

June 1, 1943.

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2,320,554

HYDRAULIC SPOILING DEVICE

Filed Jan. 26, 1942

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

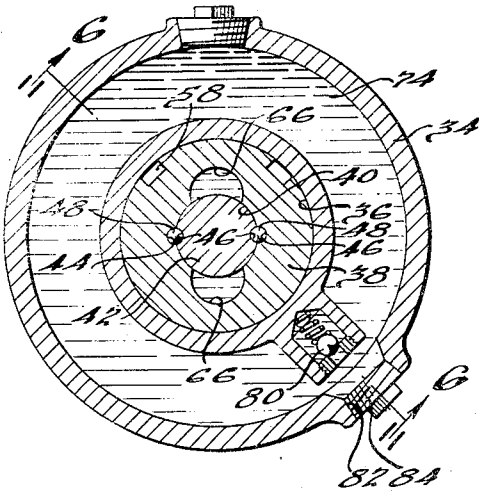


FIG. 4.

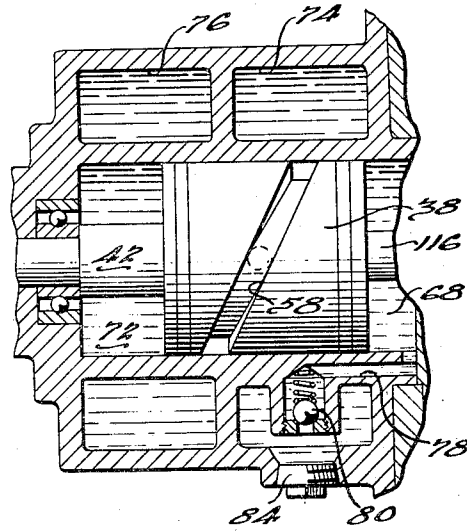


FIG. 5.

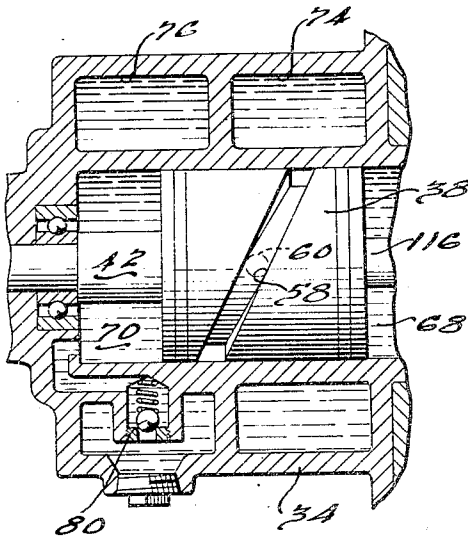


FIG. 6.

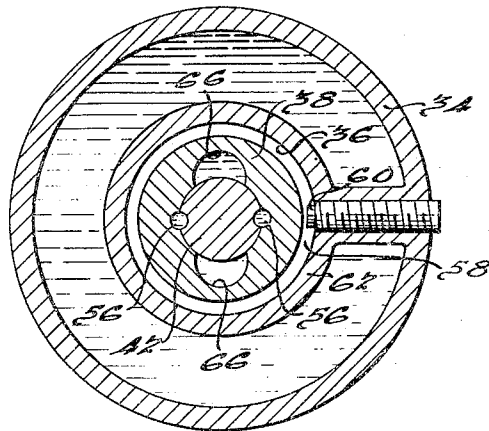


FIG. 7.

