Oct. 10, 1950 W. T. MacCREADIE 2,525,230

WIRE ROPE MAKING MACHINE

Filed March 2, 1949 5 Sheets-Sheet 1

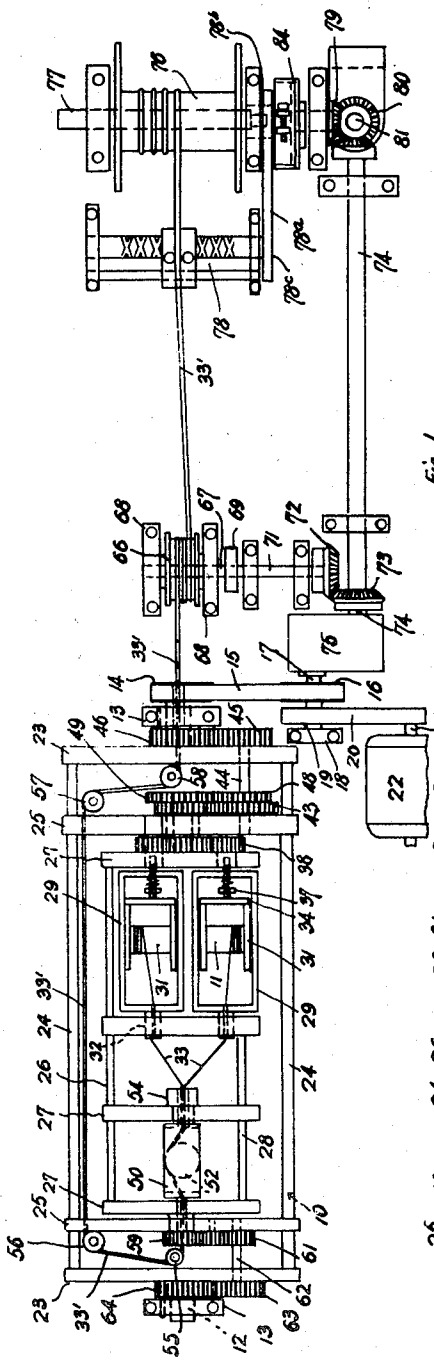


Fig. 1.

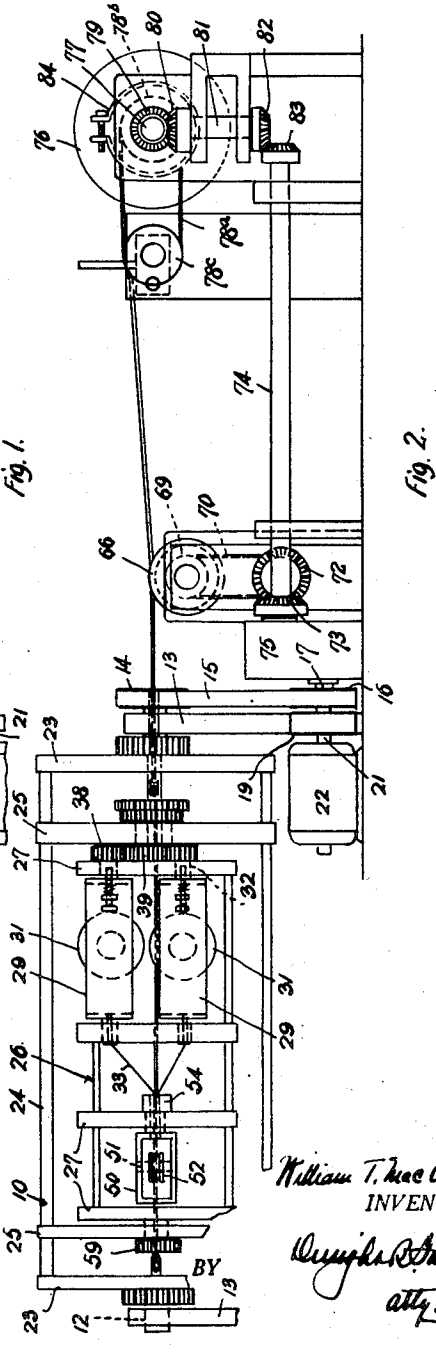


Fig. 2.

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Oct. 10, 1950 W. T. MacCREADIE 2,525,230

