

Oct. 18, 1949.

A. ARNASON  
WIRE ROPE MACHINE

2,485,348

Filed Nov. 26, 1947

15 Sheets-Sheet 1

FIG. 1.

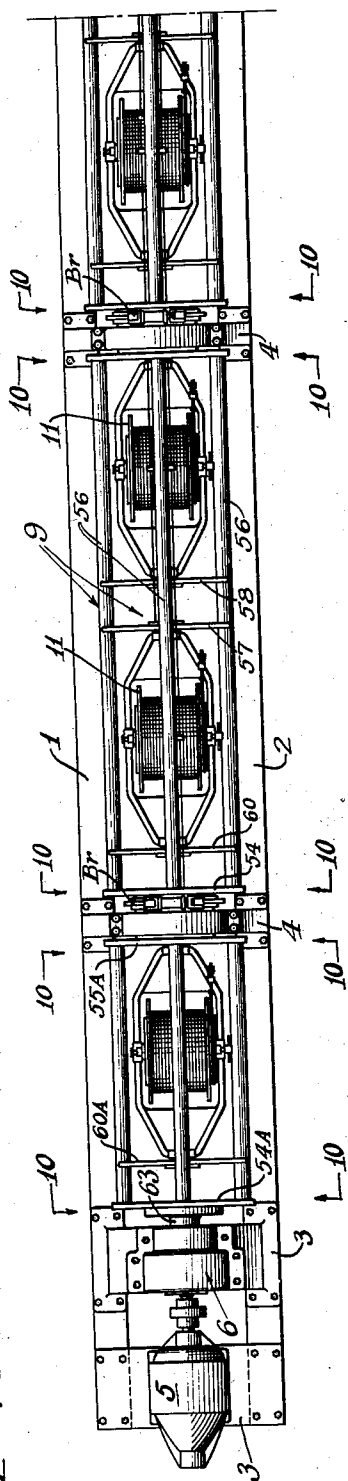
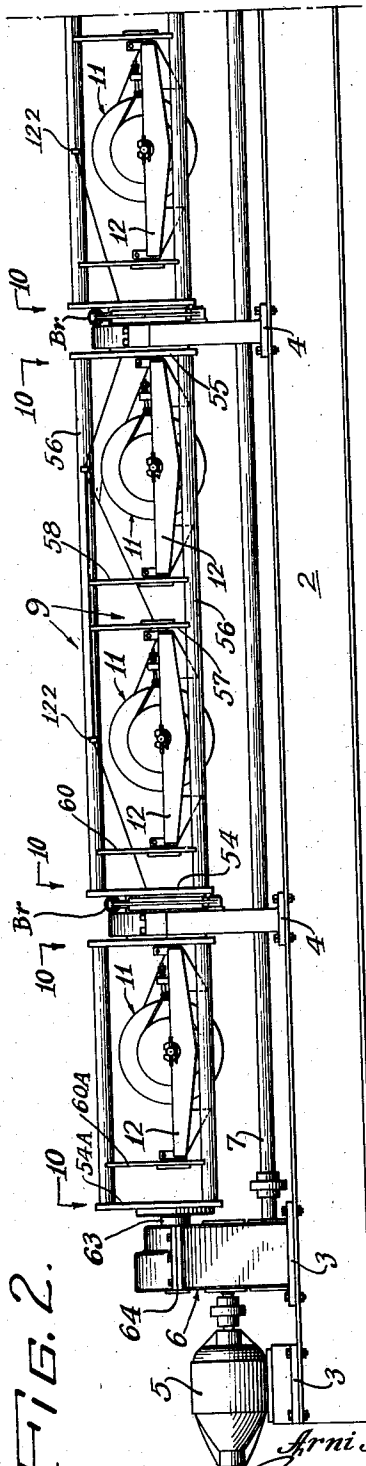


FIG. 2.



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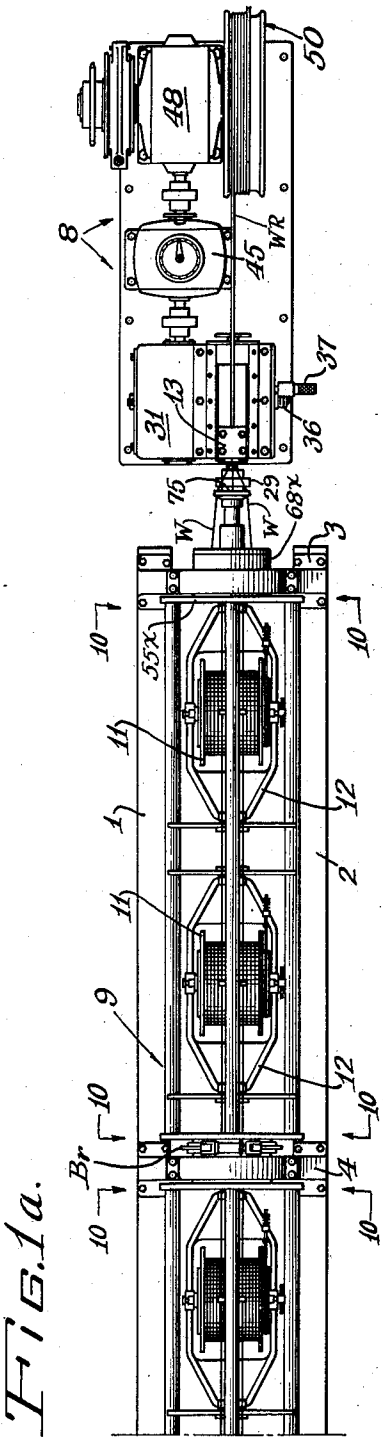
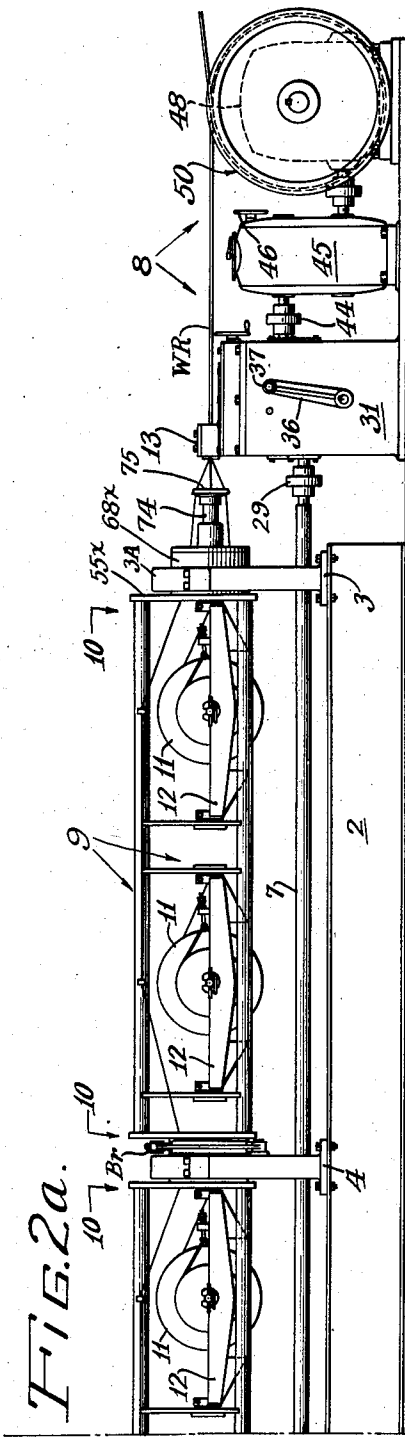
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15 Sheets-Sheet 2



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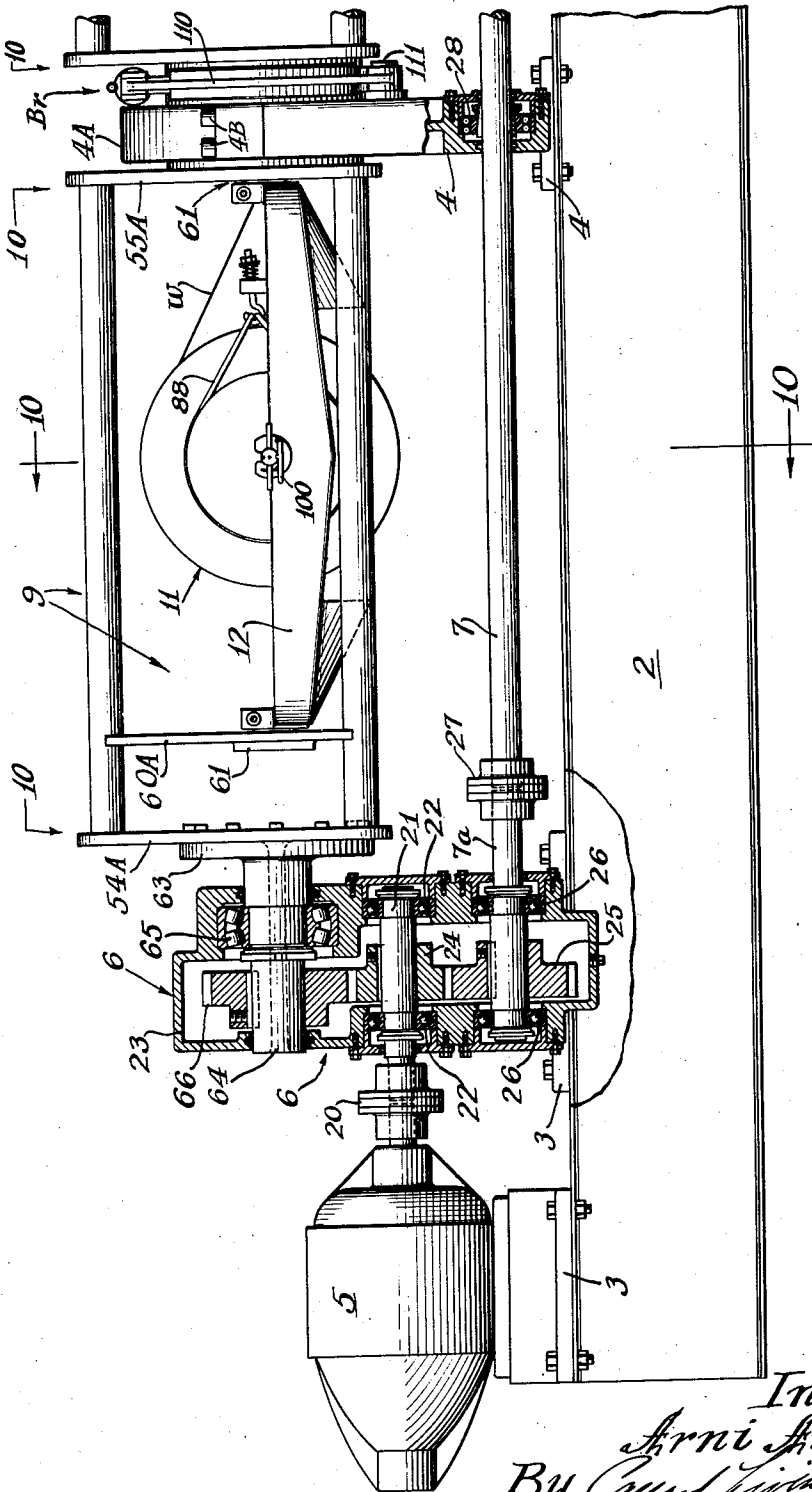


FIG. 3.

