

Sept. 25, 1956

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2,763,979

CABLE TWISTING, WRAPPING, AND REELING MECHANISM

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3 Sheets-Sheet 1

Fig. 1.

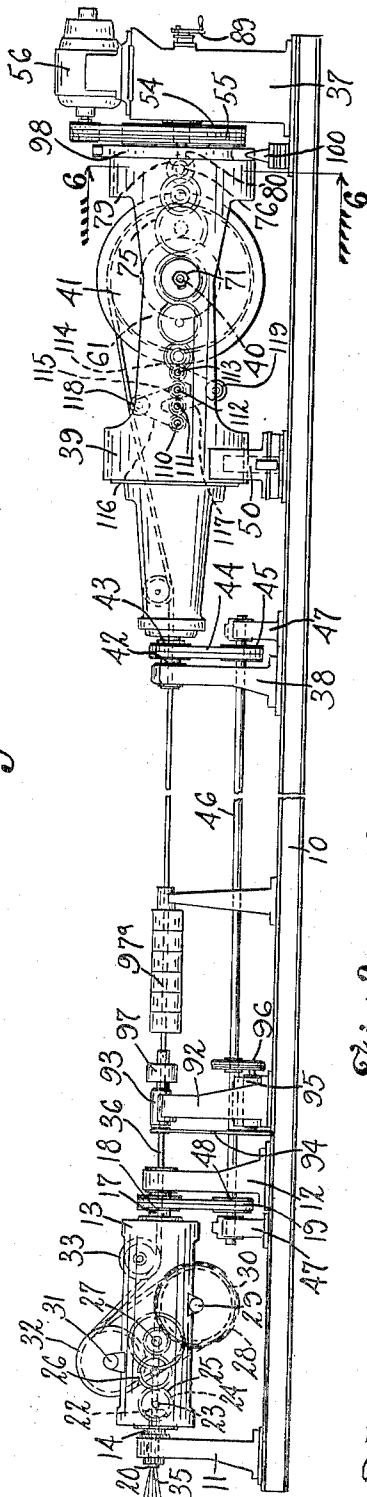


Fig. 2.

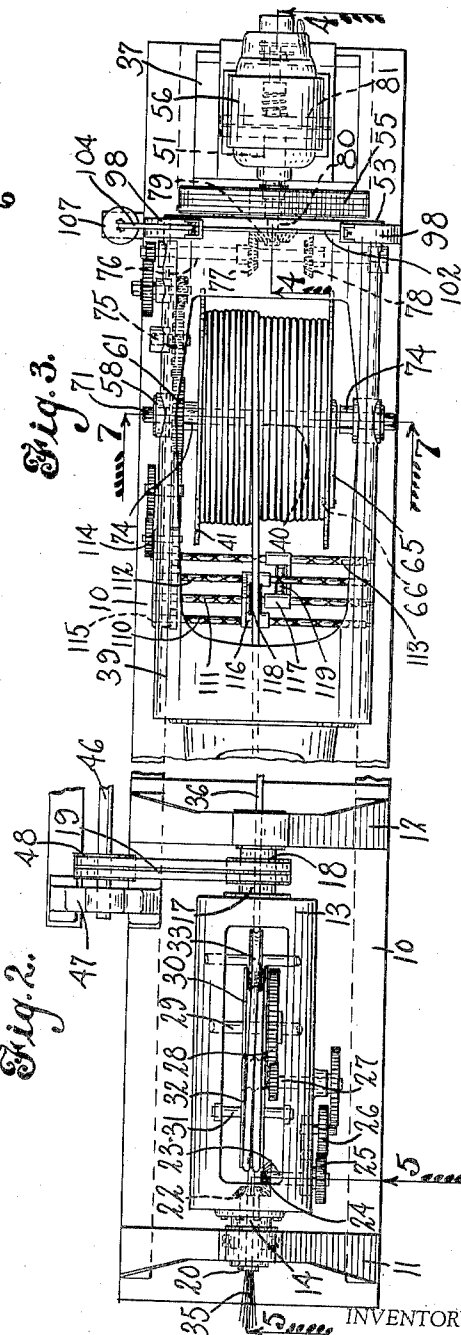
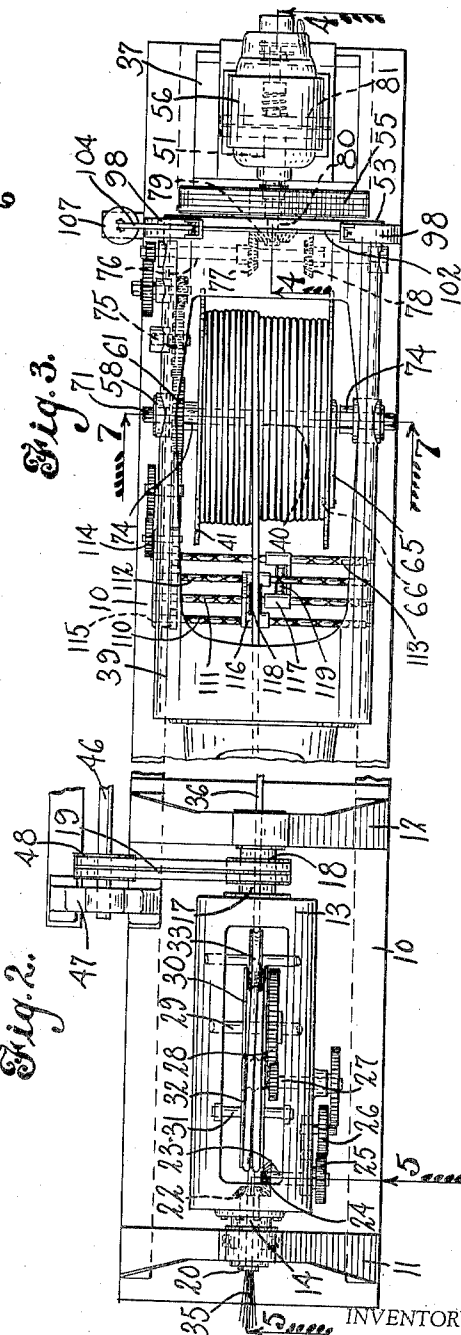