WIRE ROPE MAKING MACHINE

Filed March 2, 1949 5 Sheets-Sheet 2

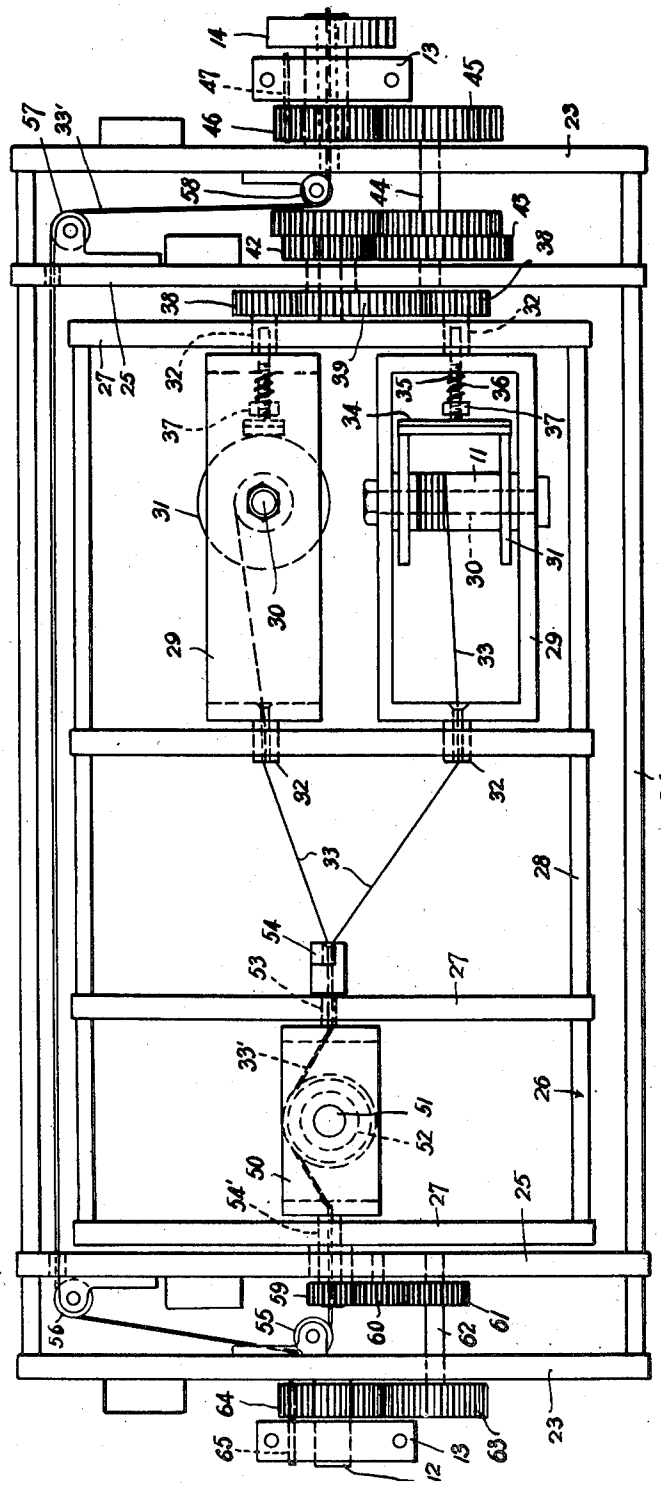


Fig. 3.

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Oct. 10, 1950 W. T. MacCREADIE 2,525,230

WIRE ROPE MAKING MACHINE

Filed March 2, 1949 5 Sheets-Sheet 3

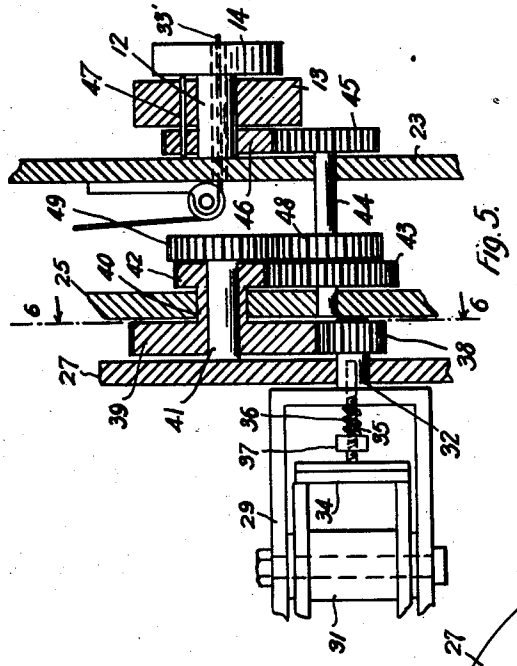


Fig. 5.

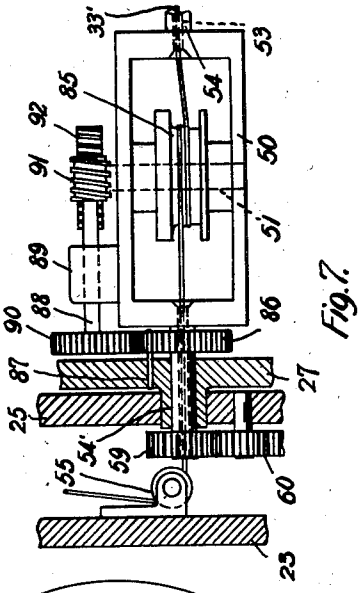


Fig. 7.

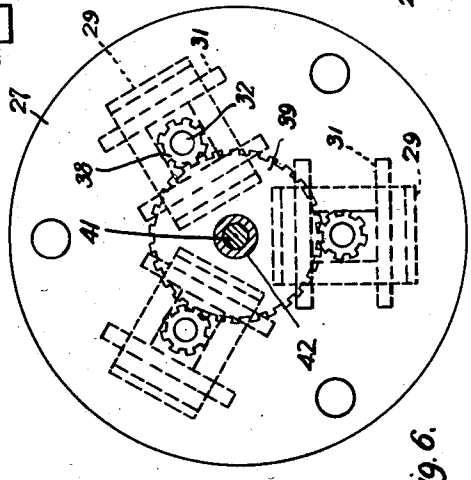


Fig. 6.

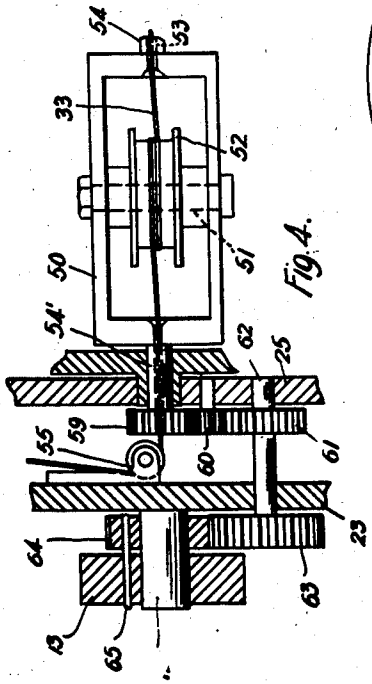


Fig. 4.