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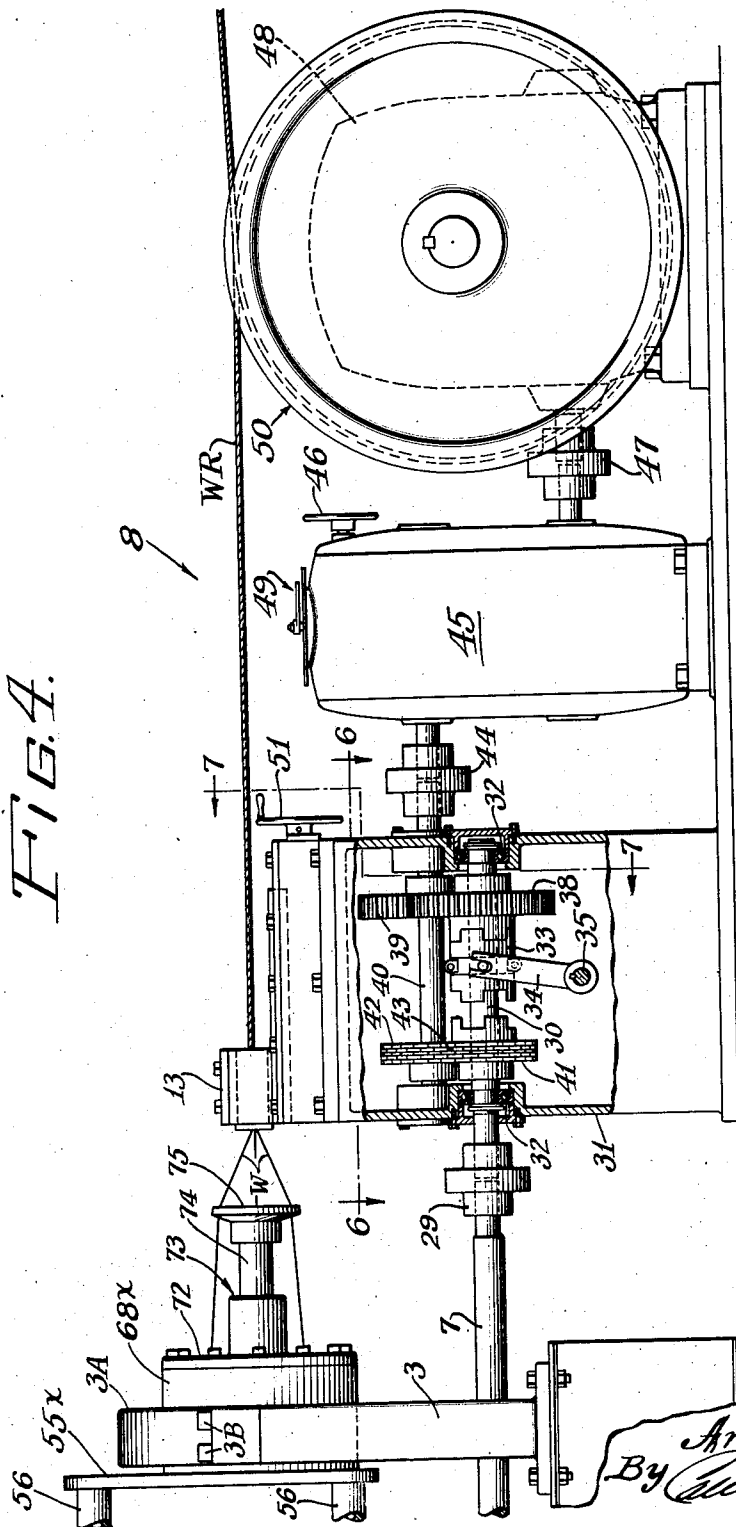
Oct. 18, 1949.

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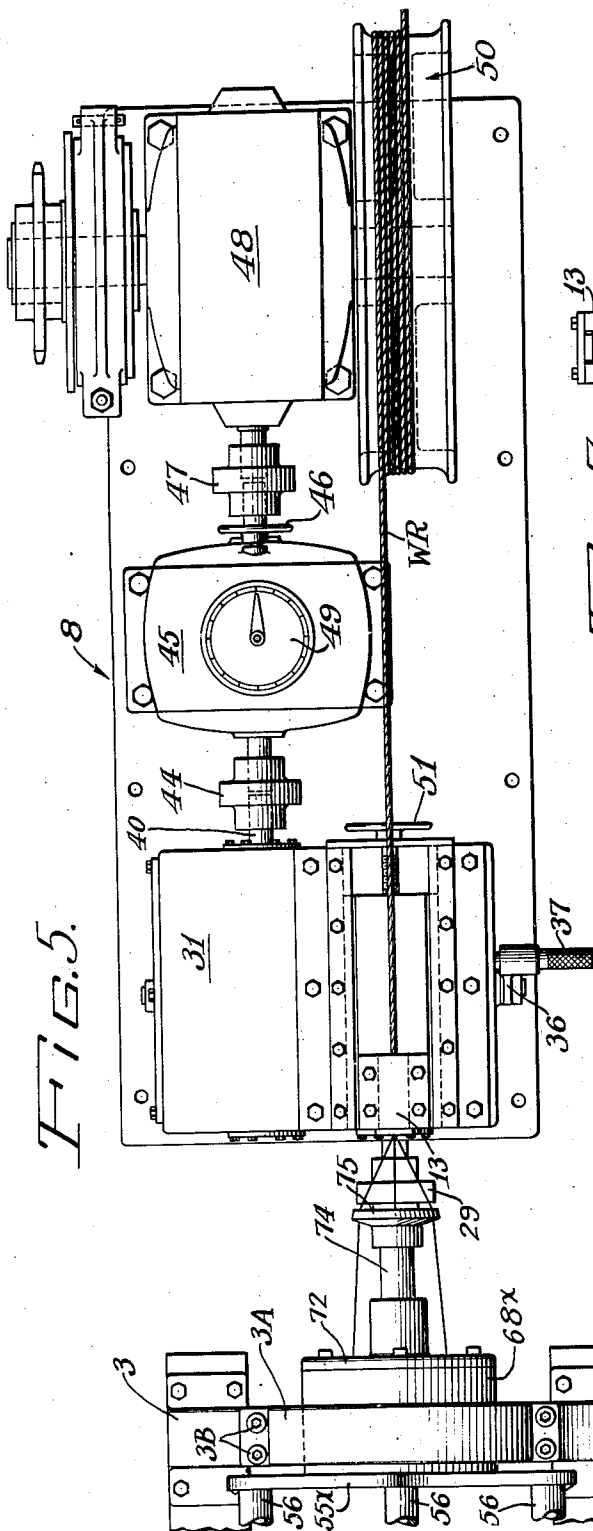
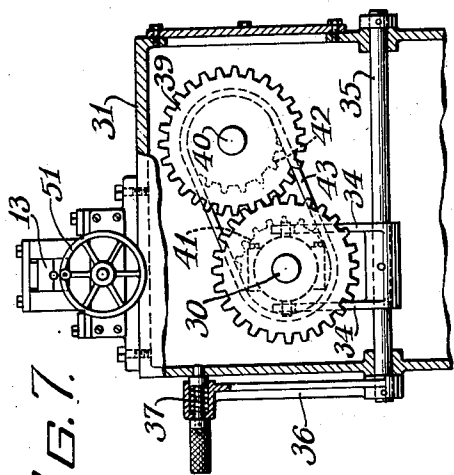
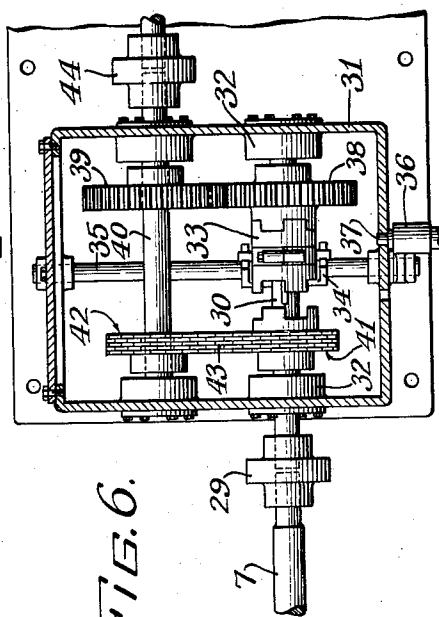
Oct. 18, 1949.

