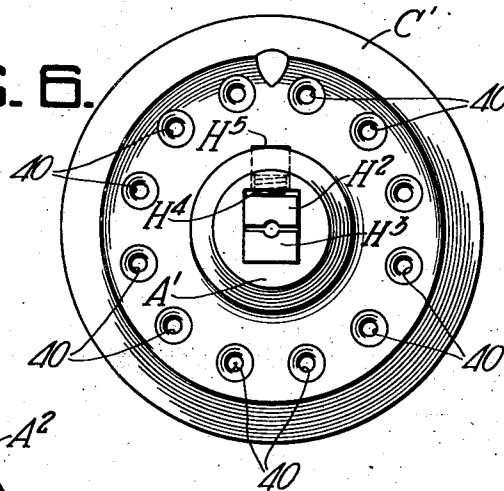
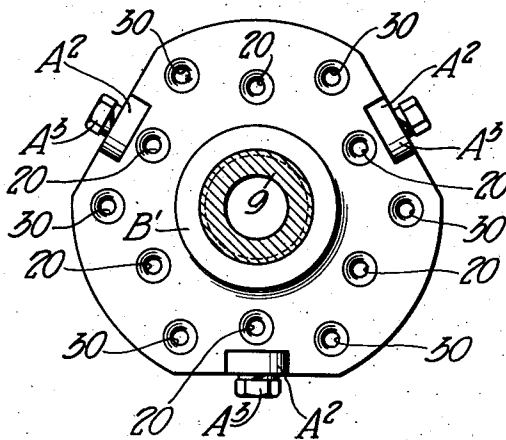


FIG. 8.



INVENTORS:
 EMIL RAMSTEDT and
 DANIEL D. SYMMES,
 BY: *John E. Jackson*
 THEIR ATTORNEY.

UNITED STATES PATENT OFFICE

2,374,133

APPARATUS FOR MANUFACTURING WIRE ROPE

Emil Ramstedt, New Haven, and Daniel D. Symmes, West Haven, Conn., assignors to The American Steel and Wire Company of New Jersey, a corporation of New Jersey

Application May 21, 1943, Serial No. 487,936

8 Claims. (Cl. 57—59)

The present invention, which is a continuation-in-part of our application Serial No. 451,352, filed July 17, 1942, relates generally to apparatus for manufacturing wire rope and, more particularly, that class of wire rope requiring multiple stranding operations, and especially rope employing filler wires in the valleys between the strands of the inner and outer layers.

The invention contemplates improved apparatus including a novel form of twister head having at least a pair of lay plates located in close proximity to the stranding die and adjustable relative to each other.

The principal object of the invention is to so arrange the parts of the apparatus that the individual strands going to make up the rope will be guided and held in relative positions to each other up to a point closely adjacent the stranding die so as to prevent the centrifugal forces resulting from the high speed revolving of the stranding machine from throwing the strands out of their relative positions as they approach the stranding die.

In the drawings:

Figure 1 is a side elevation of the wire rope-making machine illustrating one embodiment of the invention;

Figure 2 is a plan view thereof;

Figure 3 is a fragmentary view similar to Figure 1 illustrating an alternative embodiment of the invention;

Figure 4 is an enlarged detail of the improved twister head shown in Figures 1 and 2;

Figure 5 is an elevation viewed from the right side of Figure 4;

Figure 6 is an end view of the modified form of twister head shown in Figure 3;

Figure 7 is an enlarged detail in longitudinal section of a modified form of twister head, the view being taken approximately on line VII—VII of Figure 6;

Figure 8 is a section on line VIII—VIII of Figure 7; and,

Figure 9 is an enlarged cross sectional view of a multiple strand wire rope of the character made by the machine of the present invention.

Referring more particularly to the drawings, the two types of apparatus herein illustrated are adapted for laying up or twisting together a multiplicity of component strands so as to form the same into a unitary rope such as illustrated in Figure 9.