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Oct. 10, 1950 W. T. MacCREADIE 2,525,230

WIRE ROPE MAKING MACHINE

Filed March 2, 1949 5 Sheets-Sheet 4

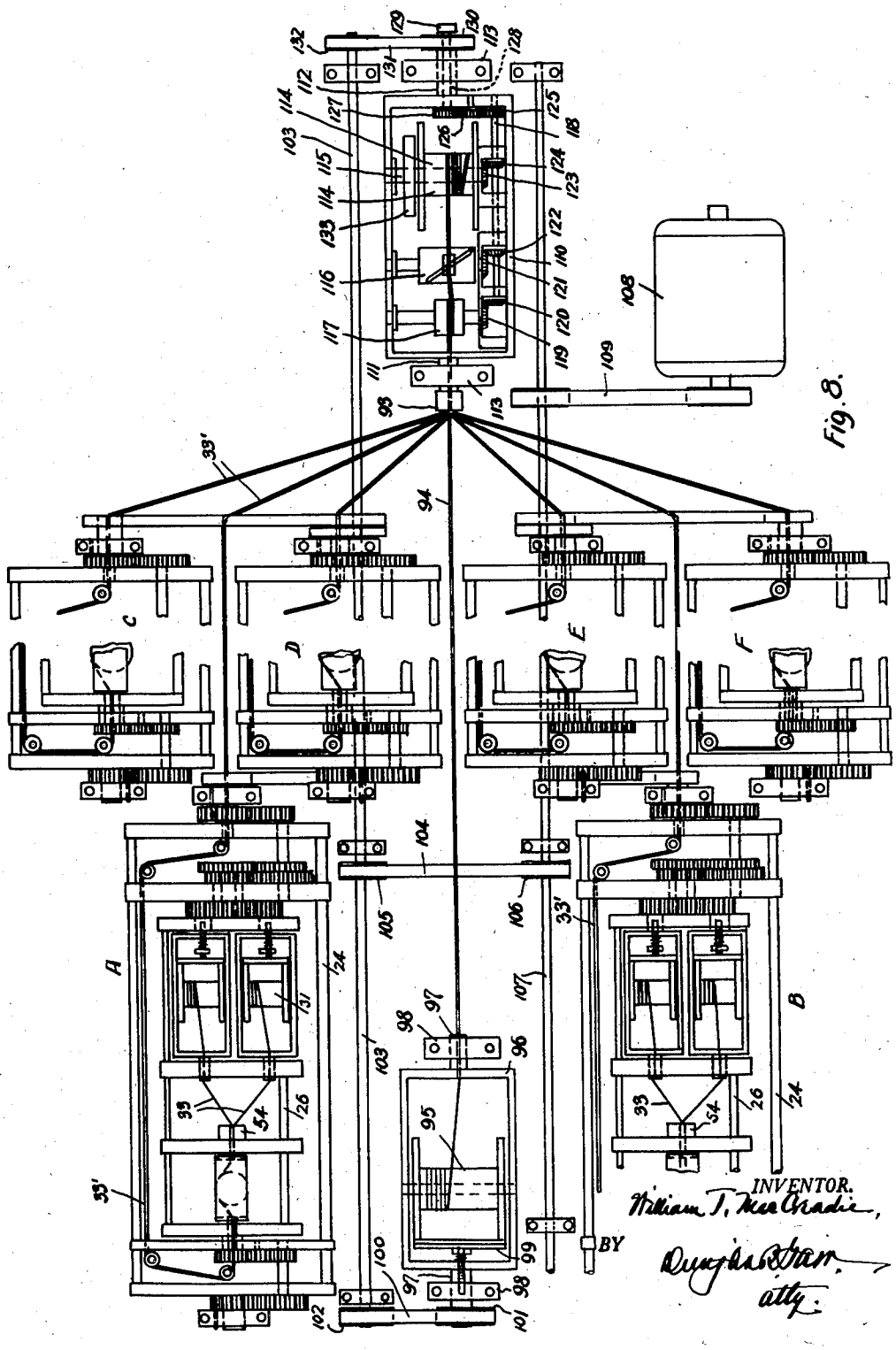


Fig. 8.

Oct. 10, 1950 W. T. MacCREADIE 2,525,230

WIRE ROPE MAKING MACHINE

Filed March 2, 1949 5 Sheets-Sheet 5

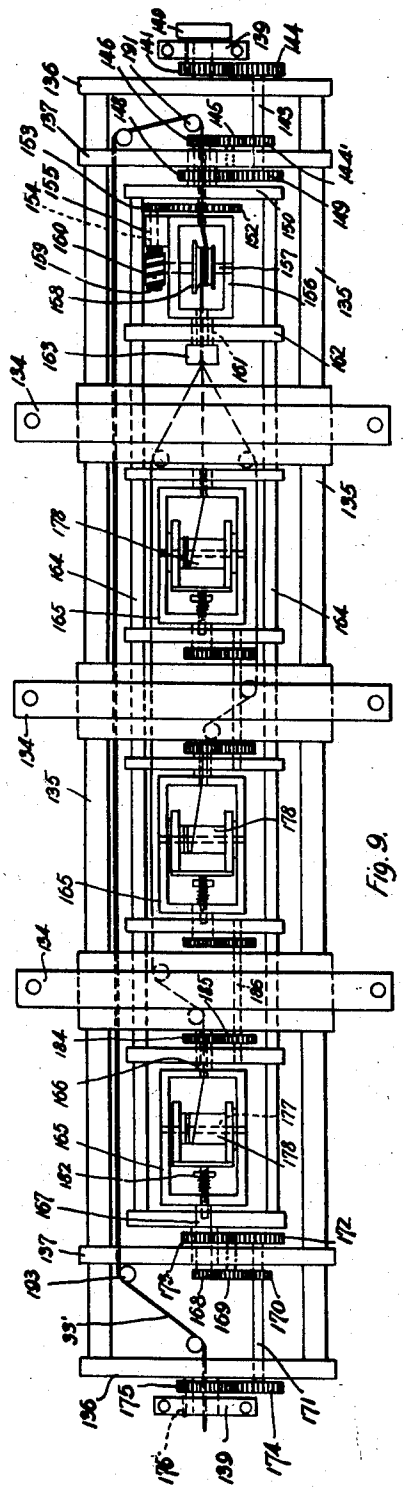


Fig. 9.