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WIRE ROPE MACHINE

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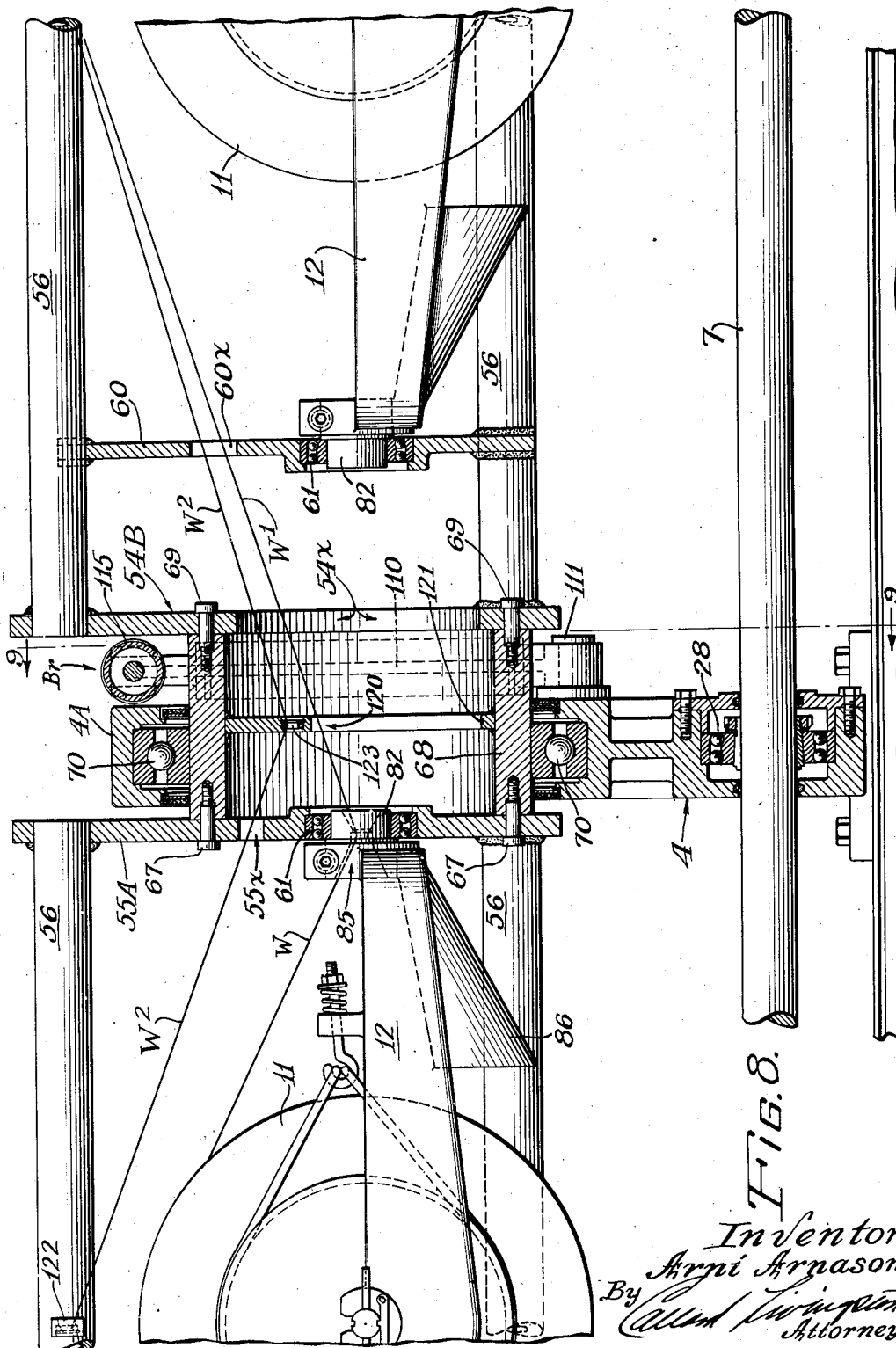
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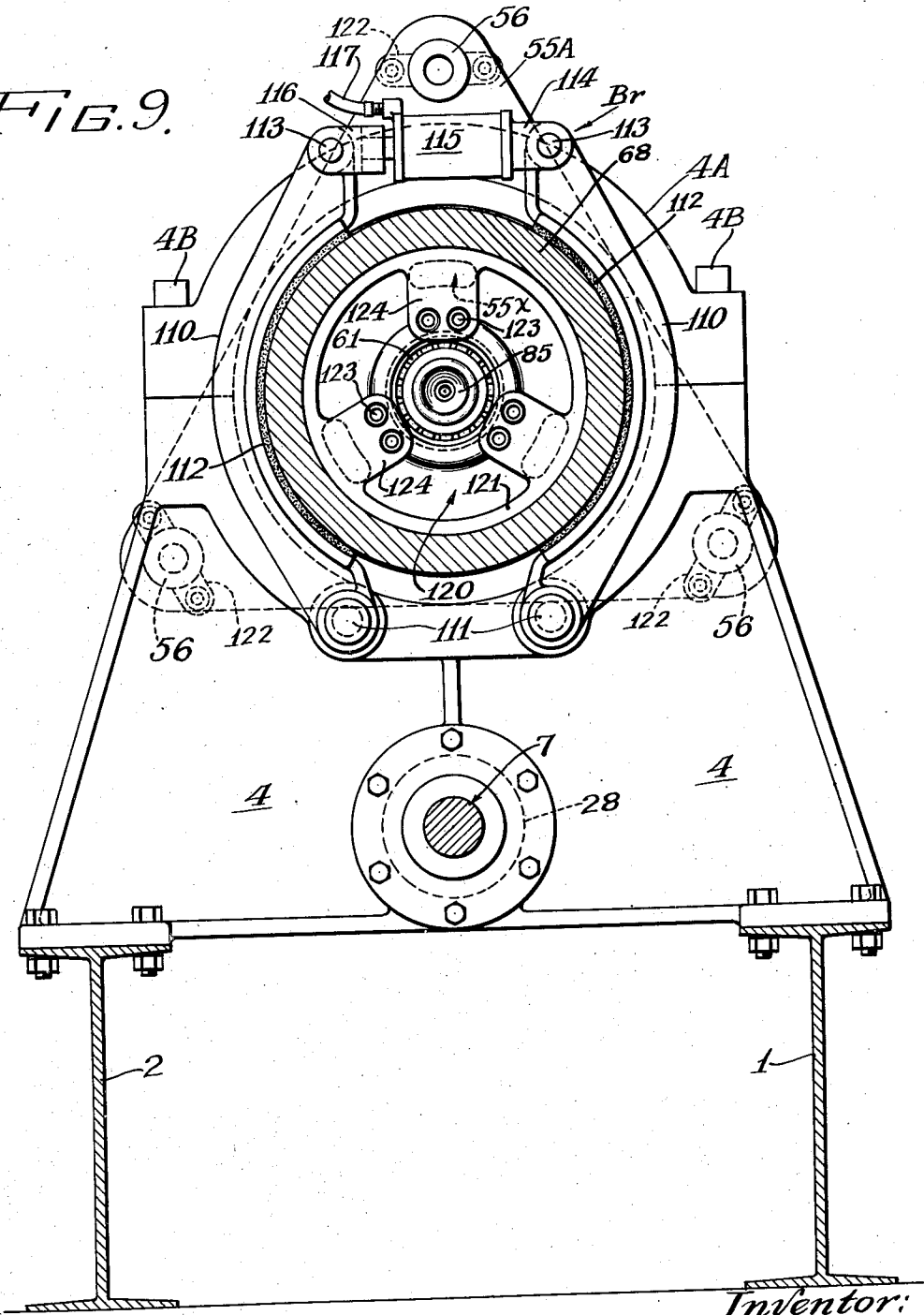
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WIRE ROPE MACHINE

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FIG. 9.



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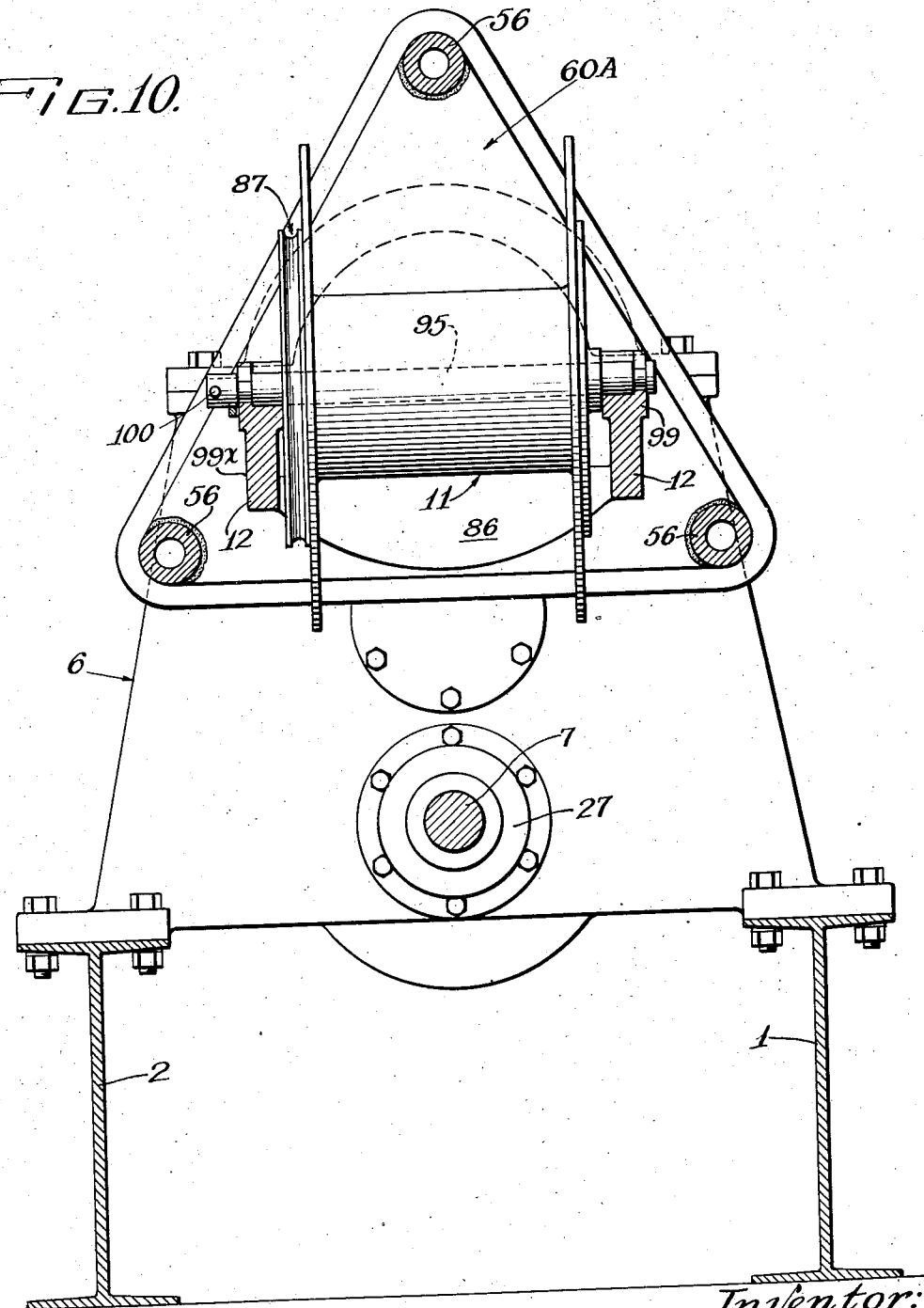
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FIG. 10.



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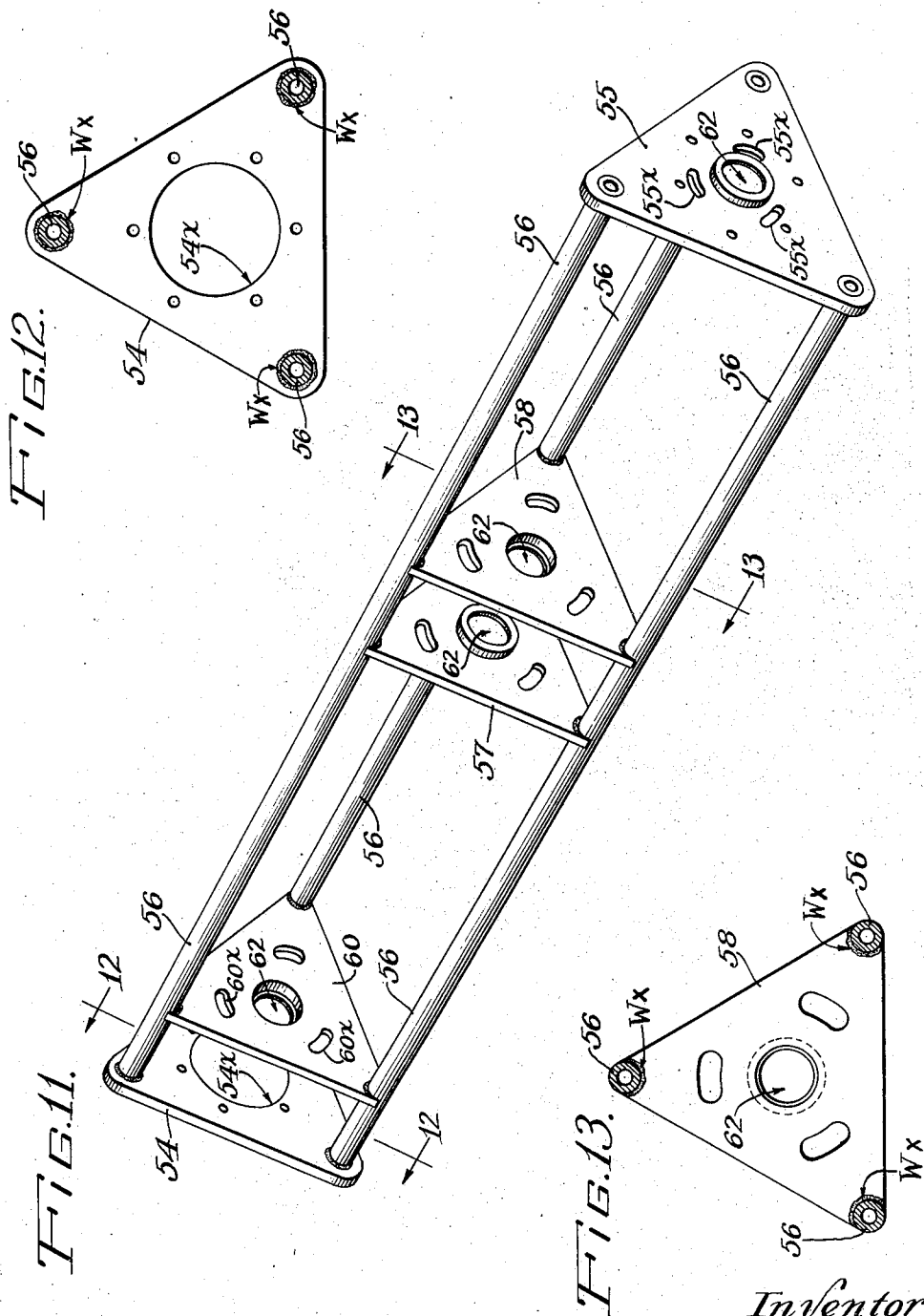
Oct. 18, 1949.