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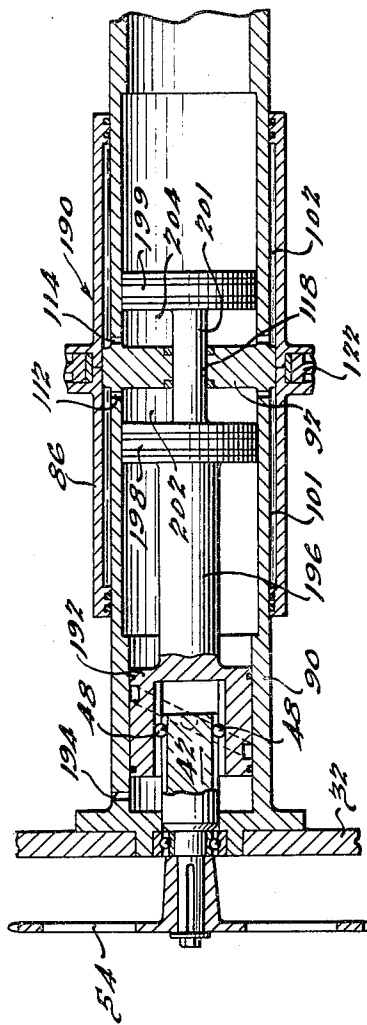
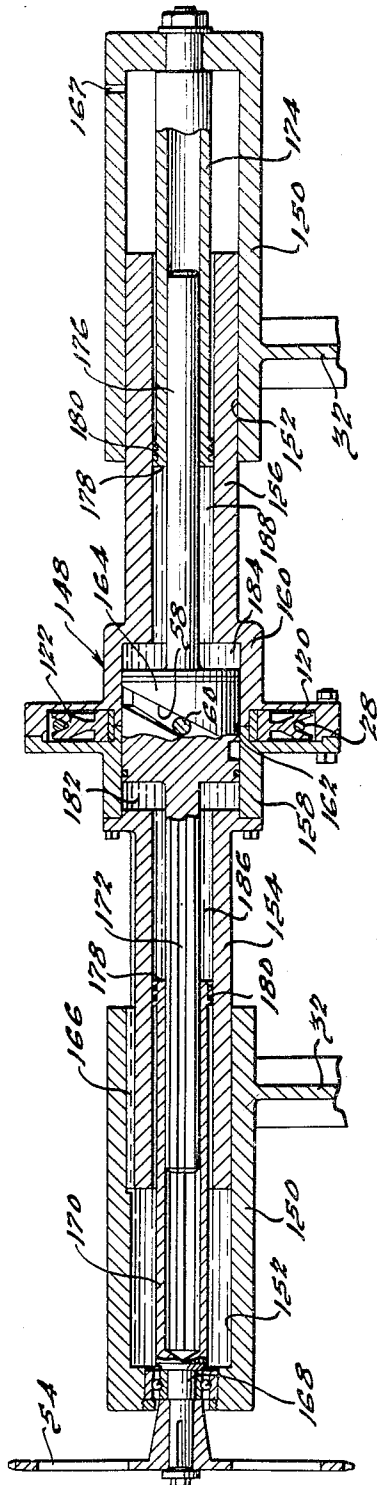
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3 Sheets-Sheet 3



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2,320,554

HYDRAULIC SPOOLING DEVICE

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Application January 26, 1942, Serial No. 428,155

14 Claims. (Cl. 242—158)

The present invention relates to improvements in hydraulic actuating devices, and particularly to such devices employed in the spooling of cable, or the like.

One of the primary objects of the present invention is to provide simplified hydraulic actuating devices which are economical to construct and install.

Another object of the invention is to provide improved devices of the type mentioned which are positive in their action.

Another object of the invention is to provide improvements in hydraulically actuating spooling devices, or level winders, for guiding a cable as it is wound on a spool, or drum, of a power driven winch in synchronism with the speed of such spool, or drum.

Another object of the invention is to provide improvements in devices of the type mentioned so that such devices are compact and occupy relatively little room on the winches on which they are employed.

Another object of the invention is to provide improvements in spooling devices for power driven winches which are positive in their action even when there is a relatively heavy line pull on the cable.

Other objects of the invention will become apparent from the following specification, the drawings relating thereto, and from the claims hereinafter set forth.

In the drawings, in which like numerals are used to designate like parts in the several views throughout:

Figure 1 is a top plan view of a power driven winch having a spooling device, or level winder, according to the present invention associated therewith;

Fig. 2 is an enlarged, fragmentary cross-sectional view taken substantially along the line 2—2 of Figure 1;

Fig. 3 is a cross-sectional view taken substantially along the line 3—3 of Figure 2;

Fig. 4 is an enlarged cross-sectional view taken substantially along the line 4—4 of Figure 2;

Fig. 5 is a cross-sectional view taken substantially along the line 5—5 of Figure 3;

Fig. 6 is a cross-sectional view taken substantially along the line 6—6 of Figure 4;

Fig. 7 is an enlarged cross-sectional view taken substantially along the line 7—7 of Figure 2;

Fig. 8 is a view similar to Figure 2, and showing a modified form of the present invention; and

Fig. 9 is a fragmentary view similar to Figure

2, and illustrating another modified form of the present invention.