Fig. 3.



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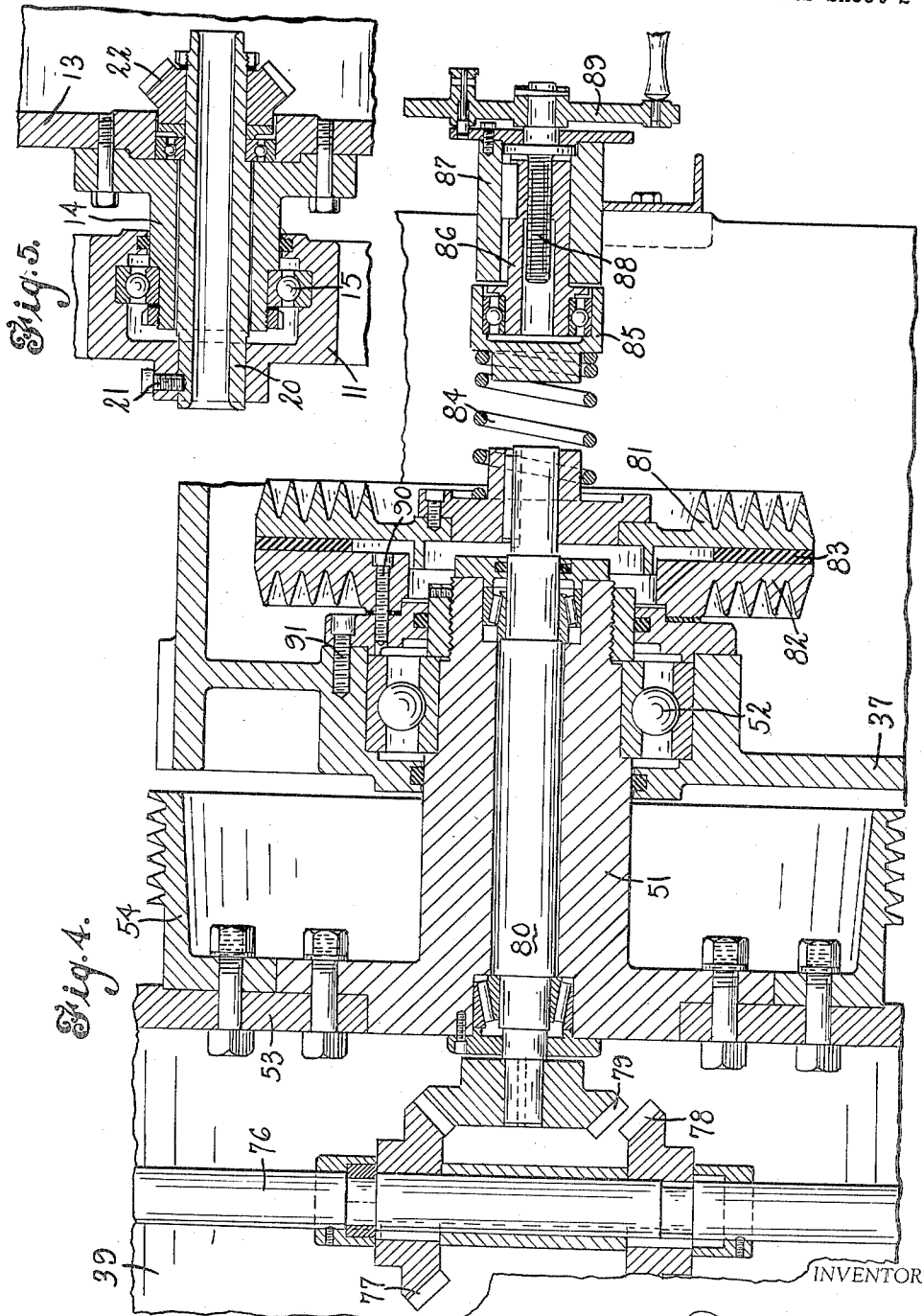
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3 Sheets-Sheet 2