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WIRE ROPE MACHINE

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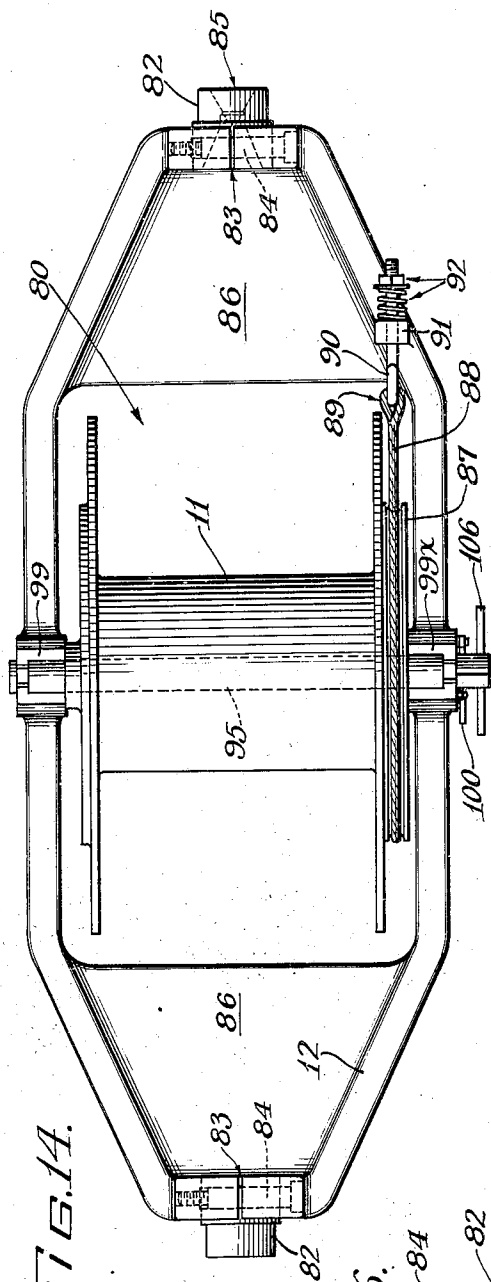


FIG. 14.

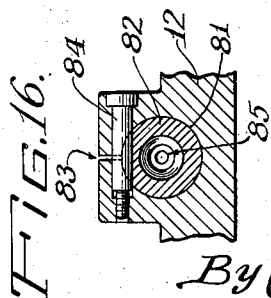


FIG. 16.

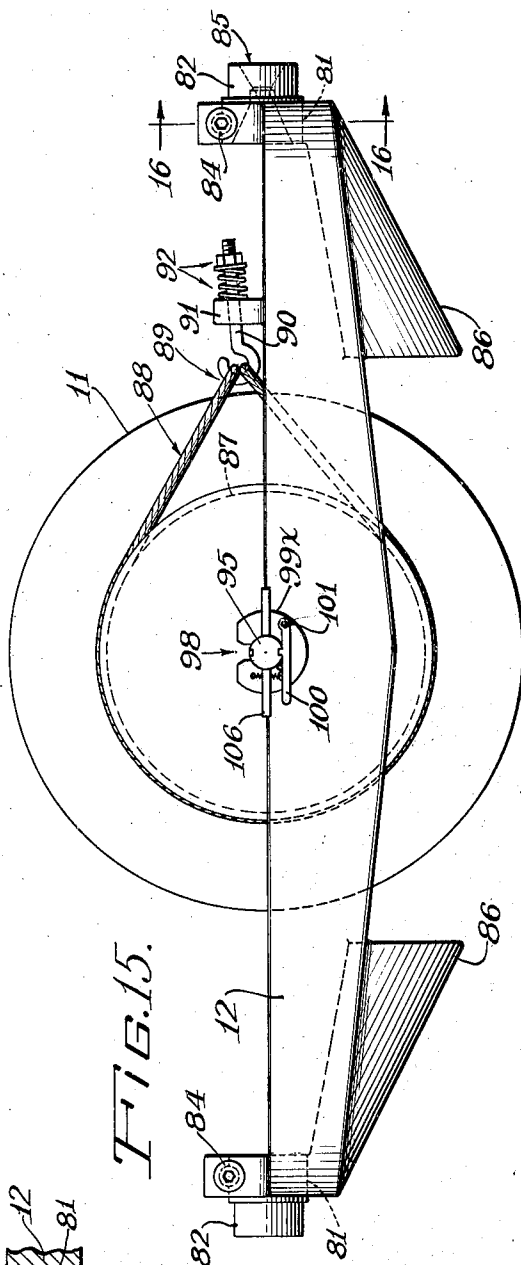


FIG. 15.

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FIG. 17.

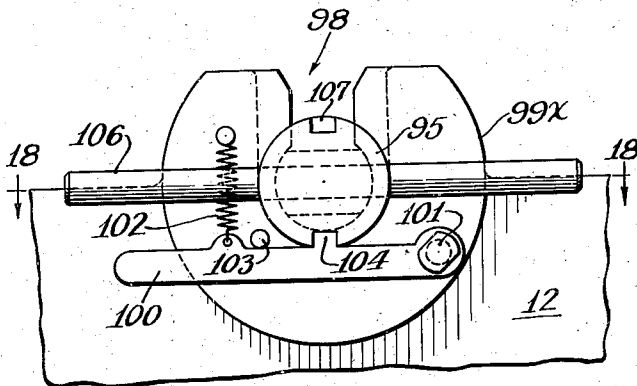


FIG. 19.

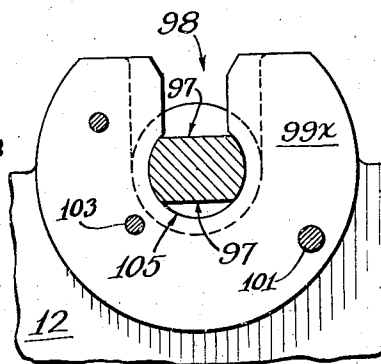


FIG. 18.

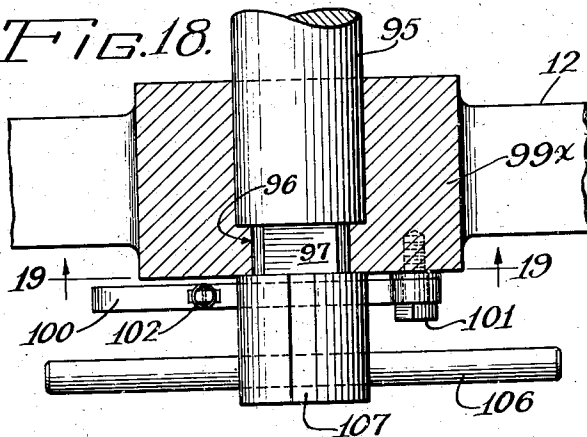


FIG. 21.

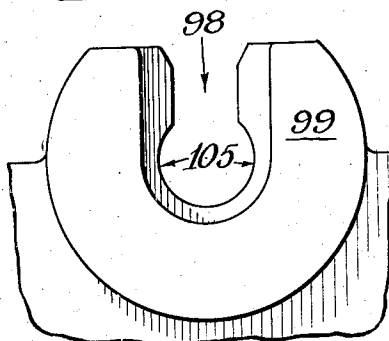


FIG. 20.

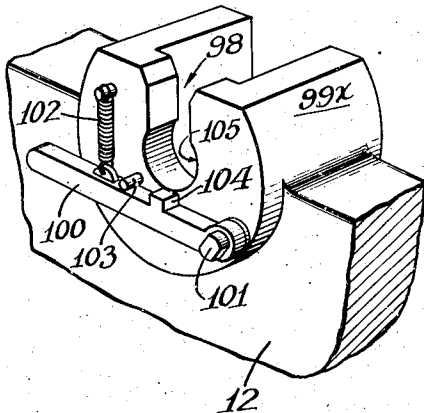
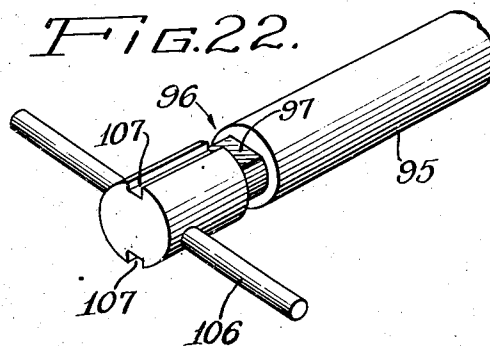


FIG. 22.