Referring to the drawings, and referring particularly to Figures 1 through 7 thereof, in which one embodiment of the present invention is illustrated, a power winch is generally indicated at 10 comprising a standard 12 having a spool or drum 14 keyed to shaft 16 for rotation therewith. The ends of such shaft 16 are disposed in suitable bearings on the standard 12.

Such shaft 16 is driven to drive the spool 14 through suitable means, such as a suitable motor 18 which is operatively connected through a gear reduction mechanism 20 with a driving sprocket 22. Such sprocket 22 is connected to another sprocket 24, which is keyed to the shaft 16, through a chain 26.

A cable 28 is adapted to be wound onto the spool 14 or unwound therefrom, and level winder or spooling means generally indicated at 30 are provided for guiding the cable 28 as it traverses the space between the ends of the spool 14.

It is pointed out that the term "cable" as here used and as used in the claims is intended to be generic, and includes stranded cable, single wire, rope, and the like.

The level winder 30 is mounted upon a pair of standards 32 disposed adjacent the standards 12 and in such a position that the guide for the cable 28 reciprocates in a path substantially parallel to the axis of the shaft 16 and between the ends of the spool 14. A casing 34 is fixedly connected to one of the standards 32 and includes a central bore 36. A piston or plunger 38 is disposed within the bore 36 in engagement with the wall thereof, and is adapted to rotate and reciprocate therein.

In order to effect such rotation and reciprocation of the piston 38 within the bore 36 of the casing 34, such piston 38 is formed with an axial recess 40 in one end thereof which is adapted to slidably receive therein a drive shaft 42. The plunger 38 and the drive shaft 42 are formed with axially extending, complementary grooves or recesses 44 and 46, respectively, preferably at diametrically opposed points, which are adapted to receive therein balls 48. Such balls provide the rotative driving connection between the drive 42 and the piston 38, and permit relative axial movement therebetween.

The drive member 42 has a reduced end portion 50 which extends through a sealed opening 52 formed in the outer end of the casing 34, to the outer end of which is keyed a sprocket wheel 54. The reduced end of the member 42 is also

rotatably supported within a ball bearing assembly 55, which is disposed within a recess formed in the casing adjacent the opening 50 for rotatably supporting the member 42 with respect to the housing 34.

The sprocket wheel 54 is operatively connected to another sprocket wheel 55' through a chain 58. Such sprocket wheel 55' is keyed to the end of the shaft 16, so that the member 42 is synchronously driven with the spool 14.

The axial movement of the piston 38 is effected by means of a continuous cam groove 58, which is now accelerating to obtain uniform movement, formed in the peripheral surface thereof, which is disposed at a predetermined angle with respect to the axis of the piston 38 and the axis of the shaft 42, in order to effect the desired axial displacement of the piston 38 upon rotation thereof. This axial movement is effected by means of a pin 60 which is threadably received through a boss in the casing 34 and projects inwardly of the wall 62. Such pin 60 projects radially inwardly into engagement with the side walls of the groove 58, so that as the piston 38 is rotated, the engagement of the inner end of the pin 60 with the cam groove 58 will cause the piston 38 to reciprocate within the bore 36. The member 60 is shown as a pin, but it will be understood that the inwardly projecting end of such member could be constructed with a rotatable bearing ring or ball, if desired.

The piston 38 is constructed with an end wall 64 having an axial opening therethrough, and the opposite end of such piston is provided with axially extending spaces 66 communicating with the axial opening. The space within the bore 36 is adapted to receive therein separate supplies of fluid, such as oil, on opposite sides of the wall 64 of the piston, as indicated at 68 and 70. The fluid supply 70 fills the space within the bore behind the piston wall 64 within the spaces 66.

Annular seals 72 are provided in the periphery of the piston 38 to prevent leakage of fluid from one of the supplies 70 to the other along the periphery of the piston.

Separate or communicating fluid reservoirs, of small capacity, are provided for merely insuring a full supply of fluid to each of the supplies 68 and 70 on opposite sides of the piston, and such reservoirs are in the form of separate annular chambers 74 and 76 formed in the casing 34. Filling openings having removable plugs therein are provided in the top of the cylinder 34 communicating with each of the chambers 74 and 76, if they are separated, or a single opening may be used if they communicate.