Those skilled in the art will understand that the machine may be adapted for making different sizes of wire rope employing different num-

bers of strands. For example, the machine is capable of making a wire rope having a center strand 1 surrounded by six strands 2 which in turn are surrounded by twelve outer strands 4 with six intermediate filler strands 3 located in the valleys or interstices between the strands 2 and the strands 4. The filler strands, as will be readily apparent from an examination of Figure 9, are of materially smaller diameter than the main strands of the rope.

Heretofore various attempts have been made to manufacture multiple strand rope in a single operation, however these attempts have not been wholly successful, especially at high speeds due to the difficulty encountered in properly guiding the several strands into their proper lay position with respect to each other and holding such strands in such position until they enter the stranding die. Furthermore, difficulty has been found in securing the proper angle of lay due to the fact that the lay plates had more or less fixed positions relative to each other or single lay plates have been used.

The present apparatus, due to its construction and arrangement of parts, permits such controls as are necessary to properly lay up a rope at high speed. In both embodiments of invention illustrated in the accompanying drawings, a conventional form of filer 5 is provided which carries reels of strand material 6 rotatably supported in cradle 7, trunnioned in the filer in a conventional manner. A plurality of suitable guide sheaves 8 are provided on the filer for guiding the strands to a twister head 9 which projects from one end of the filer and terminates closely adjacent to a stationary die H. The free or terminal end of the head 9 of Figures 1, 2, 4 and 5 carries lay plate elements A and B. The lay plate element A has a threaded connection with the head 9 and a lay plate C is formed integral therewith. It will be apparent, however, that the lay plate C may be formed separate from the part A and fixedly secured thereto. The threaded connection for the part A with the head 9 is opposite hand to the direction of rotation of the filer and head so that it will have no tendency to become loosened during operation of the apparatus. The second lay plate element B is mounted in a recess in the element A and is adjustable relative to the element A. The element B has the lay plate proper G formed integral therewith and, here again, it will be obvious that this plate G may be formed separate from the main portion of the element B and fixedly secured thereto. The element B is provided with a spline D which

slidably engages a pin E carried by the part A and the part B is locked in its adjusted positions by a set screw F. The stationary die H is slidably mounted on the standard J and is adapted to be adjusted to and from the head 9 by means of an adjustment screw K.

The head 9 and the lay plate elements A and B are provided with a centrally arranged longitudinal bore 10 through which the core of the cable 1 is adapted to pass. The lay plate G carried by the member or element B is formed with a plurality of guide apertures 20 through which the inner strands 2 of the cable pass, conventional guide bushings being incorporated in the lay plate as shown. The lay plate G also has a plurality of guide apertures 30 for guiding the relatively small filler strands 3. The lay plate C carried by the element A is provided with a plurality of guide apertures 40 for guiding the outer strands 4 of the rope. This lay plate C also is provided with a plurality of apertures 20^a and 30^a through which the strands 2 and 3 pass to the guide apertures 20 and 30, respectively, in the lay plate G.

With the parts constructed and arranged as above described, it will be readily seen that wire rope can be stranded having a plurality of layers of strand elements by simultaneously stranding the concentric layers in a stranding die by passing the strand elements for each concentric layer through separate relatively axially adjustable lay plates C and G which, as shown and described above, are positioned remote from the flier and closely adjacent the stranding die so that the points of delivery of the strand elements from the lay plates to the stranding die are radially spaced from the axis of the stranding die a distance which is less than the radial distance from the points of delivery of the strand elements from the flier to the longitudinal axis. The close spacing of the lay plates relative to the die also reduces to a minimum the tendency of the strands to move outwardly as a result of the centrifugal forces produced by the high speed revolving of the flier.

It will also be apparent that, with apparatus constructed and arranged as described above, the strands going to make up the inner layer of rope strands are at all times restrictively guided so as to maintain them within the conical space defined by the lay plate G as a base and the stranding die H as an apex and, furthermore, since all guide apertures in the plates G and H provide tubular-like guideways, all the strand elements are positively held in their relative positions against centrifugal forces.