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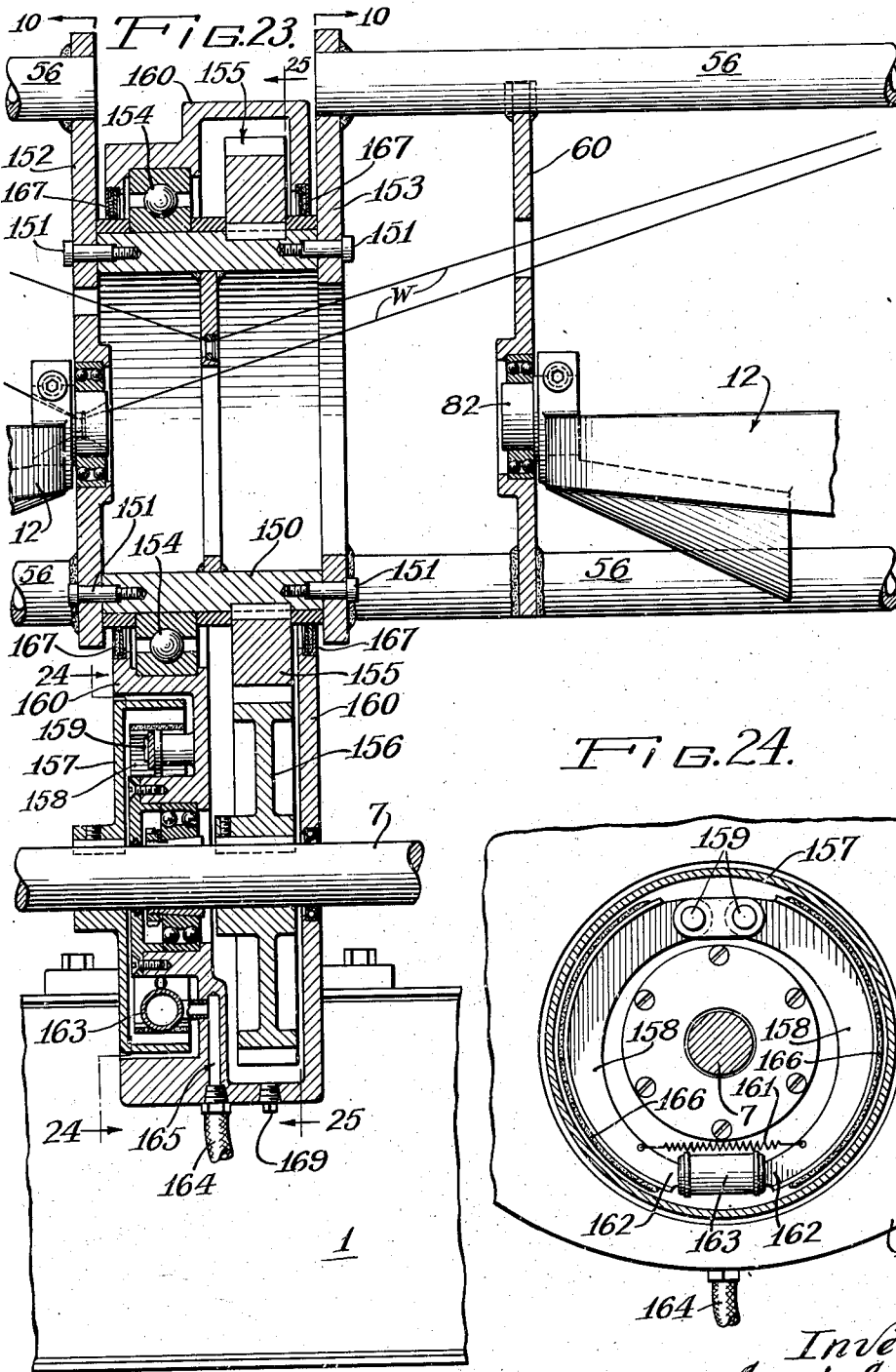
Oct. 18, 1949.

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WIRE ROPE MACHINE

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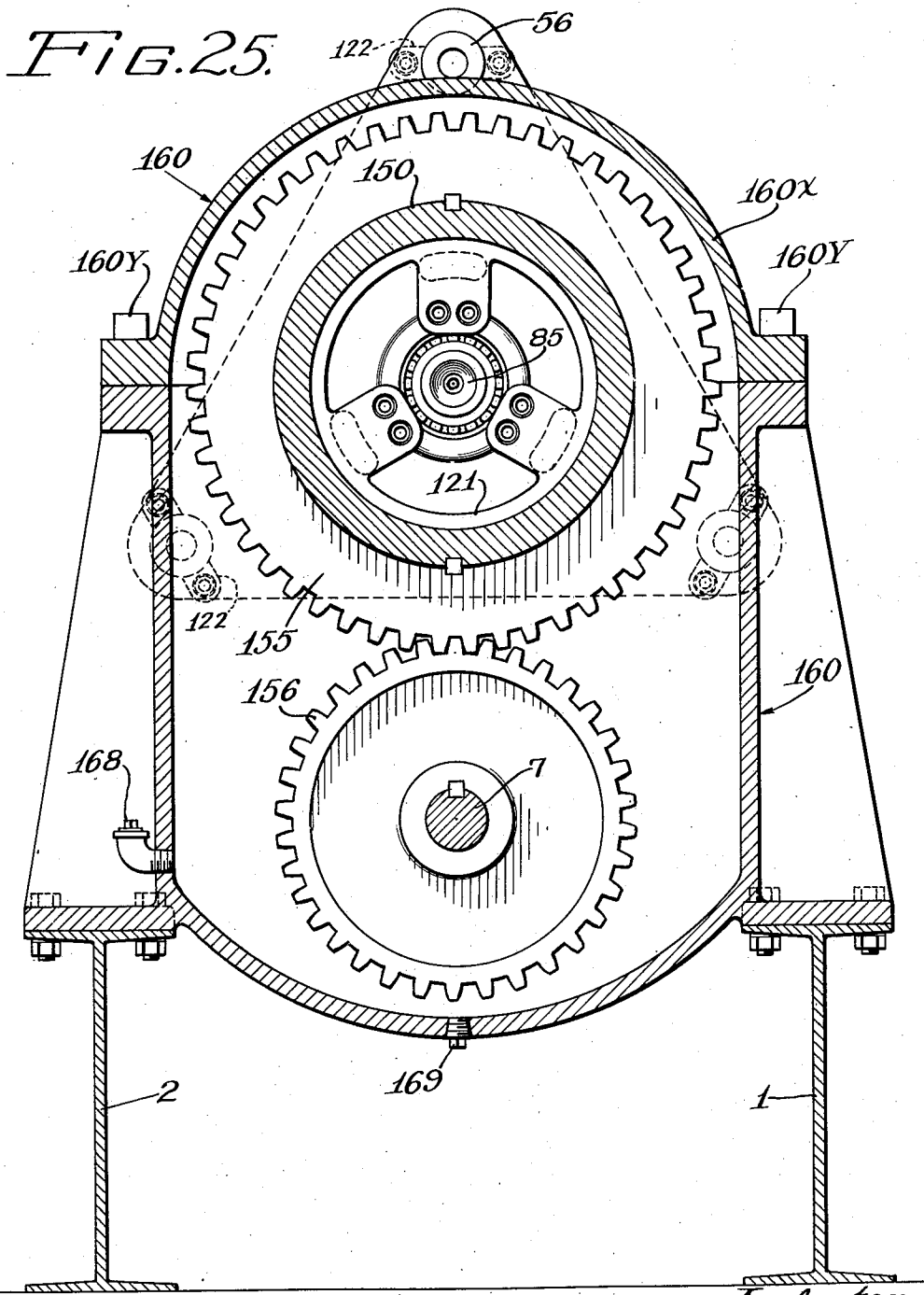
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WIRE ROPE MACHINE

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15 Sheets-Sheet 13



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WIRE ROPE MACHINE

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FIG. 26.

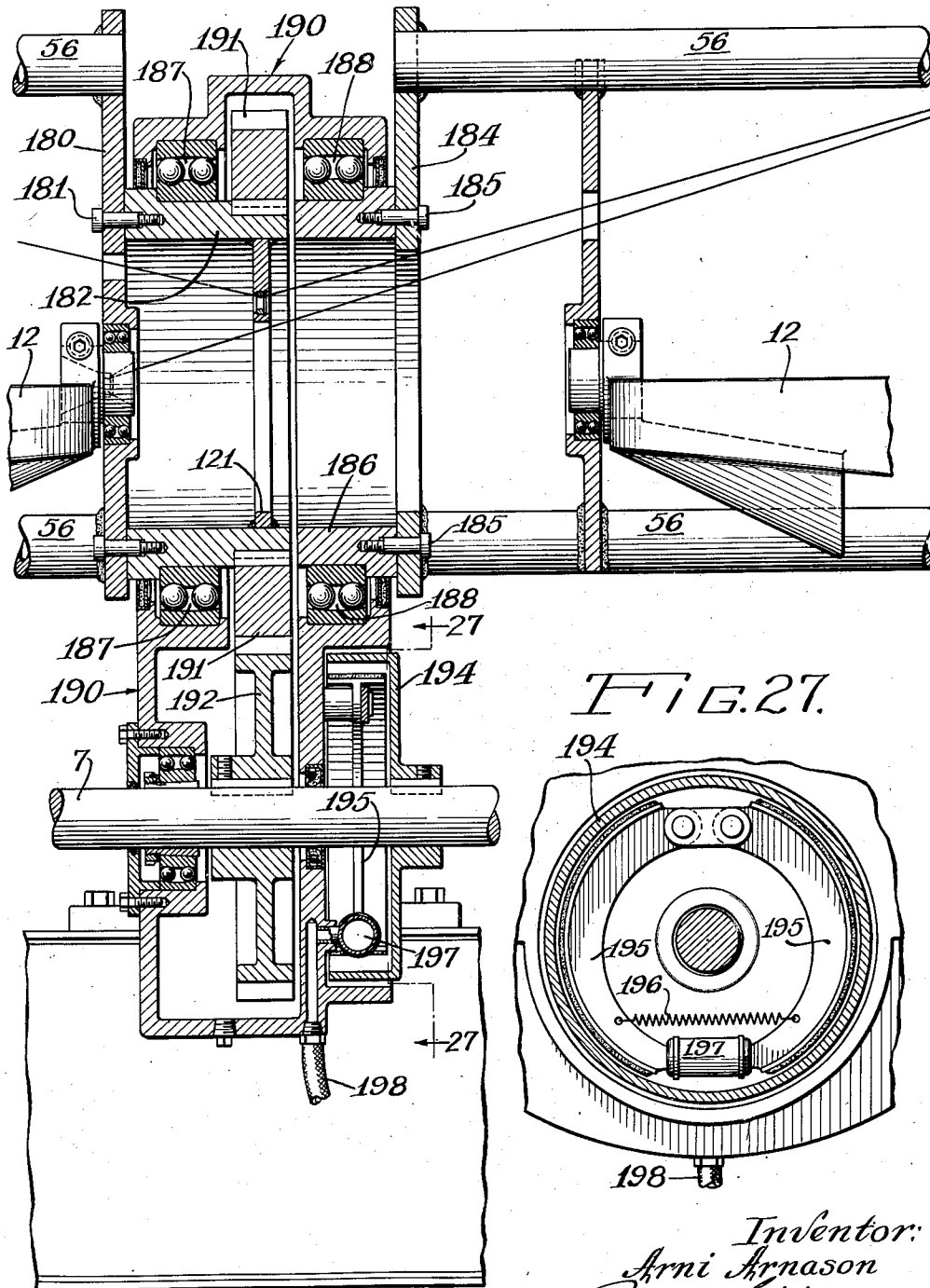
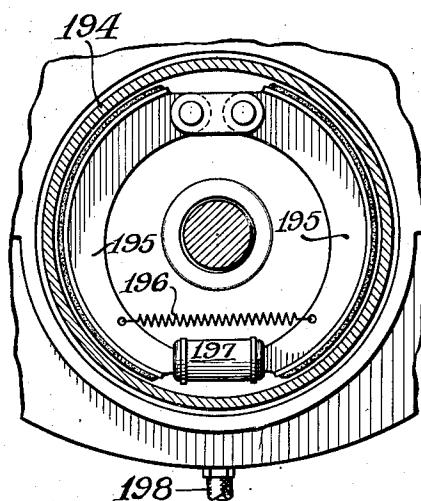


FIG. 27.



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FIG. 29.