Communication between chamber 74 and the supply 68, on one side of the piston 38, is through a passageway 78, disposed adjacent the bottom of chamber 74, having a resilient check valve assembly 80 disposed therein so that the fluid from the chamber 74 only enters the supply 68 in the event of a loss of fluid therein, and such fluid cannot pass from the supply 68 back into the chamber 74.

A suitable opening 82 having a removable plug 84 therein is provided through the casing 34 in alignment with the check valve assembly 80, so that such check valve may be readily installed.

A similar passageway and check valve indicated by the same number 80, as shown in Figure 3, is provided for communication between the chambers 76 and the fluid supply 70 at the

opposite side of the piston 38 for permitting a supply of fluid to enter the supply region 70, but preventing the return of fluid therefrom back to the chamber 76.

Thus, a full supply of fluid is insured on both sides of the piston 38, but the fluid cannot return from either of such sides to the reservoirs.

In order to guide the cable 28 as it is wound upon the spool 14 or unwound therefrom, a linearly movable or reciprocable element 86 is disposed between and mounted on the standards 32. Such member 86 is in the form of a tubular casing having radially inward, annular flanges formed on the ends thereof with annular sealing means 88 fixed to the faces thereof.

Such member 86 is adapted to be slidably mounted upon another tubular member 90, which is fixed to the standards 32 and is in axial alignment with the bore 36 and in communication with such bore. A separating ring portion 92 is interposed in the member 90 substantially midway between the ends thereof and provides a partition separating such member 90 into chambers 94 and 96. The annular surface of the member 92 slidably engages the inner surface of the member 86 and is provided with annular sealing means 98 in order to prevent leakage therealong.

The member 86 is of slightly greater diameter than the member 90, so that annular spaces are provided therebetween. Such annular spaces are indicated at 101 and 102 on opposite sides of the partitioning member 92, and, in effect, form expansible and contractible chambers having annular end wall portions 104 and 106, respectively. The opposite ends of each of the annular chambers are defined by the annular portions 108 and 110, respectively, which are those portions of the partitioning member 92 which project within the space between the members 86 and 90.

The chamber 94 is in open communication with the chamber 101 through a plurality of apertures 112 formed in the member 90; and the chamber 96 is in open communication with the chamber 102 through a plurality of similar apertures 114 formed in the member 90 on the opposite side of the partitioning member 92.

An axially extending tubular member 116 is fixed to the wall 64 of the piston 38, and projects into the member 90 with a space between the walls thereof. The end of such tubular member 116 is slidably received within a sealed axial opening 118 formed in the partitioning member 92, so that the open end of the member 116 projects within the chamber 96. The opposite open end of the conduit 116 communicates with the supply 70 within the casing 34 through the axial opening or passageway 66 formed in the piston 38.

The chamber 94 communicates with the supply 68 through the opening in the casing 34 and through the space between the outer periphery of the member 116 and the opening in member 90 adjacent the casing 34.

The member 86 has a housing 120 formed integral therewith, or suitably fixed thereto, substantially midway between the ends thereof, which is adapted to have rotatably mounted therein a guide pulley 122. Such guide pulley 122 may be mounted upon a suitable ball bearing assembly 124 for rotation within the housing 120. A removable end closure 126 is fixed to one side of the housing for the purpose of assembling the ball bearing unit 124 and the pulleys 122.

The housing 120 is also provided with a trans-

verse guide opening 128 therein which is adapted to receive a bearing sleeve 130. Such bearing sleeve 130 slidably receives therethrough a guide rod 132, which is disposed substantially parallel to the axis of reciprocation of the member 86 and which has its ends fixed to the standard 32. The member 86 is thus fixed against rotation but may reciprocate with respect to the spool 14.

The cable 28 is received through suitable inlet and outlet openings provided within the housing 120, and is trained about the pulley 122.

It will be understood that the supply 68 fills the casing 64 on one side of the piston 38 and also fills the chamber 94 and the chamber 101. The oil supply 70 fills the casing 34 on the opposite side of the piston and also fills the spaces 66, the conduit 116, the chamber 96, and the chamber 102.

