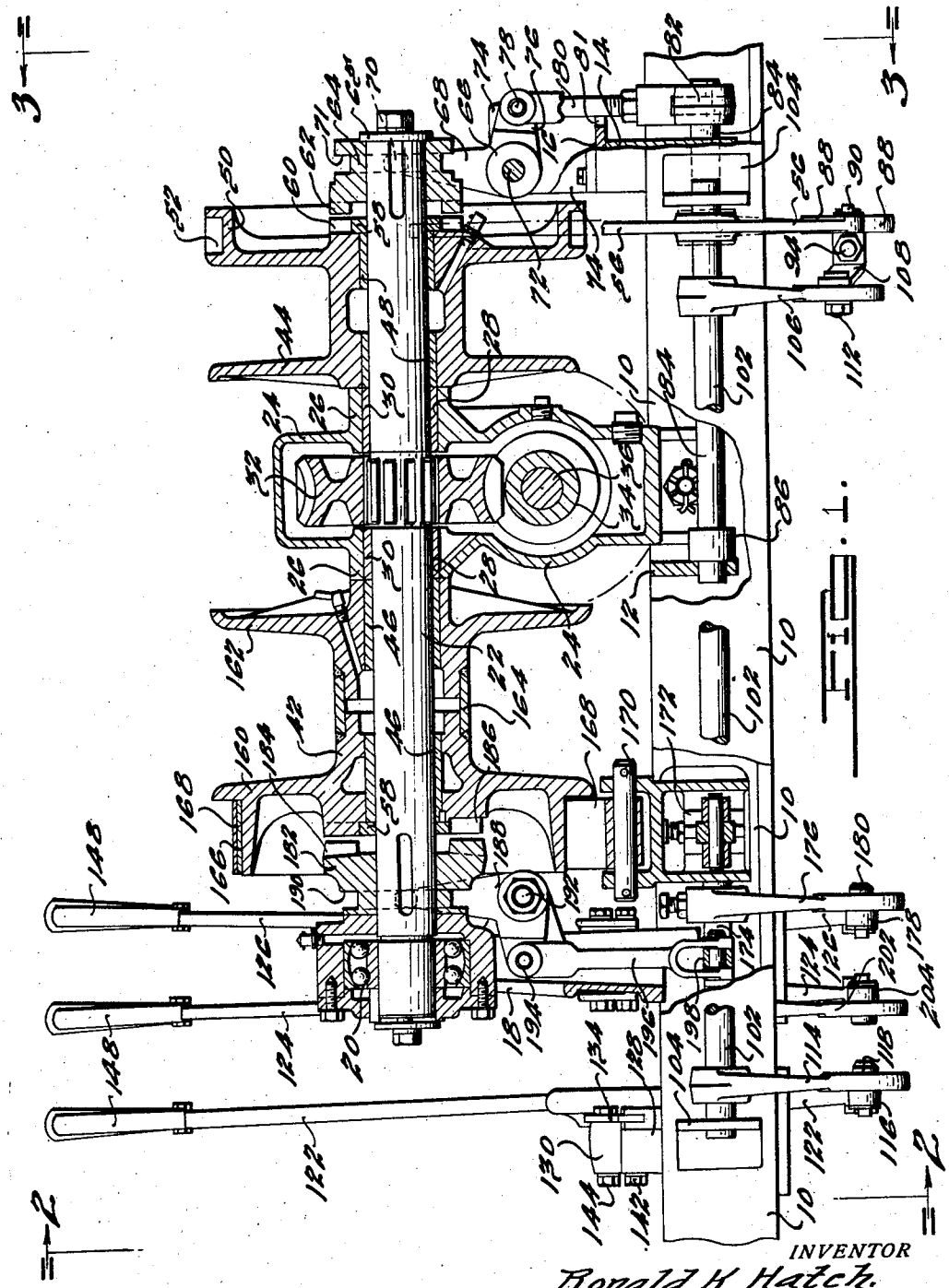
March 4, 1941. R. K. HATCH 2,233,703

WINCH CONTROL

Filed Nov. 23, 1938 2 Sheets-Sheet 1



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WINCH CONTROL

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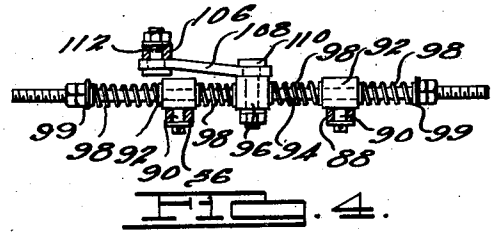


FIG. 4.