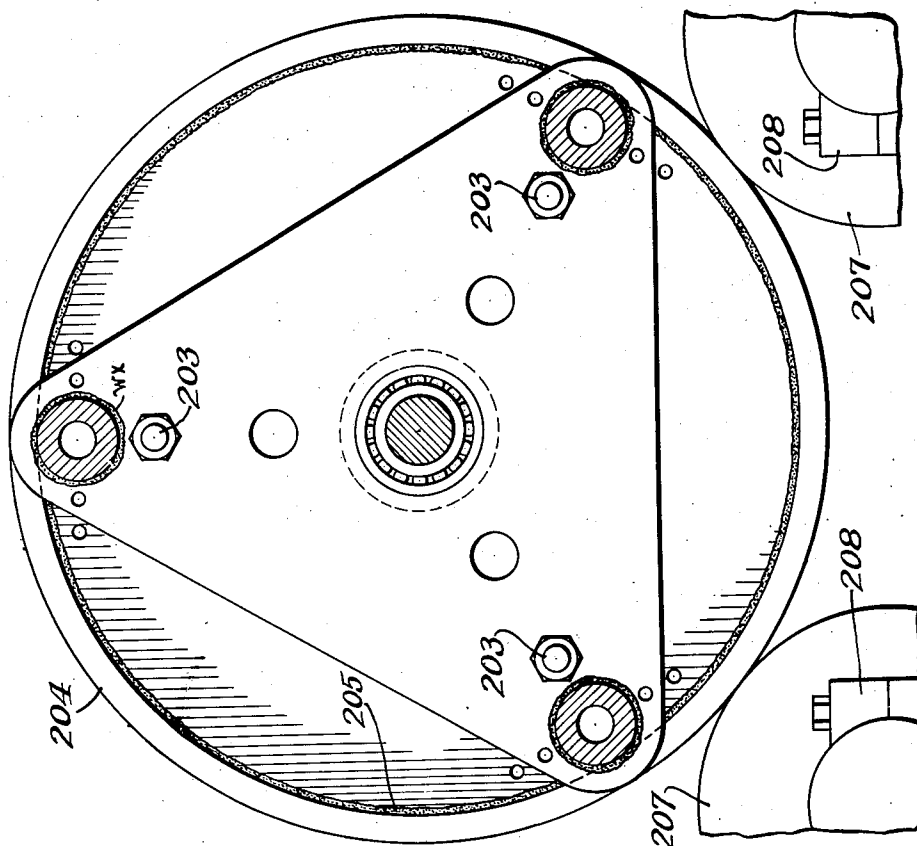
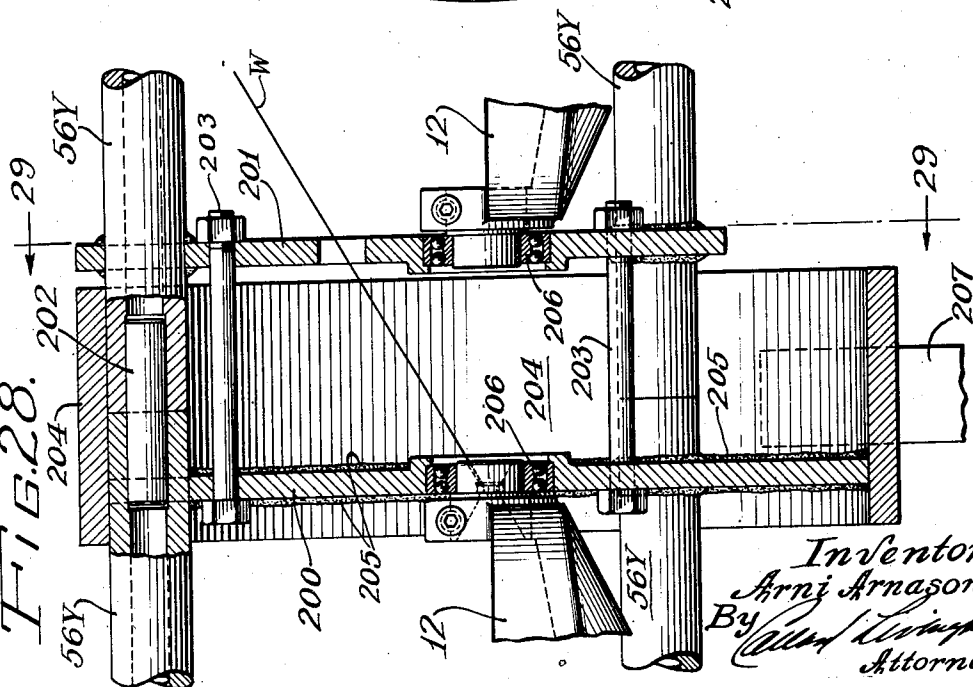


FIG. 28.



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## UNITED STATES PATENT OFFICE

2,485,348

## WIRE ROPE MACHINE

Arni Arnason, Winnetka, Ill.

Application November 26, 1947, Serial No. 788,147

19 Claims. (Cl. 57—59)

1

This invention pertains to improvements in wire-rope making machinery and has for its principal object the provision of a high-speed stranding and closing machine for wire rope and analogously stranded filamentary products.

The machine disclosed herein is of the multi-strand, multi-bobbin variety employing a rotating head and carrier of improved construction and which is cheaper to manufacture, operate, and maintain than prior types.

Among the principal objects and aspects of novelty in the machine are:

The provision of an improved carrier construction employing spider plates, tubes, and intermediates;

The provision of single and dual bobbin sections in unit assemblies with intermediate drive and coupling affording an over-all unitary carrier and head structure of great rigidity and capable of high-speed, smooth, stranding and closing operation;

The provision of an improved bobbin cradling, loading, and lead-off arrangement with improved lead-off angle and easy threading;

The provision of efficient and uniform section braking with single-ended drive, common take-off drive for the intermediates and the haul-off.

Additional objects and aspects of utility and novelty reside in details of the construction and operation of the embodiment hereinafter particularly described and explained in view of the accompanying drawings in which:

Figs. 1 and 1a are complementary top plan views of the machine, Fig. 1 showing the left or drive end, and Fig. 1a showing the right-hand or haul-off end;

Figs. 2 and 2a are complementary side elevational views of the machine similar to Figs. 1 and 1a;

Fig. 3 is an enlarged elevational fragment at the drive end of the machine showing one bobbin section and with parts shown in section;

Fig. 4 is an enlarged elevational fragment at the haul-off end of the machine with parts broken away to show the reversing gear;

Fig. 5 is a top plan view, to enlarged scale, of the closing head and haul-off;

Fig. 6 is a horizontal section through the reverse drive along lines 6—6 of Fig. 4;

Fig. 7 is a vertical sectional detail through the reverse drive and taken along lines 7—7 of Fig. 4;

Fig. 8 is a vertical sectional detail, to enlarged scale, through one of the intermediates between bobbin sections;

Fig. 9 is a transverse vertical sectional detail through one of the intermediates, taken to en-

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larged scale in the direction of lines 9—9 of Fig. 8, showing a carrier brake;

Fig. 10 is another transverse vertical section through a bobbin unit as viewed in the direction of lines 10—10 of Fig. 3 and with the bobbin shown in elevation;

Fig. 11 is a perspective detail of one of the spider-frame assemblies of the carrier or head structure;

Fig. 12 is an enlarged sectional detail of a terminal spider plate as taken in the direction of lines 12—12 of Fig. 11;

Fig. 13 is an enlarged sectional detail of an intermediate spider plate looking in the direction of lines 13—13 of Fig. 11;

Fig. 14 is a top plan view, to enlarged scale, of a bobbin with its cradle and tensor;

Fig. 15 is a side elevation of the cradle of Fig. 14 and the bobbin, tensor, and lock;

Fig. 16 is a vertical sectional detail along lines 16—16 of Fig. 15, showing the wire lead-off pushing and mounting trunnion of the bobbin cradle;

Fig. 17 is an enlarged side-elevational detail of one of the bobbin locks;

Fig. 18 is a horizontal sectional detail through the bobbin lock along lines 18—18 of Fig. 17;

Fig. 19 is a vertical sectional detail through the bobbin lock taken in the direction of lines 19—19 of Fig. 18;

Fig. 20 is a perspective fragment of one of the cradle bobbin mounts and lock;

Fig. 21 is a rear or inside elevational view of the companion socket or mount to Fig. 20;

Fig. 22 is a perspective fragment of one of the bobbin spindles;

Fig. 23 is a vertical sectional detail through a modified form of intermediate showing countershaft drive and brake;

Fig. 24 is a transverse vertical sectional detail looking into the countershaft brake on lines 24—24 of Fig. 23;

Fig. 25 is a transverse vertical sectional detail along lines 25—25 of Fig. 23 showing the carrier drive gears therefor;

Fig. 26 is a vertical sectional detail through a modified form of intermediate in which each section is individually driven from the countershaft by a gear at the front thereof, the view in other respects being similar to that of Fig. 23;

Fig. 27 is a vertical sectional detail of the brake means for the intermediate of Fig. 26 and taken in the direction of lines 27—27 thereof;

Fig. 28 is a vertical sectional detail through a modified form of intermediate which omits individual drive and adapts the new carrier struc-

ture to mounting on the old roller frames of prior machines;

Fig. 29 is a transverse section of one of the spider-roller assemblies looking in the direction of lines 29—29 of Fig. 28.

A short introductory statement of operation will be found hereinafter.

#### *Introductory statement of operation*

Referring to Figs. 1, 1a and 2, 2a, showing the entire machine from the top and side, respectively, the mechanism is mounted upon a bed structure consisting of parallel beams 1 and 2 tied by cross members 3 and intermediate plates 4.

At the left-hand end of the machine is the power plant or motor 5, the end-drive gear unit 6, and driven end of the countershaft 7 (see also Fig. 3); at the right-hand end of the machine is the closing head and haul-off unit 8.

Extending the length of the machine between the gear unit 6 and the haul-off or capstan unit 8 is a rotatable carrier indicated generally at 9 and consisting of a plurality of sections 10 each provided with a wire bobbin 11.

In the embodiment of Figs. 1, 1a, 2, 2a and 3, the entire carrier and all of its bobbin sections is rotated as a unit through a single-ended drive in gear unit 6; however, the bobbins are seated in cradles 12 trunnioned coaxially of the rotation axis of the carrier and are loaded for inertia so as to stand still as the carrier rotates thereabout.

The rope wires are led off from each bobbin through guides inside the carrier and finally emerge at the right-hand end of the machine to enter the closing die 13, which, cooperatively with the haul-off capstan, lays the wires spirally to form up the rope without introducing any torque or twist into any of the strands, so that the resulting rope is dead and will run and coil without springing or twisting.

In the embodiment of Figs. 1 and 2, the drive is single-ended, the carrier sections are rigidly interconnected, and the braking is effected between sections on the carrier itself.

In modified embodiments hereinafter described, the carrier sections may be rigidly interconnected with individual section drive and countershaft braking, or the sections may be impositively coupled through a countershaft drive with countershaft braking.

#### *Prior stranding and closing machines*

Three general types of stranding and closing machine are recognized in the art; included is the so-called planetary type which is characterized by the fact that the bobbins are not set coaxially of the rotative axis of the carrier, but are cradled around the peripheral part of the carrier on axes which are parallel to each other and to the axis of the carrier; this means that there are several bobbins, usually between four and eight, to each carrier section. This type of machine is slow, cumbersome, expensive to make and maintain, and relatively difficult to thread; the speed limitations of this type of strander or closer are well-known.

Another prior type of machine is the so-called snake having an elongated carrier somewhat similar in appearance to the carrier of Fig. 1-1a, and characterized by the fact that the sections are held together by a form of peripheral tie-rods and the bearing support is usually afforded by peripherally-engaged rollers. This form of prior machine and its various embodiments is

characterized by marked susceptibility to torque dislocation when run at any speed above a slow minimum, which, if exceeded, causes the intermediate sections to weave and warp in a sinuous fashion (hence the name snake) which is absolutely destructive of the machine and produces an inferior rope product.