As the spool 14 is driven, the sprocket wheel 54 is synchronously driven, thereby rotating the piston 38. Reciprocation of such piston is effected through the co-operation of the pins 60 with the groove 58. As the piston 38 is moved toward the right, viewing Figure 2, the fluid within the supply 68 and 94 is forced through the openings 112 into the chamber 101. The pressure of such fluid upon the wall portions 104 and 108 causes the member 86 to move to the left, viewing Figure 2. The fluid within chamber 102 is then displaced into chamber 96 and passes through conduit 116 into the supply portion 70 to fill the space left by the piston 64 in its movement toward the right. Conversely, the movement of the piston 64 toward the left, viewing Figure 2, will force the fluid from supply 70 through conduit 116 into chamber 96 and through apertures 114 into chamber 102, thereby causing movement of the member 86 toward the right, viewing Figure 2.

Constant rotation of the sprocket 54 in either direction thus causes reciprocation of the element 86 and guides the cable 28 between the ends of the spool 14 as it is being wound thereon or being unwound therefrom.

In order to insure movement of the element 86 to its limits, and to provide a slight over-throw so that the cable 28 is wound properly on the spool 14, resilient means are provided which are associated with the supplies 68 and 70 on the opposite sides of the piston in order to maintain pressures on such separate supplies.

The resilient means for acting upon the supply 68 comprises a disc-shaped member 134 disposed within the member 90 adjacent the outer end of the chamber 96. A resilient sealing cup 136 is fixed to the disc 134 and resiliently engages the inner peripheral surfaces of the member 90. A coil spring 138 engages the opposite face of the member 134, with the opposite end of the spring engaged by a closure plate 140 so as to exert a pressure upon the fluid within the chamber 96. An air vent 142 is provided through the member 90, communicating with the space beyond the member 134.

A similar structure is provided for communication with the supply 70 on the opposite side of the piston 38, and such structure is mounted within a cylindrical projected portion 144, which may be formed integral with the casing 34 and which communicates with the bore 36 in the supply portion 70 through a conduit 146. The disc, sealing cup, end member and vent are given the same numerals as immediately above to describe like parts, in that their action is the same except

that they act upon the fluid in supply 70 through the conduit 146.

Referring to Figure 8, a modified form of the spooler, or level winder, is shown which is generally indicated at 148. The same numerals are used to designate corresponding parts in this embodiment as are used above in connection with the embodiment shown in Figures 1 through 7.

A pair of axially aligned cylindrical members 150 is formed integral with the upper ends of the standards 32, and have facing open ends. Such members have cylindrical recesses or bores 162 therein which are adapted to telescopically receive the outer ends of the tubular members 154 and 156, respectively. Such members are complementary in shape to each other and correspond to the casing 34 in the embodiment above described. The members thus provide a cylindrical bore 162, within which a piston 164 is rotatably and slidably disposed. Such piston 164 corresponds to the piston 38, above described, and has a similar groove 58 formed in the periphery thereof. A pin 60 projects into the groove from the housing formed by sections 158 and 160, so that upon rotation of the piston 164 it is caused to reciprocate within the bore 162 through the co-operation of the pin 60 with the continuous groove 58.

The outer end of one of the members 154 or 156 is splined to one of the members 150, as indicated at 166, so that the members 154, 156 and the casing are held against rotation with respect to the standards 32, but may slide axially with respect thereto.

An air vent 167 is provided in one of the members 150, and the other member 150, having the wheel 54 attached thereto, may vent through the axial opening therein.

The sprocket wheel 54 is connected through a suitable stub shaft 168, which projects through a sealed opening in the end of the adjacent member 150 with an axially disposed drive member 170. Such drive member 170 has a cylindrical bore therein with a splined inner surface which is adapted to reciprocally receive therein the splined end of a shaft 172 which is formed integral with or otherwise suitably secured to one of the ends of the piston 164. Thus, the splined connection between the members 170 and 172 causes the piston 164 to rotate upon driving the sprocket wheel 54, but permits relative axial sliding movement therebetween.

A tubular guide member 174 is fixed to the opposite end of the opposite member 150 in axial alignment with the member 170. A guide rod 176 is fixed to the opposite side of the piston 164, and is slidably received within the tubular member 174. The members 170 and 174 have radial projections 178 formed on the inner ends thereof, and annular sealing means 180 are provided in the peripheral surface thereof which slidably engage the member 154 as it is axially reciprocated.