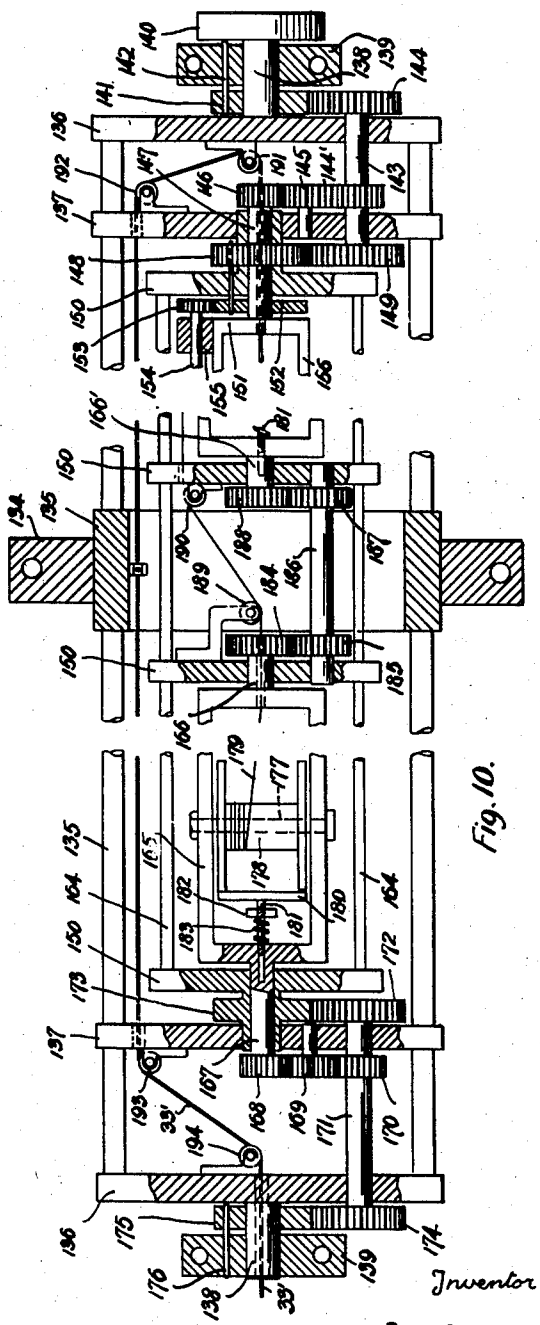


Fig. 10.

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Patented Oct. 10, 1950

2,525,230

UNITED STATES PATENT OFFICE

2,525,230

WIRE ROPE MAKING MACHINE

William T. MacCreadie, Lewisburg, Pa.

Application March 2, 1949, Serial No. 79,230

10 Claims. (Cl. 57—58)

1

The primary purpose of the invention is to provide a machine which is wholly automatic for the production of twisted cable or rope which is capable of producing cable or rope at much greater speeds than has been found possible heretofore with other machines. It is also a purpose of the invention to provide a machine which properly twists the various strands of the cable or rope into finished form, and when the strands have all been twisted upon one another the cable comes from the machine to be wound upon the wind-up bobbin without a twisting motion. The purpose of this is to facilitate winding of the completed rope upon the wind-up bobbin.

Figure 1 of the drawings is a top plan view of a wire making machine constructed in accordance with the invention,

Figure 2 is a side elevation of the same machine, parts broken away,

Figure 3 is an enlarged view of the frame for carrying the supply bobbins and associated mechanism,

Figure 4 is a fragmentary sectional view showing the twisting drum and the mechanism associated therewith for operating it,

Figure 5 is a similar view of the supply bobbin and the means by which it is operated,

Figure 6 is a sectional view taken substantially upon the line 6—6 of Figure 5,

Figure 7 is a view similar to Figure 4 and disclosing a modified form of the invention,

Figure 8 is a top plan view of a modified form of the invention.

Figure 9 is a further modification showing the small bobbins arranged all in a line, and

Figure 10 is an enlarged fragmentary view of the arrangement shown in Figure 9.

Referring to Figures 1 and 2, a main horizontally disposed rotating frame is indicated at 10. The ends of the main frame 10 are provided with axially disposed aligned trunnions or stub shafts 12 rotatably supported in bearings at the upper ends of supporting posts 13. One of the trunnions 12 has affixed thereto a drive pulley 14 over which passes a belt 15 which also passes over a pulley 16 affixed to a shaft 17 mounted in suitable bearings 18 and also having a drum 19 over which passes a belt 20 receiving power from a pulley on the end of a shaft 21 of a motor 22. By the power connection just described it is apparent that operation of the motor will cause the main frame 10 to rotate in a direction to be determined by the direction of rotation of the motor shaft.

2

The main frame 10 consists of transversely disposed heads 23 comprising its opposite ends, connected by horizontal elongated frame members 24 in any desired number. Spaced inwardly from the heads 23, connected to the members 24 and constituting also a part of the main frame are plates 25, which plates constitute the main supports for the mechanism now to be described.

Arranged within the main frame and supported thereby is an inner frame represented generally at 26. This inner frame comprises a series of spaced parallel heads 27 rigidly connected to one another by longitudinally disposed bars 28 in any desired number and parallel with elongated members 24. The inner frame 26, in the operation of the machine, remains stationary, while the outer or main frame 10 rotates relatively to the inner frame.

The inner frame 26 is coaxial with the main or outer frame, and arranged longitudinally within the said inner frame are a plurality of supply bobbin carriages 29, all of which are pivoted for rotation within the said inner frame and upon axes parallel to the axis of the frame 26 and equally spaced from the said axis (see Fig. 1). Each of the supply bobbin carriages 29 has disposed laterally thereof a supporting shaft 30 upon which the supply spools or bobbins 31 are rotatably mounted. Each of the said carriages 29 is supported for rotation in the inner frame upon trunnions represented at 32. A conventional brake to govern the tension of the wires 33 drawn from the bobbins 31 is shown. This brake comprises a plate 34 disposed transversely within the bobbin carriage and having a central supporting shaft 35 secured in the adjacent end of the bobbin carriage. This shaft is capable of sliding within its support and a spring 36 encircling the shaft exerts pressure against the nut 37 adjustably arranged upon the shaft, so that tension of the spring 36 exerted upon the plate 34 may be regulated.