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Fig. 6.

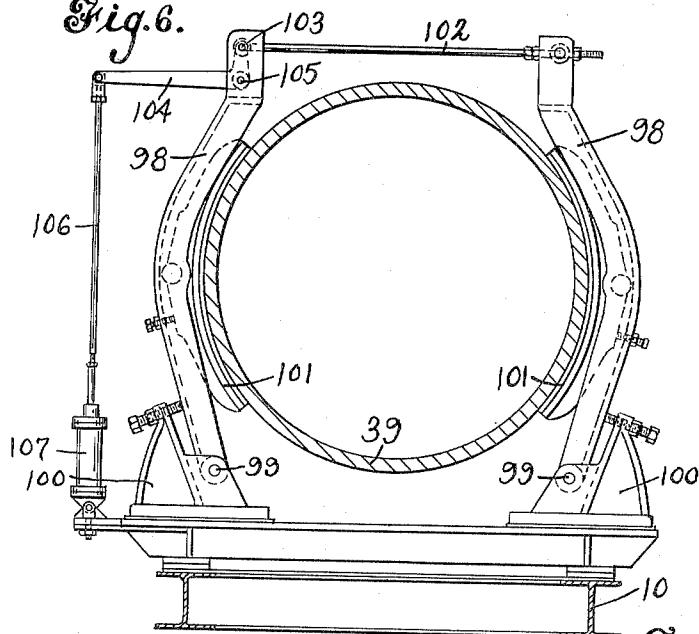
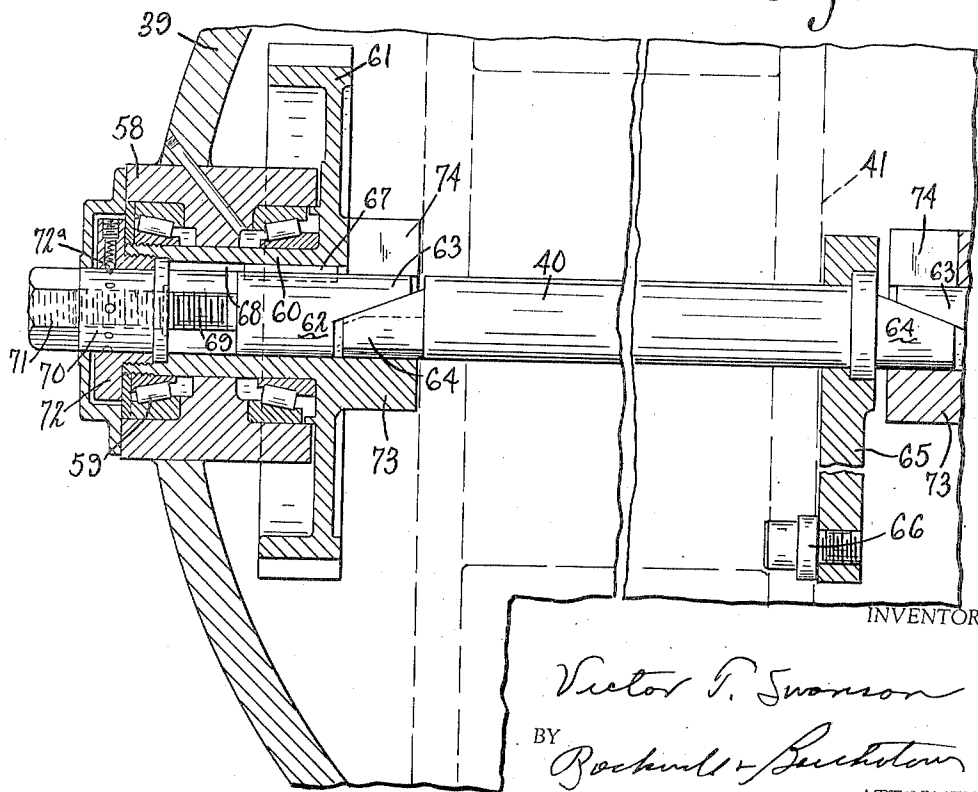