The elements thus provide separate oil chambers 182 and 184 on opposite sides of the piston 164 within the casing. The members 154 and the radial surface of the projection 178 form an annular chamber 186 around the member 172, in communication with the supply 182. The member 156 forms a similar chamber 188 with the radial face of the projection 178 of member 174, and communicates with the fluid supply chamber 184. The chambers 182, 186 and 184 and 188 are filled with oil, so that as the wheel 84 is rotated, the piston 164 is correspondingly

rotated, causing the piston to reciprocate axially. This reciprocation causes displacement of the fluid within chambers 182 and 184.

It will thus be seen that as the piston 164 is caused to move to the left, viewing Figure 8, the fluid from within chamber 182 is displaced into chamber 186, and causes the chamber 186 to expand, thus moving the guide pulley 122 to the right, viewing Figure 8. When the piston 164 moves toward the right, viewing Figure 8, it will be seen that the fluid is displaced from the chamber 184 into chamber 188, causing the pulley 122 with the housing to move to the left, viewing Figure 8. As the fluid is displaced from chamber 182, the fluid from chamber 188 will pass into the chamber 184; and, conversely, when the fluid is displaced from chamber 184, the fluid from chamber 188 will fill chamber 182.

In Figure 9, another modified form of the present invention is illustrated in which the spooling device, or level winder, is generally indicated at 190. Such spooling device 190 is generally similar to that shown in Figure 2, except that the fluid chambers and piston means are of different form so that the overall length of the device is less than that of the embodiments described above and may thus be located in a smaller space. The same reference numerals as used in the embodiment described in Figures 1 through 7 have been used here to indicate corresponding parts. It will thus be seen that the member 90 is mounted on the standards 32 and fixed against rotation with respect thereto. The drive member 42 projects through one end thereof into one end of the member 90. It is then connected to a member 192, which in structure is generally similar to the piston 38, above described. Such member 192 is formed with the groove 58 therein, which is engaged by a pin 60 to cause the reciprocation of the member 192. Such pin 60, not shown in this embodiment, may project through an opening formed in the member 90 and be fixed thereto. An air vent 194 may be provided in the end of the member 90, so as to permit free axial movement of the member 192.

The member 192 has an integral, axially extending shaft 196 having spaced pistons 198 and 199 secured to the outer ends thereof. That shaft portion 201 connecting the members 198 and 199 is preferably of a smaller diameter than the major shaft portion 196. The members 198, 199 and shaft portion 201 are preferably formed separate from each other, so that they may readily be secured together and mounted within the member 90 in the position shown.

Separate fluid chambers 202 and 204 are thus formed between the partitioning member 92 and piston 198 and piston 199, respectively. The supply chamber 202 communicates with the expandable chamber 101 through the radial openings 112; and the chamber 204 communicates with the chamber 102 through the radial openings 114.

As the wheel 54 rotates, it will thus be seen that the pistons 198 and 199 are caused to reciprocate within the member 90. When the pistons 198 and 199 are moved to the left, viewing Figure 9, the fluid from chamber 204 passes into the chamber 201 and causes the housing 86, together with the pulley 122 which carries the cable 28, to move to the right, viewing Figure 9. When the pistons are moved in the opposite direction, the fluid enters chamber 101, causing the housing 86 to move in the opposite direction.

It will be appreciated, in all of the embodi-

ments described above, that by properly proportioning the relative dimensions of the supply chambers such as 70 and 88 with the volumes and relative dimensions of the chambers 101 and 102, that any desired stroke for the reciprocating member, such as 86, may be obtained.

It is pointed out that the present invention hereinabove described has advantages over the conventional hydraulic system employing the necessary pump, check valves, needle valves, pilot valves and a four-way automatic valve, not only because such conventional system is more costly, but such system does not operate properly. The reason for this is that the pump, in such a system, is not instantly responsive to the turning of the cable drum. A lag occurring while the pump is building up a working pressure would throw the reciprocating action out of step with the revolving drum. This could be caused by starting from a dead stop or by a loss of time in the operation of the check valves or the operation of pilot valves which, in turn, actuate the automatic valve before a start could be made at the actuating end of the circuit to move the piston and thus guide the cable across the face of the drum. For proper action, these movements must be timed exactly. In the conventional system mentioned it is not possible to overcome the time losses mentioned, especially with a slot turning pump.