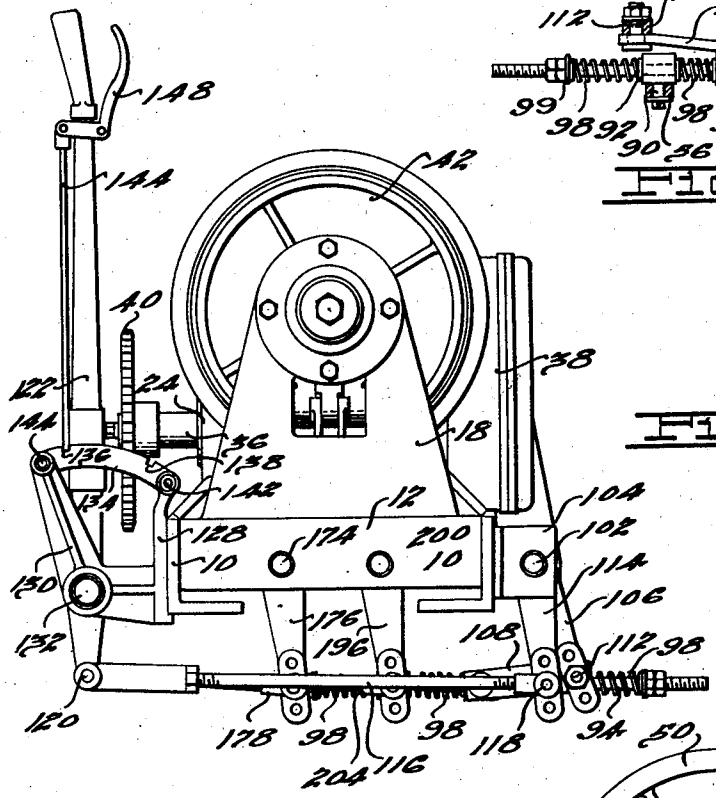


FIG. 2.

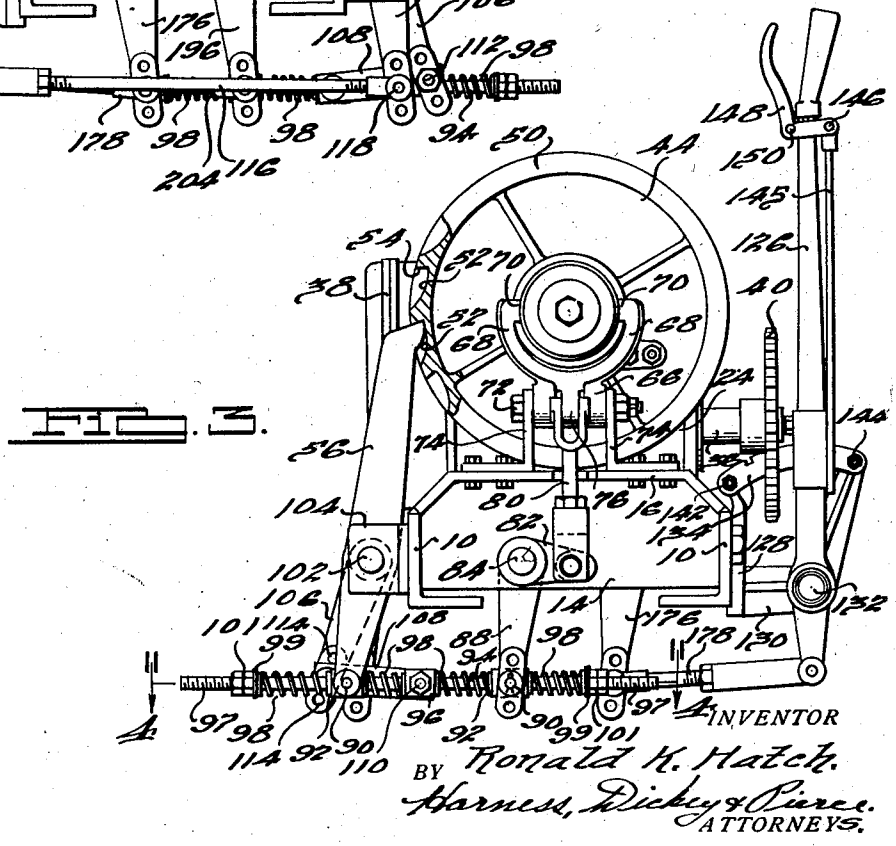


FIG. 3.