One of the trunnions (Fig. 5) 32 of each supply bobbin carriage passes through the adjacent plate 27 and has secured to its outer end a pinion 38, which pinions are in mesh with a gear 39 disposed axially of and rotatably mounted adjacent plate 25 of the main or outer frame 10. The gear 39 rotates upon a stub shaft 41 affixed to plate 27 of the stationary or inner frame, and this gear 39 has a hollow shaft portion 40 extending loosely through the frame member 25 with a gear of reduced size 42 either integral with or rigidly secured to the said portion. The reduced gear 42 is in mesh with a gear 43 affixed

to a trunnion 44 having bearing at one end in the adjacent frame member 25 and at its opposite end in the head 23 of the outer frame.

The outer end of the trunnion 44 has affixed thereto a gear 45 which is in mesh with a gear 46 held stationary upon the trunnion 12 by a pin 47 which passes through the gear 46 as well as the bearing post 13. The trunnion 44 also has affixed thereto a gear 48 which meshes with a gear 49 affixed to the outer end of shaft 41. The gears 45, 46, 48 and 49 are all of equal diameter.

Arranged for rotation within the inner frame 26 and in the longitudinal axis thereof is a frame 50 (Fig. 4) which carries a transversely disposed shaft 51 upon which is rotatably mounted a drum 52. The trunnions 53 and 54', which are secured to and support this frame, are hollow, and trunnion 53 as affixed thereto a conventional twisting die 54 through which pass the wires 33 leading from the supply bobbins 31 carried by the bobbin supply carriages 29. The strands 33, gathering and being twisted together in the die 54 pass as a single strand 33' therefrom and around the drum 52 and through the hollow supporting trunnion 54' at the outer end of the frame 50 and over a pulley 55 secured to the head 23 at the outer end of the main frame. The twisted strand then passes laterally from the guide pulley 55 to a similar guide pulley 56 secured near the periphery of the frame 10 to a plate 25, through which it passes and travels longitudinally of the frame toward the inner end thereof and over a guide pulley 57 also secured to the rotating frame 10. The inner head 23 of the outer frame is provided on its inner face with a guide pulley 58 having its periphery disposed in the axis of the said frame and over which the strand 33' passes through the hollow trunnion 12 which supports the said frame. The course of the twisted strand from this point on will be later described.

Referring back to the twister frame and particularly to Fig. 4 of the drawing, it will be seen that the hollow trunnion 54' has a pinion 59 affixed to its outer end. The pinion 59 is in mesh with an intermediate pinion 60 rotatably supported by the plate 25 and the intermediate pinion 60 is in mesh with a pinion or gear 61 secured upon a shaft 62 having bearing at its ends in the plate 25 and the head 23 of the outer rotating frame. The outer end of the shaft 62 has a gear 63 affixed thereto, and this gear is in mesh with a pinion 64 pinned as at 65 to the bearing member 13. The ratio of the interconnected gears 59 to 64 inclusive is such that the frame 50 rotates at twice the speed of rotation of the main or outer frame 10. It will thus be seen that the wires 33 passing through the die 54 are given a twisting action by rotation of the frame 50 so that the strand 33' is formed.

We have seen that the single wires 33 in a number to be determined by the number of supply bobbins are converged in the twisting die 54 and there formed into the strand 33', which strand passes around the drum 52 while the latter is rotated in the axis of the machine, from whence the twisted strand passes over the pulleys 55, 56, 57 and 58 and out through the hollow stub shaft 12. As the strand 33' emerges from the hollow shaft 54, it is rotating in the same direction as the outer or main frame 10, however, as the strand passes laterally over pulley 55 and rearwardly over pulley 56 this direction of rotation of the strand is then reversed. Due to the fact, however, that the inner frame is stationary while the outer frame is rotating, the speed of rotary movement of the strand 33' is reduced by one-half as it progresses rearwardly of the main frame and near the periphery thereof. As the strand then passes over pulleys 57 and 58 and back into the axial center of the frame, the remaining twisting or rotating speed of the strand is eliminated so that the complete strand as it issues from the hollow stub shaft 12 has no rotative movement. This is of decided advantage in winding the completed strand upon the wind-up bobbin, as it enables the strand to be more conveniently handled.

Any desired type of wind-up bobbin and wind-up bobbin mechanism may be employed for taking off the completed strand. The drawing discloses a typical wind-up bobbin, guide and mechanism for operating the elements. In the drawing, the strand 33' passes over a haul-off drum 66 supported by a shaft 67 mounted in suitable bearings 68, and this shaft carries a pulley 69 over which passes a belt 70 which receives power from a shaft 71 having a beveled gear 72 at one end. The gear 72 is in mesh with a similar beveled gear 73 affixed to a shaft 74 leading to gear reducing mechanism of conventional type located within a gear reducing box 75.

After taking several turns around the haul-off reel 66, the strand 33' passes to a wind-up bobbin indicated at 76. This bobbin is carried by a shaft 77 mounted in suitable bearings as shown, and a conventional guide represented generally at 78 determines the laps upon the wind-up bobbin. The shaft 77 receives its power through a beveled gear 79 secured to one end of the shaft, which gear is in mesh with a similar gear 80 secured upon a vertically disposed shaft 81 mounted in suitable bearings, and the shaft 81 is equipped with a beveled gear 82 in mesh with a similar gear 83 on the adjacent end of shaft 74. A friction brake of conventional form is indicated at 84 in order that proper tension upon the strand 33' may be maintained between the wind-up bobbin and the haul-off drum 66. The guide mechanism 78 as above mentioned is driven by belt 78^a passing over pulley 78^b connected to shaft 77 and also over pulley 78^c affixed to guide member 78, as shown in Figures 1 and 2.

In instances where heavier gauge wire is employed to make the complete strand, it is desirable that haul-off mechanism be substituted for the twisting drum 52 as above described. Figure 7 of the drawings discloses this variation. In the said figure, the wire 33' enters the twister frame 50 and takes several laps around the haul-off drum 85, from whence it passes in the manner already described out through the hollow trunnion 54' and over the pulley 55 in the manner heretofore described.

In the present instance, however, the hollow shaft 54' has affixed thereto a gear 86, which gear is pinned as at 87 to the stationary frame plate 25. A shaft 88 rotatably mounted in a suitable bearing 89 on one side of the frame 50 has a gear 90 at one end in mesh with the gear 86, while a worm 91 at the opposite end of said shaft 88 is in mesh with a worm gear 92 affixed to the shaft 51 which carries the haul-off drum 85.