Due to providing for adjustment of the plate G relative to the plate C, a nicety of control of the angle of lay can be effected and the same plates and same head can be used for making cables of varying lays. The several strands as they pass from the lay plates converge to a point of twist T at one extremity of the stationary die H. The finished rope passes from the opposite end of the die H and is drawn off continuously by a suitable motor-driven capstan L of conventional form and wound up on a suitable take-up reel M.

In the embodiment of the invention shown in Figures 3, 6, 7 and 8, the lay plate G' is formed integral with the lay plate element B' which has a threaded connection with the head 9. The lay plate G' is provided with the guide apertures 20 and 30 for guiding the strands 2 and 3. The lay plate C' of Figure 7 is formed as an integral part of the lay plate element A' and is equipped with

guide extensions A² slidably mounted in guide slots formed in the member G'. The extensions are adapted to be secured in various positions of adjustment by locking screws or bolts A³, threaded into the member G', which pass through slots in the arms A².

The lay plate C' has the guide apertures 40 for directing the outer strand toward the point of twist T'. The strands 2 and 3 are guided by the apertures 20 and 30 in the lay plate G' toward a point of twist T² at one extremity of a split strand die composed of parts H² and H³ mounted in an axial seat formed in the part A'. A spring H⁴ is interposed between the part H³ and an adjusting screw H⁵ threaded into the part A' so as to vary the pressure exerted by the die on the strands 2 and 3.

It will be apparent to those skilled in the art that apparatus arranged and constructed as illustrated in Figures 3, 6, 7 and 8 will perform the same method as set forth for the apparatus of Figures 1, 2, 4 and 5 and, in addition, will provide for an additional compressing or laying action due to the die carried in the central bore of the lay element A'. The apparatus last described provides for laying up a wire rope having two or more concentric layers of strands by simultaneously stranding the concentric layers in axially adjustable stranding dies, one being carried by the lay plate C' and the other being carried on the support J. The strand elements for each concentric layer are passed from the flier through separate and relatively axially adjustable lay plates positioned closely adjacent their respective dies, and at a point remote from the flier, so that the points of delivery of the strand elements from the lay plates to the stranding dies are radially spaced from the longitudinal axis of the stranding dies a distance which is materially less than the radial distance from the points of delivery of the strand elements from the flier to said longitudinal axis. Furthermore, the arrangement of parts permits the guiding and restraining of all of the strand elements from centrifugal forces which ordinarily would tend to force them out of their proper lay positions.

In both embodiments of the invention disclosed, it is apparent that the point of twist for all strands can be controlled with precision by varying the angle of lay of the component strands by reason of the fact that one of the lay plate elements can be adjusted relative to the other. In this way the included angle between each component strand and the axis of rotation of the flier can be accurately adjusted and thus uniformly lay the strands in position. Also, in both embodiments, the head 9 is arranged so that the lay plates are closely adjacent the dies and serve to positively guide the strands and hold them against centrifugal forces. Any slight inequalities due to wear of the parts can be readily compensated for by making minor adjustments from time to time. Thus the rope-making machine can be maintained in an optimum operating condition over long periods of time.

While we have described quite precisely the specific embodiments of the invention herein illustrated, it will be understood that we are not limited thereto since various modifications or substitutions of equivalents may be made by those skilled in the art without departing from our invention as defined in the appended claims.

We claim:

1. A machine for making wire strand or rope, including a rotary flier carrying a plurality of

reels of strand or rope elements, a stationary strand die, the flier carrying an adjustable twister head equipped with a plurality of lay plates, one of which is fixedly secured to said flier and the other of which is slidably supported by said fixedly secured one, each of said lay plates having a plurality of tube-like wire or strand guide apertures, said fixedly secured lay plate having a plurality of openings adjacent the apertures therein and corresponding in number to the wire or strand guiding apertures of the slidably supported lay plate, and means for holding said lay plates in various positions of adjustment.