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WINCH CONTROL

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Application November 23, 1938, Serial No. 241,953

5 Claims. (Cl. 254—187)

The present invention relates to improved winch constructions and to improved means for operating the same.

One of the primary objects of the present invention is to provide an improved winch construction having a pair of drums, or spools, thereon in which one of the drums may be used for the live load and the other drum for shifting the load when raised either by a direct connection to the load or by connection to the boom, and in which said other drum is operated in an improved manner.

Another object of the invention is to provide an improved winch construction of the type mentioned in which one of the drums has a clutch and a pawl and ratchet mechanism associated therewith, in which the clutch and pawl are actuated by a single lever.

Another object of the invention is to provide an improved winch construction of the type mentioned in which a resilient means is included in the operating connection between the lever and the pawl and clutch mechanism so that the pawl and clutch are resiliently urged into and out of operative connection with their respective complementary elements on the spool with which they are associated.

Another object of the invention is to provide an improved winch construction of the type mentioned having safety features which insure engagement of a safety pawl until after a driving clutch element is in driving engagement, and also insures driving engagement of the clutch element until after the pawl is in engagement, so that the operator cannot inadvertently allow his load to drop.

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 longitudinal, vertical cross-sectional view, with parts in elevation, of an improved winch construction according to the present invention;

Fig. 2 is an end elevational view taken in the direction of the arrow 2—2 of Fig. 1;

Fig. 3 is an end elevational view taken in the direction of the arrow 3—3 of Fig. 1; and

Fig. 4 is a plan view taken along the line 4—4 of Fig. 3.

The winch of the present invention is particularly adapted for mounting on trucks or other vehicles; but it is also of general utility and may be stationarily mounted as well.

Referring to the drawings in which one embodiment of the present invention is specifically illustrated, a winch construction is shown including a frame work comprising longitudinally extending angle sections 10 connected together by transversely extending, upstanding plate members 12, which may be welded together at suitable intervals along the length of the members 10. Another transversely extending, upstanding plate member 14 is disposed adjacent one end of the members 10 and is welded thereto. The top edge of the plate member 14 extends above the top of the members 10 with the corners cut way to support a transverse plate member 16 which may be welded tc the top edge, following the contour thereof, and to the angle members 10, as best shown in Fig. 3.

A transversely extending, upstanding mounting bracket 18 is disposed between the upstanding sides of the angle members 10 adjacent one end thereof and is welded thereto. The members 12, 14, 16 and 18 serve as mounting means for shafts and other elements of the winch construction in a manner that will become more apparent from the following description.

The bracket 18 serves to mount a bearing means 20 which rotatably supports one end of a drive shaft 22. The driving gear housing 24 is mounted on the angle members 10 of the frame intermediate the ends of the shaft 22 to serve as the other support for the shaft as well as support gearing therein. The housing 24 is provided with aligned bosses 26 having openings 28 therethrough, through which the shaft 22 extends. Bushings 30 are disposed within the openings 28 and engage the shaft 22.

A worm wheel 32 is disposed within the housing 24 and is suitably keyed to the shaft 22. A worm 34 is disposed within the lower part of the housing in mesh with the wheel 32, and is keyed to a transverse shaft 36 mounted within suitable bearings on the housing. The forward end of the shaft 36 extends within a housing 38 which has mounted therein a worm shaft safety brake (not shown) of suitable construction. The rear end of the shaft 36 extends outwardly of the housing 24 and has fixed thereto a drive sprocket 40 which may be suitably connected to a suitable type of power drive.

It is evident from the above that the shaft 22 is driven by the sprocket 40 through the worm 34 and worm wheel 32; and it is to be understood

that the drive means is reversible so that the shaft 22 may be driven in either direction.

A main drum or spool 42 is rotatably mounted on the shaft 22 on one side of the housing 24, and another drum or spool 44 is rotatably mounted on the shaft 22 on the opposite side of the housing. Bushings 46 and 48 are disposed between the axial openings through the spools 42 and 44, respectively, and the shaft 22 so that the spools are free to rotate on the shaft. Suitable lubricating means are associated with the spools.