Fig. 7.



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CABLE TWISTING, WRAPPING, AND REELING MECHANISM

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Application May 6, 1953, Serial No. 353,257

9 Claims. (Cl. 57—66.5)

This invention relates to a wire-twisting or cableforming apparatus and more particularly to a device for twisting a plurality of separate wires into a cable and reeling the resulting cable upon a suitable reel for shipping or other use.

In devices of this character a plurality of separate wires or strands are drawn through a closing or twisting head usually by a suitable capstan arrangement, the capstan being carried upon a rotatable flyer or cradle which serves to twist the wires as they pass through the head. Usually the take-up reel is provided in the same flyer or cradle as the capstan, and both reel and capstan are rotated so that the wires will be drawn into the device to form the twisted cable and so that the reel will be rotated to wind the resulting cable thereupon.

It is desired in most instances to cover the resulting cable in some manner, and where the cable is reeled up upon the reel directly after the twisting operation, this covering must be effected as a later step in the manufacture of the completed cable. According to the present invention the twisting and reeling apparatus comprises two spaced units. In the first or twisting unit capstans are provided in a rotating flyer or cradle which draw the wires through the twisting or closing head and form them into a twisted cable. From this unit the wires are passed to a flyer or cradle containing a take-up reel which is positively rotated so that the completed cable will be reeled up in a satisfactory manner.

The two flyers are spaced a considerable distance apart so that the twisted cable passes from the first to the second, or reeling unit covering or other operations may be performed thereon during the passage of the cable from one unit to the next so that the cable, as finally taken up by the reel, is in a more finished state.

In order that no twist be imparted to the cable itself it is desirable that the two cradles or flyers be rotated at the same speed, and it is also desirable that the speed of the reel in the take-up unit be related to the speed of the capstans in the twisting unit in order that the cable between the two units will be maintained in a taut condition but at the same time not placed under excessive tension. To this end the cradle or flyer which supports the take-up reel is driven by suitable power such as an electric motor, and rotation of the take-up reel is effected by the rotation of the cradle. Also the twisting cradle or flyer is likewise rotated from the cradle which carries the take-up reel through suitable driving mechanism so that the rotation of the two flyers or cradles will be directly related. Also the capstans provided in the twisting cradle are rotated from the rotation of the latter, and thus all of the moving parts are connected together so that their speeds will be directly related.

One object of the invention is to provide a new and improved apparatus for twisting and reeling a cable.

Another object of the invention is to provide new and improved mechanism for twisting a plurality of wires into a cable, passing this cable to a reeling mechanism in a position spaced from the twisting mechanism whereby

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a covering or binding may be applied to the cable during such passage.

Still another object of the invention is to provide an improved cable-twisting and reeling mechanism whereby a pair of flyers or cradles are arranged in spaced position, one of which is employed to twist the wire into a cable, and the other carries a positively driven take-up reel to reel up the twisted wire.