From this construction, it is apparent that as the gear 86 is affixed to the stationary frame plate 27, and as the gear 59 is rotating the frame 50, the gear 90 is being rotated as it travels in planetary manner around the stationary gear

86. The rotation thus applied to gear 90 is transmitted through shaft 88 to the worm-worm wheel connection 91—92 to the shaft 51 which carries the haul-off drum 85. In this manner, pulling action is imparted to the wire 33.

With the use of the strander as above described in association with a predetermined number of other similar stranders, and in association with other means now to be described, it is possible to produce from a number of wires a series of twisted strands which may all be brought together and twisted into a complete cable or rope upon a proper core element.

Figure 8 of the drawing shows an assembly by which this result may be accomplished. In the said figure, there are shown six stranders or strand-forming machines as above fully described assembled in relationship to one another. These stranders are represented at A, B, C, D, E and F. It will be observed that the strands formed by each of these stranders are brought together in a twisting die 93 and are twisted around a core member 94 leading from a core bobbin 95 rotatably mounted in a carriage or frame 96 which is rotatably supported by its trunnions 97 and bearings 98. A proper drag upon the bobbin may be brought about by the brake 99 of the construction and character heretofore described. Rotative movement of the carriage 96 upon its trunnions, in order that a twisting action may be given to the core 94, is brought about by a belt 100 passing over a pulley 101 on a carriage trunnion 97. This belt passes over pulley 102 affixed to the end of a power shaft 103 mounted in suitable bearings and extending longitudinally of the general assembly. The shaft 103 receives its power from a belt 104 passing over a pulley 105 affixed to shaft 103 and also over pulley 106 affixed to the main power shaft 107 spaced from and parallel with shaft 103. The shaft 107 is driven from the motor 108 by the belt and pulley arrangement 109 as shown. The power necessary to operate the several stranders A to F inclusive, is derived from one or the other of the shafts 103 and 107 as will be understood and as shown.

The strands 33' and the core 94 are brought together in proper twisted relationship in the twisting die 93 carried by the cable wind-up bobbin carriage 110. This carriage is mounted for rotation on its trunnions 111 and 112 in suitable bearings 113. The cable wind-up bobbin 114 is rotatably mounted upon its shaft 115 disposed laterally within the carriage 110. The guide or lapper for leading the cable properly to the bobbin is represented generally at 116 and a haul-off drum 117 is also arranged within the carriage 110 and interposed between the die 93 and the guide mechanism 116. A shaft 118 is mounted at one side and longitudinally of the carriage 110 in suitable bearings to drive the haul-off bobbin, the guide mechanism and the cable wind-up bobbin. The haul-off drum shaft has one end provided with a beveled gear 119 in mesh with a similar gear 120 affixed to the shaft 118, while the operating shaft of the guide mechanism has attached thereto a beveled gear 121 in mesh with a similar gear 122 affixed to shaft 118. The shaft 115 which supports the cable wind-up bobbin also is provided with a beveled gear 123 in mesh with a similar gear 124 affixed to the shaft 118. The shaft 118 is provided with a gear 125 in mesh with an intermediate or idle gear 126 rotatably carried by the carriage 110. Idle gear 126 is in mesh

with gear 127. The gear 127 is affixed to a shaft 128 which, in turn, is rigidly and non-rotatably secured to a support 129. The trunnion 112 constitutes a hollow shaft which is affixed at its inner end to the carriage 110 and extends through the bearing 113 and carries at its outer end a pulley 130, over which passes a belt 131 similarly passing over a pulley 132 affixed to the power shaft 103.

A suitable drag or friction brake 133 is associated with the cable wind-up bobbin to maintain a constant and desired tension upon the rope as it is being wound upon the bobbin.

From this description it is apparent that as power is imparted to the hollow trunnion 112, the cable wind-up bobbin carriage 110 is caused to rotate, carrying with it the haul-off 117, guide mechanism 116, and the wind-up bobbin 114. At the same time, the idle gear 126 travelling around fixed gear 127 imparts, through gear 125, rotative movement to shaft 118 which, through the several beveled gear connections shown, drives the haul-off drum, the guide mechanism and rotates the cable wind-up bobbin.

It will be understood that the several units which make up the entire combination will be so regulated as to speed of operation as to synchronize with one another in the delivery of the strands or cables to the proper place in timely manner to produce a complete and perfect cable or rope.

The core member 94 may be of hemp, paper, wire or it may be a strand similar to the strands 33' as produced by the stranding mechanism.

It may be found desirable to form a twisted strand core for the rope at the same time the outer or enveloping strands are being made and assembled with the core. In this event, the bobbin 95 and its carriage 96 will be dispensed with, and substituted therefor will be a strander similar to that heretofore described.

The stranders above described have their supply bobbins and the supporting carriages therefor radially spaced within the inner frame. Due to this fact, it is necessary that the frame 26 be relatively wide, which might be of disadvantage where it is necessary to economize space, or where it is necessary to obtain greater speed in production. Therefore, I propose an alternate or modified arrangement of supply bobbins and carriages therefor, which, instead of being arranged in spaced radial relationship, are located in tandem or in longitudinal alignment one with the other in the supporting frame.

Referring to Figures 9 and 10 of the drawings, I have shown a battery of supply bobbin carriages and their associated mechanisms, three in number, arranged in spaced longitudinal alignment and all equipped so as to operate in synchronism and in cooperation with one another.