The drum or spool 44 has an integral, annular portion 50 formed with ratchet teeth 52 so that this portion forms a ratchet wheel integral with the spool. The ratchet teeth have a curved base which serves to force the pawl out of engagement with the wheel upon rotation of the spool 44 clockwise, viewing Fig. 3, and have an undercut edge 54, as best seen in Fig. 3, and are adapted to be engaged by a pawl 56. The mounting and actuating means for the pawl will be described in detail hereinafter.

A thrust ring 58 is mounted on the shaft 22 and engages the outer side of the hub of drum 44 to prevent axial displacement of those elements mounted on the shaft. The hub on the drum 44 is formed with integral teeth 60 which embrace the ring 58 and which are adapted to releasably engage complementary teeth 62 on a sliding clutch element 64. The driving faces of the teeth 50 and 62 are square, while the back faces are beveled. These beveled faces have a cam action on the jaw 64, and serve to force the jaw out of engagement with the spool upon rotation of the spool clockwise, viewing Fig. 3, when the pawl is in engagement with the teeth 52. When the pawl is out of engagement with the wheel and the spool is rotating counterclockwise, the clutch is driven counterclockwise and the load on the spool keeps the square driving faces of teeth 60 and 62 in engagement. The clutch jaw 64 is slidably mounted on the end of the shaft 22 and is keyed thereto for rotation therewith and for axial movement into and out of driving engagement with the teeth 60. A washer 65 is fixed to the end of shaft 22 and serves as a stop to limit the axial movement of the sliding jaw 64.

A bell crank 66 having yoke arms 68 with turned fingers 70 is pivotally mounted on pivot pins 72 so that the fingers 70 engage within an annular groove 71 in clutch element 64. The ends of the pins 72 are received through aligned openings in upstanding angle brackets 74 which are suitably fixed to the top surface of plate 16. The pins 72 may be in the form of a bolt having a nut thereon so that the pin may be fixed to the plate 74. The crank 66 has an outwardly extending arm 76 which is pivotally connected by pivot pin 78 to the upper end of an adjustable link bolt 80.

The link 80 extends downwardly within a slot 81 in plate 16, the lower end thereof is pivotally connected to one end of the crank arm 82, the other end of the arm being provided with an opening therethrough which receives therein a shaft 84. The arm 82 is fixed to the shaft 84 for rotation therewith and may be so fixed in a number of ways. One such way is to broach a flat-sided opening through the arm for cooperation with a complementarily shaped shaft having a flat formed thereon. The shaft 84 may be journaled within aligned openings in the frame cross plates 12 and 14 and be fixed against axial displacement by means of collars 86 which embrace and are fixed to the shaft and bear against plates 12 and 14.

An operating shaft lever 88, which is spaced inwardly from the arm 82, has an opening through the upper end thereof which receives therethrough the shaft 84. The lever 88 and shaft 84 are suitably fixed together so that the shaft rotates with the turning of the lever. The lower end of the lever 88 has an opening therethrough which rotatably receives therein the stub shaft 90 of a trunnion member 92. The trunnion 92 has an axial opening therethrough which slidably embraces an operating rod 94. A block member 96 is fixed to the rod 94 intermediate the ends thereof, and the ends 97 of the rod are threaded. Coil springs 98 are disposed on opposite sides of the trunnion 92 and are compressed between the opposite ends of the trunnion and one end of the member 96 and a washer 99, respectively. Nuts 101 are threadably received over the inner end of rod 94 and may be threaded therealong to vary the force exerted by springs 98. This construction provides a resilient connection between lever 88 and rod 94 so that the lever 88 is resiliently urged in both directions, forwardly and backwardly, depending upon the direction of the force applied to shift rod 94.

An operating shaft 102 is mounted forwardly of the front member 10 on outboard brackets 104 which are suitably fixed to the member 10.