Still another object of the invention is the provision of a cable-twisting and reeling mechanism of the character described wherein the two cradles or flyers together with the capstans for drawing in the wire and the reel for taking up the completed cable may all be driven at directly related speeds from a single source of power.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a side elevational view of a cable-twisting and reeling apparatus embodying my invention;

Fig. 2 is a top plan view of the cable-twisting mechanism located at one end of the entire machine;

Fig. 3 is a top plan view of the reeling mechanism located at the other end of the machine;

Fig. 4 is a sectional view on line 4—4 of Fig. 3 showing the drive for the flyer which carries the take-up reel;

Fig. 5 is a sectional view on line 5—5 of Fig. 2 showing the drive of the cradle carrying a capstan and twisting mechanism;

Fig. 6 is a transverse sectional view on line 6—6 of Fig. 1 showing the braking mechanism of the take-up flyer; and

Fig. 7 is a sectional view of line 7—7 of Fig. 3 showing the mounting of the take-up wheel.

To illustrate one embodiment of my invention I have shown in the drawings a cable-twisting and reeling mechanism comprising a base structure 10 having mounted thereon a pair of spaced supporting standards 11 and 12 extending upwardly from this base. Rotatably supported by these standards is a flyer or cradle 13, the latter being provided at one end, as shown in Fig. 5, with a tubular or hollow trunnion 14 rigidly secured to the flyer, the trunnion being mounted in suitable bearings 15 in the standard 11. A similar hollow trunnion 17 is mounted at the other end of the cradle and is rotatably supported in the standard 12. This trunnion 17 is, however, somewhat longer and secured thereto is a pulley 18 by which the flyer is driven through the belt 19, as will be hereinafter explained.

A closing or twisting sleeve-like head member 20 is secured to the standard 11 by the set screw 21 (Fig. 5), which head extends through the hollow trunnion 14 and into the flyer 13. Upon the inner end of this sleeve is rigidly mounted a bevel gear 22. It will be seen, therefore, that this bevel gear is stationary at all times, being fixed to the standard 11 so that it acts as a fulcrum gear.

Rotatably mounted in the flyer 13 (Fig. 2) is a transverse shaft 23 having a gear 24 thereon which meshes with the bevel gear 22, and on the outer end of this shaft is a gear 25 connected through reducing gearing 26 with a transverse shaft 27 also rotatably mounted in the cradle. The shaft 27 is connected by the gearing 28 with the shaft 29 of a capstan 30, the shaft being rotatably mounted at the lower portion of the cradle.

Also rotatably mounted at the upper portion of the cradle is a shaft 31 carrying a capstan 32 and adjacent the forward end of the cradle a guide pulley 33 is rotatably mounted in the casing, the lower end of this pulley being substantially at the same level as the axial opening in the trunnion 17, while the upper surface of the capstan 30 is substantially at the same level as the sleeve-like twisting head 20.

With this arrangement it will be apparent that as the flyer is rotated, the bevel gear 24 will likewise be rotated about its axis by reason of the fact that its teeth mesh with those of the fulcrum gear 22 which remains stationary. This will effect rotation of the gearing 26 and 28 and, therefore, rotation of the capstan 30.

The wires to be twisted are drawn into the flyer or cradle 13 through the head 20, as shown at 35, these wires passing to the capstan 30 and, due to the rotation of the flyer about its trunnions in the standards 11 and 12, the wires are twisted together before reaching the capstan. This capstan is provided with a plurality of grooves, two as shown in the drawing, as is also the capstan 32 so that the twisted cable passes from the capstan 30 to the capstan 32, back to the capstan 30 and again to the capstan 32, from which it passes below the guide pulley 33 and thence out through the hollow trunnion 17, as shown at 36.

Mounted adjacent the other end of the base or platform 10 is a standard 37, and spaced from this standard is a cooperating standard 38. Rotatably mounted in these standards is a flyer or cradle 39 in which is rotatably mounted a transverse shaft 40 adapted to carry a reel 41 upon which the cable may be reeled up. Secured to the cradle is a hollow trunnion 42 through which the cable 36 is lead to the cradle 39, and secured to the trunnion 42 is a pulley 43 about which is trained a belt 44. This belt 44 is also trained about a pulley 45 secured to a line shaft 46 rotatably mounted in standards 47 carried by the base 10 so that rotation of the flyer 39 and the trunnion 42, which is rigid therewith, will effect rotation of the shaft 46. Secured to this shaft adjacent the other end thereof is a pulley 48 about which is trained the belt 19 which passes about the pulley 18, previously described, so that rotation of the shaft 46 will effect rotation of the flyer 13. Thus the two flyers 13 and 39 are directly connected to each other, so that the speed of rotation of one will always be directly related to the speed of the other, and preferably the speeds will be equal so that there will be no twisting of the cable between these two members.