A third and more popular type of machine is the tube variety, which employs an especially constructed, elongated pipe having a plurality of window-like cutouts arranged symmetrically about its periphery and length affording access to bobbins interiorly thereof and lightening the mass thereof in an essential way, said cutouts constituting probably one-quarter to one-third of the surface area of the tube or tubes, it being necessary in high-capacity (multi-strand) machines to have several tubes because it is impossible as a practical and economical matter to make dynamically balanced, true-running, tubes beyond a certain length if the machines are to be run at any usefully high speed.

The said tube type of machine is capable of higher operating speeds than either of the other two prior types; but it is subject to the objection of extremely high manufacturing cost because the section tubes are individually tailored, trued, and balanced, and involve much hand-machining; the costs in a high-capacity, 19 bobbin machine of that class are very great as compared with the cost of a machine according to the present disclosures.

#### *Detailed description, single-ended drive*

Referring to Fig. 3, motor 5 connects through coupling 20 with a stud shaft 21 seated in ball bearings 22 in housing 23 at the left-hand end of the machine. A driving pinion 24 on the stud shaft, meshing with counter pinion 25 on stud shaft 7a, supported in ball bearings 26, drives the countershaft 7 through coupling 27. The countershaft extends the length of the machine and is journaled in ball bearings 28 in the intermediate plates 4 (Figs. 2a, 3, and 8) and in the right-hand end-plate housing 3; and from the latter, it emerges for connection by coupling 29 with stud shaft 30 of the reverse and haul-off drive, as in Figs. 2a, 4, and 6, particularly.

As in Figs. 4 and 6, the reverse gear is disposed in a housing 31 in the closing and haul-off unit, the stud shaft 30 being journaled in bearings 32 therein and having keyed slidably thereon a clutch pinion 33 which may be slid back and forth on this shaft responsive to swinging of a yoke lever 34 on cross shaft 35 connecting exteriorly of the housing to hand operating lever 36 (see also Fig. 7). A spring detent 37 on said operating lever holds the same in forward and reverse positions.

With the clutch yoke 34 shifted to the right, Fig. 4 or 6, the clutch pinion engages with gear 38 to drive gear 39 on the reverse countershaft 40 in a first direction. With the yoke shifted to the left (not shown), the clutch pinion 33 would drivingly engage sprocket 41 floating on stud shaft 30, thereby driving sprocket 42 in the same direction through chain 43 (see dotted line showings, Fig. 7), to drive the reverse countershaft in a second direction.

The reverse countershaft 40, Fig. 4, drives, through coupling 44 a conventional reduction gear unit 45 whose ratios may be selected by wheel 46, and this gear unit in turn, through coupling 47, drives the capstan, which is also of conventional construction, and which is provided with the

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usual flanged take-up sheave or drum 50. The take-up drive ratios, as indicated by indicator 49, determine the length of the lay of the strands as they pass through die 13, the latter, it being noted, being adjustable by hand wheel 51 (Figs. 4 and 5) toward and away from the outfeed end of the machine for selection of suitable lead angles for different lays.

#### Carrier structure

In Fig. 11 there is shown a dual section carrier frame consisting of a pair of terminal spider plates 54 and 55 of triangular shape and provided with cornerwise openings to receive the ends of connecting frames or pipes 56 which are welded for rigid attachment to their respective spider plates and which are disposed relative to each other in triangular array for the length of the carrier section.

A pair of median spider plates 57 and 58, also of triangular shape, is situated between said terminal plates and in spaced relation to each other for reasons to appear; at their corners, these median spiders are notched or cut-away to closely fit into the spanner frames or pipes 56, and are welded to the latter at these points for further rigidification of the carrier structure. The welding WX of the terminal spiders and frames is detailed in Fig. 12, while that of the intermediate or median spiders is detailed in Fig. 13. In the dual-section carrier unit shown in Fig. 11, there is provided a third intermediate spider 60 weldably secured to the frame pipes, for purposes to appear.

The carrier section shown in Fig. 3 is a single-bobbin section, and differs from the construction of Fig. 11 only in that it has terminal spider plates 54A and 55A and one intermediate cradle spider 60A. Cradle bearings 61 are fitted into bores 62 (see Fig. 11) in the cradle supporting spider plates; the terminal spider 54A in Fig. 3 is bolted to a drive flange 63 on counter drive shaft 64, and the latter is journaled mainly in roller bearing 65 in housing 6 at the drive end of the machine. Said counter drive shaft 64 is driven through pinion 66 from drive pinion 24; thus, motor 5 drives the first, single-bobbin carrier section, the latter being journaled at its opposite, right-hand end, in bearing means housed in the intermediate plate structure 4 of Fig. 3 in a type of construction now described in view of Fig. 8.

In the enlarged view of Fig. 8, the terminal spider plate 55A is bolted as at 67 to the end of a collar 68 which is substantially concentric of the bores 62 in the spiders, and the opposite end of this collar is bolted as at 69 to the terminal plate 54B of the next following carrier section, said collar 68 being journaled in a ball bearing unit 70 seated in the intermediate plate structure 4, the latter having a separable bearing-retainer 4A, Fig. 3 or 9, bolted to the main plate portion 4 by bolts 4B.

In the single-ended drive embodiment presently being described, and as depicted in Figs. 1-1a, 2-2a, all of the carrier sections are rigidly interconnected as by collar means 68 according to the construction of Fig. 8, the last, right-hand terminal spider plate 55X (Figs. 4 and 5) terminating in a collar 68X journaled in bearing means identical to the means 70 of Fig. 8 but retained by separable housing section 3A bolted home as at 3B, Fig. 4.

As shown in Fig. 4, the terminal, right-hand, collar 68X is closed by an annular plate 72 having a bore 73 from which projects a short spindle 74

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provided with a flanged lead-off disc 75; the closure plate 72 is provided with openings (not seen) through which the wires W are lead over the lead-off disc into the die 13.

#### Cradle and bobbin structure

Referring to the enlarged views of Figs. 14 to 16, the cradles 12 are castings of somewhat elongated form having a central opening 80 for the bobbin reel 11 and tapering at opposite ends at which the casting is bored, as at 81 to receive trunnion and lead-off bushings 82, the cradle being split as at 83 at these points and provided with clamping bolts 84 for securing said bushings. The forward or right-hand bushing in each cradle is provided with a conical bore 85 for leading out the wire, as in Fig. 8, wherein the mounting of the trunnion bushings 82 in bearings 61 in the spider plates is also illustrated.

The cradle castings, in the regions adjoining the tapered ends thereof, are provided with integrally weighted portions (Figs. 14, 15) or inertia masses 86 disposed below the rocking axis of the cradle through the bushings 82, by reason of which the cradles remain in stationary, upright position, or nearly so, as in Fig. 2a, during rotation of the carriers, there being actually a slight pitch or lean to the cradles during such rotation.

The bobbins or reels 11 are provided with sheaves 87, Figs. 14 and 15, at one side and in which are received traction bands 88 looped as at 89 on yieldable hooks 90 in bosses 91 on the cradle castings, spring and nut means 92 affording adjustment of the tension on the bands to prevent the reels from unwinding too freely as the wire feeds out.

#### Bobbin reel mounting

As in Figs. 10 and 14, each reel 11 is removably journaled in its cradle on a special reel spindle 95 which, as viewed in Figs. 17 through 22, is provided adjacent its ends with reduced portions 96 having keying flats 97 dimensioned to fit into keying slots 98 formed in bosses 99 and 99X in the cradle castings 12, it being necessary to rotate said spindles 90° from the normally locked position illustrated in Fig. 22, so that the keying flats 97 are in vertical planes, in order to drop the spindles home in said bosses.

The boss 99 of Fig. 21 corresponds to that appearing on the right of Fig. 10, while the boss 99X is the locking boss on the opposite side of the cradle of Fig. 10, the construction of which is detailed in the perspective of Fig. 20, wherein appears a locking lever or detent 100 pivoted at 101 on the boss and normally urged by spring 102 against stop pin 103 to project locking lug 104 into the periphery of the spindle bore 105. When the spindle is dropped home into bores 105, the operator turns it a quarter-turn by manipulation of pin handle 106, so that the locking lug 104 drops automatically into one of the keyways 107 cut into opposite sides of the spindle, whereby the latter is locked in position, since the flats 97 are thereby turned out of register with the key slots 98. This construction permits quick and easy loading and unloading of the bobbins while at the same time holding them securely in their cradles. The locked condition of the detent and spindle flats is detailed in Figs. 17, 18, and 19.

#### Brakes for single-ended drive

In Figs. 1-1a, 2-2a, and 3, the brakes are indicated at Br between adjoining carrier sections 10,

the construction of these brakes appearing more particularly in Fig. 9, wherein there are provided, for each brake, pairs of brake bands 110 pivoted at 111.

Each said brake band is fitted with a lining or facing 112 which is engageable with the periphery of the corresponding carrier-section-connecting collar 68, the respective free ends of these bands being pivotally connected as at 113 to lug 114 on hydraulic cylinder 115, and to piston plunger lug 116; such that when pressure is applied to the hydraulic unit via tube 117, the ends of the brake bands at 113 are drawn together causing the same to grab the collar 68 and restrain the carriers. The relative positioning of these brakes appears to advantage in Fig. 8. It is understood that the braking system provides for connection of the several hydraulic pressure lines 117 to a common control head (not shown) in order that the braking pressures may be simultaneously applied to all carrier brakes for the several sections.

#### *Summary of operation, single-ended drive*

Bobbins of wire are loaded into the cradles by manipulation of the special reel spindles heretofore described; with a spindle 95 (Figs. 14 and 15) inserted in the reel, the handle 106 is turned into a vertical plane and the spindle dropped home in its cradle seat, whereupon the handle 106 is turned into a horizontal plane so that the detent 100 locks it in that condition.

The traction bands 88 for each bobbin are applied and suitably adjusted. With the bobbins loaded, threading may be started from the bobbin nearest the motor or drive end of the machine, the wire W being led from the reel through the corresponding lead-off bushing 82 and the eye or bore 85 therein toward the right-hand end of the machine as illustrated in Fig. 3.

As in Fig. 8, the wire W from a preceding bobbin and lead-off bushing will pass through the central opening 120 in a guide flange 121 welded in the interior of each coupling collar 68, as seen also in Fig. 9, then as indicated at W<sup>1</sup> in Fig. 8, this wire will pass upwardly toward the right through an arcuate eye 60X (see also Fig. 11) in spider plate 60 of the succeeding carrier section, and thence this wire W<sup>1</sup> will continue upwardly along the uppermost carrier frame pipe 53 and through a guide eye like the eye 122 at the left-hand extremity of Fig. 8 so that said wire may pass over the next bobbin in the manner of the wire W<sup>2</sup> at the left of Fig. 8 and continue on into the next carrier section toward the end of the machine.

Wires, like the wire W<sup>2</sup>, from preceding carrier sections, pass through arcuate slots or eyes 55X (see also Fig. 11) in the last or terminal spider plates of each preceding section, thence through one of the lead eyes 123 (Figs. 8 and 9) in the guide flanges 121 to pass upwardly through the central opening 54X in the first spider plate of the succeeding section, thence through a frame eye 122 over the next bobbin, thence down through the next spider plate slot, up again over the next bobbin, and so on until the wire emerges from the end of the machine past the lead-off disc 75 to enter the die 13.