What is claimed is:

1. In a device of the type described, a linearly movable element, a rotatable element, and means for moving said first-named element in a linear path in response to rotative movement of said second-named element, said last-named means including an hydraulic fluid displacement system, said system including a casing containing separate supplies of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite fluid chambers associated with said first-named element, and means communicating said separate supplies of fluid with said opposite fluid chambers, respectively, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element.

2. In a device of the type described, a linearly movable element, a rotatable element, and means for moving said first-named element in a linear path in response to rotative movement of said second-named element, said last-named means including a closed hydraulic fluid displacement system, said system including a casing containing separate supplies of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite fluid chambers associated with said first-named element, and means communicating said separate supplies of fluid with said opposite fluid chambers, respectively, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element.

3. In a device of the type described, a linearly movable element, a rotatable element, and means for moving said first-named element in a linear path in response to rotative movement of said second-named element, said last-named means including an hydraulic fluid displacement system, said system including a casing containing separate supplies of fluid, piston means disposed

within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite expansible and contractible fluid chambers associated with said first-named element, and means communicating said separate supplies of fluid with said opposite fluid chambers, respectively, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element to displace fluid in one direction within said casing into one of said chambers, the fluid in the other chamber being displaced into the casing from the opposite direction.

4. In a device of the type described, a linearly movable element, a rotatable element, and means for moving said first-named element in a linear path in response to rotative movement of said second-named element, said last-named means including an hydraulic fluid displacement system, said system including a casing containing a supply of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing on opposite sides of said piston means, means forming opposite expansible and contractible fluid chambers associated with said first-named element, and fluid conduits interconnecting the interior of said casing on opposite sides of said piston means with said opposite fluid chambers, respectively, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element to displace fluid from one side of said piston means into one of said chambers, the fluid in the other chamber being displaced into said casing on the opposite side of said piston.

5. In a device of the type described, a linearly movable element, a rotatable element, and means for moving said first-named element in a linear path in response to rotative movement of said second-named element, said last-named means including an hydraulic fluid displacement system, said system including a casing containing a supply of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite fluid chambers associated with said first-named element, and means communicating the interior of said casing on separated sides of said piston means with said opposite fluid chambers, respectively, resilient means acting upon the fluid in said casing on opposite sides of said piston means to permit overthrow of said first-named element upon reaching the end of its travel, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element.

6. In a device of the type described, a reciprocating element, a rotatable element, and means for reciprocating said first-named element in response to rotation of said second-named element, said last-named means including an hydraulic fluid displacement system, said system including a casing containing a supply of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite fluid chambers associated with said first-named element, and means communicating the interior of said casing on separated sides of said piston means with said opposite fluid chambers, respectively, and means operatively connecting said rotatable element with said piston to rotate

and reciprocate said piston upon rotation of said rotatable element.

7. In a device of the type described, a reciprocating element, a rotatable element, and means for reciprocating said first-named element in response to rotation of said second-named element, said last-named means including an hydraulic fluid displacement system, said system including a casing containing a supply of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite expansible and contractible fluid chambers associated with said first-named element, and means communicating the interior of said casing on separated sides of said piston means with said opposite fluid chambers, respectively, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element to displace fluid in one direction within said casing into one of said chambers, the fluid in the other chamber being displaced into the casing from the opposite direction.

8. A power winch construction comprising, in combination, a spool having a cable wound therearound, driving means for rotating said spool, a reciprocable guide element having a cable receiving guide portion and movable longitudinally of said spool between the ends thereof, a rotatable element, means operatively connecting said rotatable element with said driving means for synchronous rotation therewith, and means for reciprocating said guide element in response to rotation of said rotatable element, said last named means including an hydraulic fluid displacement system, said system including a casing containing separate supplies of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite fluid chambers associated with said first named element, and means communicating said separate supplies of fluid with said opposite fluid chambers, respectively, and means operatively connecting said rotatable element with said piston means to rotate and reciprocate said piston means upon rotation of said rotatable element.