The flyer 39 may be supported intermediate its length, as shown at 50, and at its outer end (the right-hand end as shown in Fig. 1) has secured thereto a trunnion 51 rotatably mounted by bearings 52 in the standard 37. Secured to the end plate 53 of the flyer is a pulley 54 to receive a belt 55 driven by the motor 56 supported upon the standard 37. Thus it will be apparent that the motor 56 serves as the prime mover for the entire apparatus, this motor driving the flyer 39 directly, which in turn, by means of the line shaft 46, drives the flyer 13.

As is shown more especially in Fig. 7, the reel shaft 40 is removably as well as rotatably mounted in the walls of the flyer 39. To this end a journal box 58 is secured in the wall of the flyer in which is rotatably supported by bearings 59 the hub 60 of a gear 61. The hub 60 is hollow and slidably keyed within it is a cylindrical stub shaft 62 having a beveled or wedge-shaped end 63 complementary to a similarly shaped end 64 of the shaft 40 so that when these members are in the position shown in Fig. 7, the shaft 40 of the reel is locked to the gear 61. This construction is duplicated at the other end of the shaft 40. The reel 41 is secured to the shaft 40 for rotation therewith by means of the arm 65 secured to the shaft and the pin 66 which is received in an opening in the reel head or flange.

The stub shaft 62 receives the key 67 mounted in the keyway 68 in the hollow hub 60 of the gear, and secured to the member 62 is a threaded stem 69 which is threadedly engaged with a bushing or nut 70. The bushing or nut 70 is provided with a projecting polygonal head 71 and is held in place by a gland nut 72 threaded into the hub 60. A spring-pressed retaining member 72^a normally retains the nut 70 from rotation.

As shown in Fig. 7, the hub 60 extends inwardly beyond the gear 61, as shown at 73, so as to support the end 64 of the shaft 40. This portion 73 of the gear hub

is cut away or recessed at one point, as shown at 74, so that the end 64 of the shaft 40 may be lifted from the hub or replaced therein through this recess. It will be understood that the same arrangement is provided at the other end of the shaft 40 and that by backing off the stem 69 (which is threaded into the bushing 70) by turning the bushing 70 by means of the wrench face portion 71, the block 62 is withdrawn toward the left in the hub 60 so as to withdraw the wedge-shaped end 63 of the block from engagement with the end 64 of the shaft 40. This will permit the reel to be withdrawn from the flyer and a new one replaced. When the new one is replaced the block 62 is again moved toward the right, as shown in Fig. 7, so that the mating ends 63 and 64 of the block and shaft 40 will be engaged and connect the shaft rigidly to the hub 60 of the gear 61.

The reel is driven by means of the gear 61 which is connected by suitable gearing 75 to a transverse shaft 76 rotatably mounted in the flyer 39. This shaft 76 is connected by either of two bevel gears 77 or 78 with the gear 79 (Fig. 4) secured upon a shaft 80 rotatably mounted in the hollow trunnion 51 of the flyer. Slidably keyed to the outer end of the shaft 80, which extends outwardly from the trunnion 51, is a clutch member 81 frictionally connected to a cooperating clutch member 82 by the clutch facing 83. This clutch member 81 is normally urged toward the member 82 by a spring 84 which bears at one end against the clutch member 81 and bears at the other end against a thimble 85 rotatably carried by a nut 86. This nut is slidably mounted in a sleeve member 87 carried by the standard 37, and has threadedly engaged therewith the screw 88 which may be rotated by the crank 89.