In the embodiment shown in Figs. 2-2a, there are seven bobbins; accordingly, there will be seven wires entering the die 13. When the machine is loaded and threaded as aforesaid, and various adjustments made as to lay and lead, involving, among other things, selection of the proper out-

haul speed by setting of handwheel 46 on the reduction gear unit, and the proper setting of the reverse control lever 36, motor 5 is started in the correspondingly correct direction, and the entire carrier assembly is rotated about an axis through the drive and lead-off spindles, 64-74, Figs. 2-2a.

As the capstan drum 50 hauls off the rope WR (Figs. 2-2a, 4, 5) the wires W are laid spirally by the die 13, right or left-hand, depending upon the rotation of the machine, and with a spiral lead depending upon the speed of outhaul. The machine is slowed and stopped with the aid of the brake means Br (Figs. 3 and 9) by application of hydraulic pressure to cylinders 115.

#### *Intermediate drive*

A modification of the rigidly interconnected or coupled carrier-section structure, exemplified in the preceding description, is found in Fig. 23, wherein the sections 10 and cradle structures 12 are the same as heretofore described, and particularly in the respect that each carrier section is rigidly connected to the next by means of a coupling collar 150 bolted as at 151 to the adjoining terminal spiders 152 and 153 and journaled in the intermediate as by ball bearing 154.

However, in this type of intermediate drive, the collar 150 is fitted with a ring gear 155 meshing with a driving pinion 156 fast on countershaft 7, and preferably there is one such intermediate between each pair of carrier sections—that is, a common countershaft drive at the intermediate stations.

Means for braking the intermediate drive type of construction includes a brake drum 157 fast on the countershaft 7, together with a pair of expanding brake arms 158 (Fig. 24) pivoted as at 159 on the intermediate casting 160, these brake arms being normalized or drawn together by spring means 161, and expanded for braking action by connection at their respective free ends 162 with an hydraulic unit 163 of known construction. The hydraulic pressure is controlled through fluid inlet 164 at the bottom of the casing or intermediate housing 160, in which there is formed a passage 165 leading into the cylinder of 163. Upon application of pressure to line 164, the arms 158 are expanded to urge brake liners 166, Fig. 24, against the inner periphery of the drum 157, it being understood, as in the previous embodiment, that all brake pressure lines 164 are connected preferably to a common hydraulic control head, not shown.

In other respects, the operation, loading, threading, and control of the intermediate drive type of machine is the same as that previously described. This construction is especially contrived for very large machines of the nineteen to twenty-five bobbin class utilizing the rigidly interconnected or coupled carrier sections of the type specified.

As shown in Fig. 25, the intermediate casing or housing 160 has a removable head 160X secured by bolts 160Y, and encloses the ring gear 155, pinion 156 and coupling collar 150 in a sealed condition, oil seals 167 being provided, and the housing having oil filler and drain plugs 168, 169, Figs. 23 and 25.

#### *Intermediate individual carrier drive*

For very high speed, multi-bobbin machines, the construction of Fig. 26 is desirable, according to which each carrier section is journaled in the intermediate but is not rigidly coupled to the ad-

joining section. In this embodiment, the construction of the carriers and cradles is identical to that previously described, but the terminal spider plate 180 of one section is bolted as at 181 to one half of a split collar 182, the latter containing the guide flange 121, while the first terminal plate 184 of the next section is bolted as at 185 to the other half 186 of the split coupling collar.

Each collar section is journaled in ball bearing means 187, 188, respectively, seated in an intermediate housing 190 similar to the casing 160 for rigidly coupled intermediate drive.

On the terminal (spider plate) collar 187 of each section is fixed a ring gear 191 meshing with a driving pinion 192 fast on countershaft 7; thus, at each intermediate (after the first) each carrier section is individually driven by a gear connection with the countershaft, and, as in the case of the rigidly coupled intermediate drive, the braking is applied to the countershaft by the identical means shown in Figs. 23 and 24, including a brake drum 194 (Figs. 26 and 27) fast on the countershaft, and a pair of expanding brake arms 195, actuated by spring and hydraulic means 196—197 under control of pressure from control line 198. According to this construction, practically unlimited numbers of carriers may be driven in a very long machine at high speeds with favorable driving and braking torques and with stable, workable alignment of the sections from one end of the machine to the other, using the basic carrier structure of the smaller machine of Figs. 1-1a.

#### *Roller bed carrier mounting*

The basic carrier structure heretofore described is also adaptable to the old style roller mounting used in low-speed forming machines of relatively few bobbin capacity, such machines, where they are otherwise properly constructed, being cheap and usable where they are run at slow speed and not too long.

In this adaptation construction, carrier frame pipes 56Y (Fig. 28) are passed through their respective terminal spider plates 200 and 201 so as to project therebeyond, the ends of the pipes from each section confronting each other and being aligned by pins 202, Fig. 28, and in addition, said plates are interconnected by bolt means 203.

The terminal plate 200, however, is not triangular, but circular, and is fitted within a roller ring 204 and welded thereto as at 205. Both terminal plates carry bearings 206 mounting their respective trunnion and lead-off bushings for cradles 12 of the construction heretofore described.

As in Fig. 29, the rollers 204 rest on journal rollers 207 in turn journaled as at 208 in a conventional machine bed or frame (not shown), the weight of the carriers, cradles, and bobbins holding the sections down on said journal rollers at low speeds.

I claim:

1. In wire rope machines, carriers comprising a plurality of triangular plates aligned in parallel planes, elongated frame members extended in parallelism in engagement with the corners of said plates and rigidly secured thereto, wire guiding slots in certain of said plates, and aligned bearing seats situated centrally of certain of said plates.

2. In a wire rope machine, carriers comprising triangular terminal plates aligned in parallel planes, elongated frame pieces extending in parallelism between said plates at the corners there-

of and welded rigidly thereto, said carriers aligned in seriatim and rigidly coupled by collar means secured to confronting terminal plates of adjoining carriers, intermediates journaling said collars, means drivingly coupled to a first carrier for rotating the same and the series of carriers, and at least one wire bobbin trunnioned in each carrier, together with wire lead-off means leading the wires from each bobbin through succeeding collar means for engagement with a forming apparatus.

3. In a wire rope machine, a carrier structure comprising three elongated frame members extending in parallelism and in triangular array, a triangular terminal spider plate at each end of said array with corresponding end portions of each frame member engaged in a corresponding corner portion of the corresponding plate and rigidly secured thereto, at least one triangular intermediate spider plate secured identically to said frame members between and in parallelism with said terminal plates, central bores in said plates, and a wire bobbin cradle trunnioned in bearing means in the bores of one of said terminal plates and said intermediate plate.

4. A wire rope machine including bobbin carriers in linear alignment, collar means rigidly interconnecting said carriers for joint rotation as a unit about an axis coincident with the axis of alignment thereof, power drive means including a countershaft extending parallel with said axis from a first to a last carrier, at least, a ring gear on each collar meshing with a driving pinion therefor on said countershaft providing intermediate carrier drive, and brake means coacting with said countershaft at a plurality of said intermediate drives.

5. In a wire rope machine, bobbin carriers in linear alignment, collar means rigidly interconnecting said carriers for joint rotation about the axis of alignment thereof, a countershaft common to all carriers, means for driving said countershaft, intermediate supports between said carriers and each including annular bearing means circumambiently supporting the corresponding collar means, a driving gear on said countershaft for each said collar means, a driven gear on each collar means coacting with a corresponding driving gear aforesaid, and means for leading wire from each carrier along paths through said collar means in a direction from a first carrier past a last carrier.

6. In a wire rope machine, bobbin carriers in linear coaxial alignment for rotation as a unit about a common axis, intermediate supports between succeeding carriers, confronting pairs of coaxially aligned collars between succeeding carriers and each collar rigidly attached to one of said succeeding carriers, annular bearing means circumambiently supporting each collar at each said support, a ring gear on one collar of each said pair, a countershaft common to all carriers, driving pinions on said countershaft for each said ring gear, and brake means for said countershaft, together with means for driving said countershaft.

7. The invention of claim 6 further characterized by the provision of annular bearing means circumambiently supporting said countershaft in each said intermediate support.

8. The invention of claim 6 further characterized in that said brake means includes a brake drum on said countershaft at one of said intermediate supports, at least, and braking means

mounted on the corresponding support coacting in braking action with said drum.

9. In a wire rope machine, bobbin carriers arranged coaxially in series for joint rotation, intermediates between succeeding carriers mounting the same for rotation individually, a countershaft common to all carriers and means for driving the same, and drive means in each said intermediate and drivingly connected with said carriers for jointly rotating the same from said countershaft.

10. In a wire rope machine of the class having a series of coaxially aligned and rotatable bobbin carriers, improvements comprising an intermediate between each adjoining carrier and bearing means thereat supporting said carriers for rotation, journal means at the endmost extremities of the endwise carriers rotatably supporting the same cooperatively with corresponding intermediates, a countershaft common to all said carriers and means for driving the same, gear means in each said intermediate drivingly interconnecting said carriers with said countershaft for joint rotation by the latter, and brake means at each intermediate for arresting said rotation.

11. In a wire rope machine of the class having a series of coaxially rotatable bobbin carriers, improvements comprising, namely: intermediates between adjoining carriers and endwise journals for the endmost carrier extremities all mounting said carriers for individual rotation about a common longitudinal axis, a countershaft common to all said carriers and extending in parallelism with said axis, means for driving said countershaft, and gear means in each said intermediate drivingly interconnecting said countershaft with each said carrier for individually driving the same.

12. Improvements as set forth in claim 11 and further characterized by the provision of brake means at each said intermediate for arresting said carrier rotation.

13. Improvements as defined in claim 11 and further characterized by the provision of brake means at each said intermediate for braking said countershaft.

14. In a wire rope machine a plurality of carriers assembled in linear alignment, bobbin means in each carrier, collar means rigidly interconnecting said carriers for rotation in unison about an axis concentric of the collars through the linear extent of said assembly of carriers, intermediates between succeeding carriers to support the carriers at the collars, bearing means in the intermediates supportably engaging said collars, a power drive coupled with an endmost carrier, at least, a countershaft extending from said power drive along said assembly, a ring gear on each said collar meshing with corresponding driving pinion means on said countershaft.

15. In a wire rope machine, a plurality of bobbin carriers assembled in an axially linear alignment, split collar means drivingly intercon-

necting adjoining carriers for rotation in unison, intermediate bearing means rotatably supporting the collar means between adjoining carriers, bearing means rotatably supporting the axially terminal ends of the first and last carriers, means driving a first carrier, and an axially extensive counterdrive means common to all carriers, means at each intermediate providing driving connection between said counterdrive means and at least one section of said split collar means for each said carrier.

16. The machine as defined in claim 14 and further characterized by the provision of brake means in each said intermediate and coacting with means on said countershaft for braking the latter.

17. The machine as defined in claim 15 in which said driving connection means between said countershaft means and split collar means comprises a ring gear on the said split collar means as set forth, and coacting pinion means on said counter-drive means.

18. In a wire rope machine, a plurality of independent wire feeding and carrier units, means mounting said carrier units serially for rotation about a common axis, a source of driving power, power transmission means common to all said carrier units and drivingly connected with said power source, and means drivingly interconnecting each said carrier unit with said transmission means for joint rotation by positive drive from the latter means.

19. Mechanism as set forth in claim 18 and further characterized by the provision of brake means disposed at a plurality of points along said axis for applying a braking effort at said points to retard or arrest rotative motion of said carrier units.

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