9. A power winch construction comprising, in combination, a spool having a cable wound therearound, driving means for rotating said spool, a reciprocable guide element having a cable receiving guide portion and movable longitudinally of said spool between the ends thereof, a rotatable element, means operatively connecting said rotatable element with said driving means for synchronous rotation therewith, and means for reciprocating said guide element in response to rotation of said rotatable element, said last named means including an hydraulic fluid displacement system, said system including a casing containing separate supplies of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite expansible and contractible fluid chambers associated with said first named element, and means communicating said separate supplies of fluid with said opposite fluid chambers, respectively, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element to displace fluid in one direction within said casing into one of said chambers, the fluid in the

other chamber being displaced into the casing from the opposite direction.

10. A power winch construction comprising, in combination, a spool having a cable wound therearound, driving means for rotating said spool, a reciprocable guide element having a cable receiving guide portion and movable longitudinally of said spool between the ends thereof, a rotatable element, means operatively connecting said rotatable element with said driving means for synchronous rotation therewith, and means for reciprocating said guide element in response to rotation of said rotatable element, said last named means including an hydraulic fluid displacement system, said system including a casing containing a supply of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing on opposite sides of said piston means, means forming opposite expansible and contractible fluid chambers associated with said first named element, and fluid conduits interconnecting the interior of said casing on opposite sides of said piston means with said opposite fluid chambers respectively, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element to displace fluid from one side of said piston means into one of said chambers, the fluid in the other chamber being displaced into said casing on the opposite side of said piston.

11. A power winch construction comprising, in combination, a spool having a cable wound therearound, driving means for rotating said spool, a reciprocable guide element having a cable receiving guide portion and movable longitudinally of said spool between the ends thereof, a rotatable element, means operatively connecting said rotatable element with said driving means for synchronous rotation therewith, and means for reciprocating said guide element in response to rotation of said rotatable element, said last named means including an hydraulic fluid displacement system, said system including a casing containing a supply of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite fluid chambers associated with said first named element, means communicating the interior of said casing on opposite sides of said piston with said opposite fluid chambers respectively, resilient means acting upon the fluid in said casing on opposite sides of said piston means to permit overthrow of said first named element upon reaching the end of its travel, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element.

12. In a device of the type described, a linearly movable element, a rotatable element, and means for moving said first named element in a linear path in response to rotative movement of said second named element, said last named means including an hydraulic fluid displacement system, said system including a casing containing separate supplies of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming op-

posite fluid chambers associated with said first named element, means communicating said separate supplies of fluid with said opposite fluid chambers, respectively, fluid reservoir means associated with said separate supplies of fluid, and check valves disposed between said reservoir means and said separate supplies, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element.

13. In a device of the type described, a linearly movable element, a rotatable element, and means for moving said first named element in a linear path in response to rotative movement of said second named element, said last named means including an hydraulic fluid displacement system, said system including a casing containing a supply of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite fluid chambers associated with said first named element, and means communicating the interior of said casing on opposite sides of said piston with said opposite fluid chambers, respectively, fluid reservoir means communicating with the interior of the casing on opposite sides of said piston, check valves interposed between said reservoir means and the interior of said casing on opposite sides of said piston, resilient means acting upon the fluid in said casing on opposite sides of said piston means to permit overthrow of said first named element upon reaching the end of its travel, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element.

14. A power winch construction comprising, in combination, a spool having a cable wound therearound, driving means for rotating said spool, a reciprocable guide element having a cable receiving guide portion and movable longitudinally of said spool between the ends thereof, a rotatable element, means operatively connecting said rotatable element with said driving means for synchronous rotation therewith, and means for reciprocating said guide element in response to rotation of said rotatable element, said last named means including an hydraulic fluid displacement system, said system including a casing containing a supply of fluid, piston means disposed within said casing for reciprocation and rotation therein to displace fluid within said casing in opposite directions therein, means forming opposite fluid chambers associated with said first named element, and means communicating the interior of said casing on opposite sides of said piston with said opposite fluid chambers, respectively, fluid reservoirs communicating with the supply within said casing on opposite sides of said piston, check valves disposed between said reservoirs and said supply on opposite sides of said piston, resilient means acting upon the fluid in said casing on opposite sides of said piston means to permit overthrow of said first named element upon reaching the end of its travel, and means operatively connecting said rotatable element with said piston to rotate and reciprocate said piston upon rotation of said rotatable element.

EDWARD R. BARRETT.