It will be apparent that rotation of the handle 89 will adjust the nut 88 in a longitudinal direction and thereby adjust the tension of the spring 84. As the clutch member 82 is secured to the standard 37 by screws 90 and 91, it will be seen that the shaft 80 will be releasably held against movement and the gear 79 will normally act as a fulcrum gear. It will be apparent, however, that as the cable builds up upon the reel 41, it is necessary to drive the reel at a slower speed to prevent excessive tension on the cable. The clutch facing 83 allows the clutch member 81 to slip with relation to the member 82 when the driving torque, due to the tension on the cable 36, exceeds a predetermined amount as determined by the setting of the spring 84. When the clutch members are slipping, the reel will be driven at a slower speed relatively to the speeds of the two flyers and the speed of the capstans 30 and 32, the speed of which depends upon that of the flyer 13.

When the two flyers are spaced apart a considerable distance, as shown in Fig. 1, various operations may be performed upon the cable in its passage from the twisting mechanism to the reeling mechanism, such for example as wrapping the cable with a cord or tape. For this purpose a standard 92 is mounted upon the base 10, the standard carrying a rotatably wrapping head 93 driven by a belt 94. This belt is in turn driven through a speed change mechanism 95 from a pulley 96 mounted on the line shaft 46. The cord or tape to be wrapped around the cable is carried by the spool 97, separate spools being shown at 79^a.

With the above construction it will be apparent that all of the mechanism is driven from a single motor so that the speed of one element of the mechanism will be related to the speed of each of the other elements, and that the two flyers or cradles are spaced apart so that suitable operations may be performed in the passage of the cable from one to the other. Likewise mechanism is provided for arranging for variation in speed of the reel due to variation in the torque required to turn the reel.

In Fig. 6 of the drawings I have shown a brake mechanism by which the rotation of the flyer 39 may be con-

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trolled. A pair of brake levers 98 are pivoted at 99 to standards 100 on the base member 10, these levers carrying brake shoes 101 in engagement with the flyer. A link 102 is connected at one end to one of the levers 98 and pivoted at its other end at 103 to a bell crank lever 104 pivoted to the other lever member at 105. A plunger 106 is connected to the end of the lever 104, the plunger being carried by a piston (not shown) which operates in a cylinder 107 so that when fluid pressure is introduced into the cylinder, the brake shoes 101 are applied and the rotation of the flyer is checked.

In order that the cable may be distributed evenly on the reel 41, traversing mechanism may be provided in the flyer 39, as shown more particularly in Figs. 1 and 3 of the drawings. This mechanism includes a plurality of traversing shafts 110, 111, 112 and 113 which are rotatably mounted in the flyer. These shafts are driven from the gear 61 by means of meshing gears 114 and gears 115 secured to the traversing shafts.

Mounted to travel upon the shafts 110 and 112 is the traverser or guide 116, and a similar element 117 is mounted to travel upon the alternate shafts 111 and 113. As shown in Fig. 1, each of these traversers carries a guide sheave or pulley 118 and 119, and these traversers travel in opposite directions. One of the pulleys 118 stands upon one side of the plane of the traversing shafts while the pulley 119 stands on the other side. The provision of the two traversers maintains the mechanism in balance, but it will be understood that only one of the guide pulleys 118 or 119 is operative at one time.

As will be understood by those skilled in the art, when the device is in operation and the gear 61 is rotated, the shafts 110, 111, 112 and 113 will be caused to rotate and the traversers 116 and 117 will be caused to travel in opposite directions upon these shafts, passing each other at approximately the center of the shafts. This will distribute the cable evenly upon the reel.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the claims.

What I claim is:

1. A wire-twisting or reeling mechanism comprising a pair of spaced-apart cradles, means for rotatably mounting each of said cradles, capstan means carried by one of said cradles to draw in the wires to be twisted, reeling mechanism carried by the other cradle, said cradles being provided with hollow trunnions whereby the cable formed in the first may pass therethrough to the reeling mechanism in the second, means for rotating said cradles, and wrapping means located between said cradles to wrap an element about said cable as it passes from one cradle to the other.

2. A rotatably mounted cradle provided with hollow trunnions at its ends, capstan means carried by said cradle to draw in the wires to be twisted through one of said trunnions, a second rotatably mounted cradle disposed in spaced end-to-end relation with the first and having a hollow trunnion through which the cable may enter from the first cradle, a reel rotatably mounted in the second cradle, a rotatable shaft extending between said cradles and drivingly connected to both thereof, means for rotating one of said cradles, a stationary twisting head extending through said one trunnion of the first cradle and having a fulcrum gear thereon within the cradle, and means drivingly connecting said capstan means to said gear.