2. A machine for making wire strand or rope, including a rotary flier carrying a plurality of supplies of wire or strand, a stationary strand die, said flier having a multiple part twister head including respective lay plates which are secured to respective parts of the head, each lay plate having a plurality of apertures therein encircling and guiding said wires or strands, one of said lay plates having a plurality of holes adjacent the apertures therein and corresponding in number to and arranged coaxially with the apertures in the adjacent lay plate, one part of the twister head being slidably supported by another part thereof, and means for locking said parts in various desired positions of longitudinal adjustment.

3. A machine for making wire strand or rope, including a rotary flier carrying a plurality of supplies of wire or strand, a stationary strand die, said flier comprising a two-part twister head, each part carrying a respective lay plate having a plurality of apertures therein encircling and guiding said wires or strands, one of said parts of the twister head having a longitudinal bore and the other part having a portion slidable therein so as to vary the relative positions of the respective lay plates carried by said parts, said first-named part having a plurality of openings adjacent the apertures therein and corresponding in number to and arranged coaxially with the apertures of said second-named part, means for preventing one of the parts from turning relative to the other, and means for holding the two parts in various positions of relative longitudinal adjustment.

4. A machine for making wire rope including a rotary flier carrying a plurality of supplies of strand wire, a stationary strand die, said flier having a two-part twister head including two lay plates, each lay plate having a plurality of apertures therein for guiding said strands, one of said parts of the twister head being slidably supported by the other part so as to vary the relative positions of the respective lay plates carried thereby, means for locking said parts in various positions of longitudinal adjustment, a sectional strand die carried by one of said parts, and yielding means for urging one section thereof toward the other.

5. A machine for stranding wire strand or rope, comprising a rotary flier, a stationary strand die mounted adjacent one end of said flier, said flier carrying at the strand die end a twister head which projects toward and terminates closely adjacent to the stationary die and is equipped at its terminal end with at least a pair of lay plates, each lay plate having a plurality of tube-like

wire or strand guiding apertures therein, one of said lay plates being normally held against movement relative to said twister head and said flier, the other of said lay plates being mounted so as to prevent rotary movement relative to said first-named lay plate while permitting a limited adjusting movement toward and away from said first-named lay plate, said first-named lay plate having a plurality of openings adjacent the apertures therein and corresponding in number to and arranged coaxially with the apertures of said second-named lay plate, and means for locking said second-named lay plate against said limited movement.

6. A machine for making wire strand or rope, including a rotary flier, a stationary strand die, the flier carrying an adjustable twister head equipped with at least a pair of lay plates, each lay plate having a plurality of tube-like wire or strand guiding elements therein, one of said lay plates being carried by said head and normally held against movement relative thereto, said lay plate having a plurality of openings adjacent the guiding elements therein and corresponding in number to and arranged coaxially with the tube-like elements of the other lay plate, said other lay plate being mounted so as to permit a limited movement toward and away from said first-named lay plate so as to maintain the wire or strand guiding elements thereof always coincident with the said openings in the said first-named lay plate, and means for locking said second-named lay plate in position relative to said first-named lay plate.

7. A machine for making wire rope including a rotary flier, a stationary strand die, the flier carrying an adjustable twister head equipped with at least a pair of lay plates, each lay plate having a plurality of strand guiding tube-like apertures therein, one of said lay plates being carried by said head and normally held against movement relative thereto, the other of said lay plates being mounted so as to permit a limited movement toward and away from said first named lay plate, means for locking said second named lay plate in position relative to said first named lay plate, and a second stranding die mounted in said second named lay plate.

8. A machine for making wire rope including a rotary flier carrying a plurality of reels of strand wire, a stationary stranding die, a movable stranding die, the flier carrying a twister head equipped with at least a pair of lay plates, each lay plate having a plurality of strand guiding tube-like apertures therein, one of said lay plates being carried by said flier and normally held against movement relative thereto, the other of said lay plates being mounted so as to permit a limited movement toward and away from said first named lay plate, said movable stranding die being adjustably mounted in said second named lay plate, and means for locking said movable stranding die and said second named lay plate in position relative to said first named lay plate.

EMIL RAMSTEDT.
DANIEL D. SYMMES.