In the drawing, at 134 I have shown three bearings arranged in spaced relationship to one another and supported for rotation within which is an elongated frame whose longitudinal bars 135 correspond with or are equivalent to the main frame bars 24 as heretofore described. The longitudinal bars 135 are connected at their ends by the heads 136, with plates 137 also connecting the bars and spaced inwardly from heads 136. Each of the heads 136 has arranged centrally and disposed longitudinally thereof an outwardly extending trunnion 138 having bearing in the posts or brackets 139. The trunnion 138 at one end of the frame has affixed there-

to a pulley 140 for accommodation of a drive belt from a suitable source of power, not shown. The same trunnion has loosely mounted thereon a gear 141 which is pinned as at 142 to the post 139. The adjacent end of the frame carries a rotatable shaft 143 offset from the longitudinal center of the frame, to one end of which is affixed a gear 144 in mesh with gear 141, the arrangement being such that as the shaft 138 is rotated, the gear 144 travels in planetary manner around fixed gear 141 to impart rotary movement to the shaft 143. Shaft 143 has affixed thereto another gear 144' in mesh with an intermediate or idler gear 145 which in turn is in mesh with a gear 146 attached to a shaft 147 mounted for rotation in the adjacent plate 137 and axially aligned with the shaft 138. The shaft 147 which has bearing in the plate 137, loosely carries a gear 148 which meshes with a gear 149 secured to shaft 143. The gear 148 is rigidly connected with a plate 150 constituting an end of the inner or stationary frame. Also loosely engaged upon the shaft 147 and affixed as by a pin 151 to the plate 150, is a gear 152 in mesh with a pinion 153 carried by a shaft 154 mounted in a bearing 155 secured to the haul-off carriage 156. This haul-off carriage supports a transversely disposed shaft 157 to which is secured a haul-off drum 158. One end of the shaft 157 has attached thereto a worm gear 159 in mesh with a worm 160 secured to the shaft 154.

It is apparent from the foregoing that rotative movement applied to trunnion 138 by power pulley 140 will cause the main frame to rotate in its bearings, and in so doing power will be transmitted from fixed pinion 141 to gear 144 creating rotative movement in shaft 143 and through gears 144, 144', 145 and 146 the latter will rotate the shaft 147, which being affixed to the haul-off carriage 156, causes the latter to rotate. Inasmuch as gear 152 is fixed against rotation, the pinion 153 will travel around the same and rotative movement will be created in shaft 154, being transmitted through the worm and worm gear construction to the shaft 157, causing the haul-off drum to rotate. It will be noted that the shaft 147 is hollow throughout its length so that a strand may be drawn therethrough in the manner hereafter described. The inner end of the haul-off carriage is mounted for rotation on a hollow trunnion 161, having bearing in the cross member 162 forming a part of the inner frame, and the extreme end of the hollow shaft 161 carries a twister die of conventional form indicated at 163.

Arranged in tandem and longitudinally within an inner frame comprising heads or plates 150 and the longitudinal side bars 164, are a series of supply bobbin carriages 165. The bobbin carriage 165 at that end of the frame most remote from the haul-off drum comprises the rectangular carriage as shown supported for rotative movement in the longitudinal axis of the main frame upon trunnions 166 and 167 having bearing in the adjacent plates 150. The trunnion 167 extends through and is rotatably mounted in plate 137, having a gear 168 affixed to its outer end, which gear is in mesh with an intermediate or idler gear 169 having intermeshing engagement with a gear 170 affixed to a shaft 171 having bearing in plates 136 and 137. The inner end of shaft 171 is equipped with a gear 172 in meshing engagement with a gear 173 surrounding and loosely supported by trunnion 167 and affixed to or forming part of the plate 150.

The outer end of shaft 171 has affixed thereto a gear 174 in mesh with a gear 175 loosely mounted upon trunnion 138 and rigidly connected to the post 139 by a pin 176.

The supply bobbin carriage is provided with a laterally disposed shaft 177 upon which is rotatably mounted a bobbin 178, carrying the supply wire 179. In order to regulate the tension of the wire 179 in being drawn from the supply bobbin 178 a friction brake is provided. This brake includes a plate 180 arranged to contact the peripheral edges of the bobbin flanges, and has a rearwardly projecting threaded stem 181 extending loosely into an opening disposed axially in frame 165. This stem is provided with a threaded nut 182 and interposed between the nut and the adjacent end of the supply bobbin carriage is an expansion spring 183. It is obvious from this construction that adjustment of the nut governs the degree of spring tension exerted by the brake upon the peripheral edges of the bobbin.

From the foregoing it is apparent that as the outer frame rotates it carries with it the shaft 171, the gear 174 of which travels around and is intermeshingly engaged with fixed gear 175. This action imparts rotation to shaft 171 which, through gears 170, 169 and 168 imparts rotative movement to trunnion 167 as well as to the carriage to which it is affixed. Due to intermeshing engagement between gear 172 and gear 173, the inner frame is maintained in a stationary manner.

The foregoing is a detailed description of the bobbin structure at the far end of the supporting frame, the other bobbin structures arranged in tandem in the frame are of similar construction but whereas the end bobbin frame derives its rotative motion from shaft 170, the remaining bobbin frames are interconnected so as to receive rotative motion one from another. The inner end of each bobbin frame 165 has its hollow trunnion 166 mounted in an adjacent plate 150 axially of the main frame. This trunnion has a gear 184 affixed thereto which is in mesh with gear 185 affixed to counter shaft 186 having bearing at its ends in adjacent plates 150. The said counter shaft also has a gear 187 secured thereto which meshes with a gear 188 secured to the trunnion 166' of the next adjacent bobbin frame 165. In this manner it is seen that the supply bobbin frames are all driven in tandem.

The wires 33 from these several bobbins are led through their hollow trunnions 166, from whence they pass over guides 189 laterally of the frame to guides 190 at the sides of the inner frame and thus forwardly of the machine to the twister die 163 disposed axially thereof where they are formed into strand 33'. The strand then passes over guide 191 and laterally of the main frame to guide 192, then rearwardly through suitable holes in plates 137 to guide 193, then inwardly over guide 194 in the longitudinal center of the frame and out through hollow trunnion 138 to a suitable wind-up bobbin, not shown.

The inner carriage or frame remains stationary while the bobbin holders, the twister die and the outside frame or drum all turn in the same direction, the speed of rotation of the outer frame being one-half the speed of the twister die. When the wires are twisted into the strand, the latter passes outwardly and then rearwardly and out through the main frame bearing at the far end of the machine. The outer frame, turning at a

speed one-half that of the twister die, the strand will pass from the machine without turning, thereby permitting it to be wound up without turning the wind-up bobbin. If greater speed is required, the outer frame may be turned at a speed less than one-half the speed of the twister die, in which a turning wind-up bobbin will be required, as will be understood.