3. A rotatably mounted cradle provided with hollow trunnions at its ends, capstan means carried by said cradle to draw in the wires to be twisted through one of said trunnions, a second rotatably mounted cradle disposed in spaced end-to-end relation with the first and having a hollow trunnion through which the cable may enter from the first cradle, a reel rotatably mounted in

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the second cradle, a rotatable shaft extending between said cradles and drivingly connected to both thereof, means for rotating one of said cradles, a fulcrum gear mounted in the second cradle and drivingly connected to said reel, and means restraining movement of said gear.

4. A rotatably mounted cradle provided with hollow trunnions at its ends, capstan means carried by said cradle to draw in the wires to be twisted through one of said trunnions, a second rotatably mounted cradle disposed in spaced end-to-end relation with the first and having a hollow trunnion through which the cable may enter from the first cradle, a reel rotatably mounted in the second cradle, a rotatable shaft extending between said cradles and drivingly connected to both thereof, means for rotating one of said cradles, a fulcrum gear mounted in the second cradle and drivingly connected to said reel, and means frictionally holding said gear against rotation.

5. A rotatably mounted cradle provided with hollow trunnions at its ends, capstan means carried by said cradle to draw in the wires to be twisted through one of said trunnions, a second rotatably mounted cradle disposed in spaced end-to-end relation with the first and having a hollow trunnion through which the cable may enter from the first cradle, a reel rotatably mounted in the second cradle, a rotatable shaft extending between said cradles and drivingly connected to both thereof, means for rotating one of said cradles, a fulcrum gear mounted in the second cradle and drivingly connected to said reel, and means frictionally holding said gear against rotation but permitting rotation of the gear when excessive torque is required to rotate the reel.

6. A rotatably mounted cradle provided with hollow trunnions at its ends, capstan means carried by said cradle to draw in the wires to be twisted through one of said trunnions, a second rotatably mounted cradle disposed in spaced end-to-end relation with the first and having a hollow trunnion through which the cable may enter from the first cradle, a reel rotatably mounted in the second cradle, a rotatable shaft extending between said cradles and drivingly connected to both thereof, means for rotating one of said cradles, a fulcrum gear mounted in the second cradle and drivingly connected to said reel, means for frictionally holding said gear against rotation, and means for adjusting said holding friction.

7. A rotatably mounted cradle provided with hollow trunnions at its ends, capstan means carried by said cradle to draw in the wires to be twisted through one of said trunnions, a second rotatably mounted cradle disposed in spaced end-to-end relation with the first and having a hollow trunnion through which the cable may enter from the first cradle, a reel rotatably mounted in the second cradle, a rotatable shaft extending between said cradles and drivingly connected to both thereof, means for rotating one of said cradles, and a wrapping member rotatably mounted between said cradles through which member the cable passes whereby said wrapping member operates on the cable in its passage from one cradle to the other.

8. A rotatably mounted cradle provided with hollow trunnions at its ends, capstan means carried by said cradle to draw in the wires to be twisted through one of said trunnions, a second rotatably mounted cradle disposed in spaced end-to-end relation with the first and having a hollow trunnion through which the cable may enter from the first cradle, a reel rotatably mounted in the second cradle, a rotatable shaft extending between said cradles and drivingly connected to both thereof, means for rotating one of said cradles, a wrapping member rotatably mounted between said cradles through which member the cable passes whereby said wrapping member operates on the cable in its passage from one cradle to the other, and means for rotating said wrapping member from said shaft.

9. A wire-twisting or reeling machine comprising a

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rotatably mounted cradle provided with hollow trunnions at its ends, capstan means carried by the cradle to draw in the wires to be twisted through one of said trunnions, a second rotatably mounted cradle disposed in spaced relation with the first and having a hollow trunnion through which the cable may enter from the first cradle, said trunnion being mounted in alignment with the hollow trunnions of the first cradle, a reel rotatably mounted in the second cradle, means including a fulcrum gear to rotate the reel by rotation of the second cradle, a motor having a shaft connected directly to one of said cradles, and a shaft extending across the space between said

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cradles and drivingly connected to said motor-driven cradle to be driven thereby, said shaft being drivingly connected with a hollow trunnion of the other cradle to drive the latter.

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