It is obvious from the foregoing that while the machine is designed primarily for making small strand or rope, with minor changes it may be adapted to the manufacture of ropes or cables of larger sizes. The primary purpose of the machine, as has been stated, is to obtain high speeds as well as to make strand or rope in a single operation. In making smaller ropes or strands no haul-off need be provided inside of the frame. In such instances, the haul-off is located beyond the main frame and near the wind-up bobbin.

The bobbin carriages, the twister die and the outside or rotating frame all turn in the same direction, and the gearing may be such that the outer frame turns at approximately one-half the speed of the twister die. The speed of rotation of the bobbin carriages may be different from that of the twister die, but it will be understood that these relative speeds may be adjusted as desired.

It will be obvious that if the outer frame turns at half the speed of the twister die, the strand will not be rotating when it emerges from the frame and may therefore be wound up on a non-rotating wind-up bobbin. If greater speed of production is needed, the outer frame may be rotated at a speed less than half the speed of rotation of the twister die and the strand is then wound up by means of a rotating wind-up bobbin.

In instances where larger wire is used it may become necessary to employ a haul-off with a twister die. This arrangement is shown in Fig. 9 of the drawings. In this instance, the worm gearing arrangement will bring about a speed to the haul-off drum necessary to produce the desired result.

I claim:

1. In a wire rope making machine, a rotating outer frame, a stationary frame within said outer frame, bobbin carriages rotatably mounted within said stationary frame, bobbins in said carriages, a drum and a die supported for rotation in the axis of said outer frame and adapted to receive wires from said bobbins, means to lead the strand from said drum laterally of said outer frame and in a reverse direction therein and back into the axis thereof, and a wind-up drum to receive said strand.

2. In a wire rope making machine, a rotating outer frame, a stationary frame within said outer frame, bobbin carriages rotatably supported within said stationary frame, bobbins in said bobbin carriages, a drum frame and a die rotatably supported in the axis of said stationary frame adapted to receive wires from said bobbins, guide members on said outer frame disposed eccentrically thereof to receive the strand from said drum, and a wind-up bobbin to receive the strand from said frame.

3. In a wire rope making machine, a rotating outer frame, a stationary frame within said outer frame, bobbin carriages rotatably mounted within said stationary frame, bobbins in said carriages, a drum and a die mounted for rotation in the axis of said rotating frame and adapted to receive wires from said bobbins, guide members carried by said outer frame near the periphery thereof to lead the strand laterally from the axis of the said frame and in a reverse direction therein and back into the axis of said outer frame, and a wind-up bobbin to receive said strand.

4. In a wire rope making machine, a rotating outer frame, a stationary frame within said outer frame, bobbins rotatably mounted within said stationary frame, a twisting die rotatably mounted in the axis of said rotatable frame and adapted to receive wires from said bobbins, guide members carried by said rotatable frame and disposed eccentrically thereof adapted to receive the strand from said die, a guide to lead the strand back into the axis of said frame, and a wind-up bobbin to receive said strand.

5. In a wire rope making machine, a rotating outer frame, a stationary frame within said outer frame, bobbin carriages mounted with said stationary frame, means for rotating said carriages in the same direction as said outer frame, bobbins in said carriages, a drum and a die mounted for rotation in the axis of said outer frame, means for rotating said drum and die in the same direction as said outer frame, said die and drum adapted to receive wires from said bobbins, and a wind-up bobbin to receive the strand from said drum.

6. In a wire rope making machine, a rotating outer frame, a stationary frame within said outer frame, bobbin carriages mounted within said stationary frame, means for rotating said carriages in the same direction as said outer frame, bobbins in said carriages, a drum and a die mounted for rotation in the axis of said outer frame, means for rotating said drum and die in the same direction as said outer frame, said die and drum adapted to receive wires from said bobbins, and a stationary wind-up bobbin to receive the strand from said drum.

7. In a wire rope making machine, a rotating outer frame, a stationary frame within said outer frame, bobbin carriages mounted within said stationary frame, means for rotating said carriages in the same direction as said outer frame, bobbins in said carriages, a drum and a die mounted for rotation in the axis of said outer frame, means for rotating said drum and die in the same direction as said outer frame, said die and drum adapted to receive wires from said bobbins, a wind-up bobbin to receive the strand from said drum, and means for imparting lateral rotation to said wind-up bobbin.

8. In a wire rope making machine, a plurality of rotating outer frames, a stationary frame within each of said outer frames, bobbin carriages mounted within said stationary frames, means for rotating said carriages, bobbins in said carriages, a drum and a die rotatably mounted within each of said inner frames to receive wires from said bobbins, a rotatable core bobbin, a second twister die to receive a wire from said core bobbin as well as strands from said first named dies, a haul-off drum, and a wind-up bobbin to receive the strand from said haul-off drum.

9. In a wire rope making machine, a plurality of rotating outer frames, a stationary frame within each of said outer frames, bobbin carriages mounted within said stationary frames, means for rotating said carriages, bobbins in said carriages, a drum and a die rotatably mounted within each of said inner frames to receive wires

from said bobbins, a rotatable core bobbin, a second twister die to receive a wire from said core bobbin as well as strands from said first named dies, a haul-off drum, a wind-up bobbin to receive the strand from said haul-off drum, and means for rotating said last named twister die, haul-off drum and wind-up bobbin.

10. In a wire rope making machine, an outer frame mounted for rotation on a horizontal axis, a stationary inner frame within said outer frame pivotally mounted in the axis of the latter, bobbin frames rotatably mounted in said inner frame, a flier bobbin and a twister die rotatably mounted within said inner frame with their axes coincidental therewith, gears operable upon rotation of said outer frame to rotate said bobbin frames, gears operable upon rotation of said outer frame to rotate said flier bobbin and said twister die, and bobbins rotatably supported in said bobbin frames.

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The following references are of record in the file of this patent:

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