The pawl 56 is provided with an opening therethrough intermediate its ends for free pivotal mounting on the shaft 102. An opening is also provided through the pawl adjacent the lower end thereof for the pivotal reception of the stub shaft 90 on a trunnion 92 which embraces the rod 94 forwardly of the block 96. Spiral springs 98 and a washer 99 are disposed over the rod 94 in the same relation and arrangement relative to the front trunnion as described above in connection with the rear trunnion to which the lever 88 is attached. This construction provides a resilient connection between the lower end of the pawl 56 and rod 94 as well as between lever 88 and rod 94, so that upon shifting of the rod in one direction, the clutch element is resiliently urged into driving engagement with the spool 40 and the pawl is resiliently urged out of engagement with the teeth 52. Upon shifting the rod in the other direction, the pawl is resiliently urged into engagement with the teeth and the element 64 is resiliently urged out of driving engagement with the spool.

An operating lever 106 has an opening therethrough adjacent the top thereof which embraces shaft 102 and is fixed thereto so that the lever 106 rocks upon turning the shaft in opposite directions. A connecting link 108, having its ends oppositely offset, is pivotally connected at its rear end by a pivot pin 110 to the block 96 and is pivotally connected by a pivot pin 112 at its front end to the lower end of lever 106. A plurality of longitudinally spaced openings 114 may be provided through the lower end of lever 106 for the reception of the pivot pin 112 so that the throw may be varied by selecting the desired opening for the connection.

An operating lever 114, similar to the lever 106, is also fixed to the shaft 102 at the opposite end thereof which has an adjustable link 116 pivotally connected thereto by pivot pin 118. The link 116 is pivotally connected by a pivot pin 120 to the lower end of a hand operating lever 122.

There are three hand operating levers 122, 124, and 126 in the embodiment illustrated, which are

similar to each other and which are mounted on a bracket 128 to form a unit for mounting on the winch. The bracket 128 includes spaced L-shaped members 130 which serve to journal a pivot shaft 132. The levers 122, 124, and 126 are pivotally mounted intermediate their ends to the shaft 132 at spaced intervals therealong and may be suitably fixed against axial displacement.

So that the levers may be held in either operative or inoperative position, a quadrant member 134 having notches 136 and 138 in the upper edge thereof is provided for each of the levers and may be fixed by a pin 142 to the top of bracket 128 and by a pin 145 to the top of member 130. An elongated member 145 is disposed longitudinally of each lever along the back thereof and is pivotally connected by a pin 146 to a bell lever finger member 148 which is pivotally connected by a pin 150 to each lever adjacent the handle thereof. The members 145 are adapted to be urged downwardly by springs (not shown) so that they engage their respective notches 136 or 138, depending upon the position of the lever, to hold the levers in position. The members 144 may be released from the notches by drawing the finger member 148 toward the handle so that the lever may be shifted.

The hand lever 122 serves to operate the lever 114, shaft 102, and lever 106 so that as the lever 106 is moved from one position to another it actuates the pawl 56 and the sliding clutch jaw 64. This movement of the lever 106 is translated to the pawl and clutch through the rod 94 and springs 98. When the member 145 of lever 122 is engaged in notch 136, the levers 114 and 106 are in their forward position so that the rod member 94 is urged forwardly. The pawl 56 is thus resiliently urged into engagement with the teeth of the ratchet wheel 50 so that the drum 44 cannot back up. In this position, the clutch 64 is out of driving engagement with the clutch teeth 60 on the drum 44. When the lever 122 is shifted forwardly so that the notch 138 is engaged, the levers 114 and 106 are pulled to their rear position so that the rod 94 is moved rearwardly. The pawl 56 is then resiliently urged out of engagement with the ratchet wheel and the clutch 64 is moved toward the drum 44 so that the teeth 62 thereon are in driving engagement with the teeth 60. The clutch is resiliently urged into and out of driving engagement by the spring 98 on opposite sides of the trunnion 92.

By the construction above described, a single lever is provided for moving the pawl and clutch into and out of engaging position, and both the clutch and pawl are resiliently urged both into and out of such position. The construction and arrangement of the elements are such that the pawl is never out of engagement with the wheel 50 until just after the clutch jaw 62 is in driving engagement with the spool 44. Conversely, the jaw 62 is never out of driving engagement with the spool until just after the pawl has engaged the teeth of the wheel 50. Thus, safety of operation is insured.

For the purpose of better understanding the operation of the mechanism and the safety aspects of the structure, the following example of operation is given. Viewing Fig. 3 and assuming the spool 44 to be under load with the teeth 60 and 62 in driving engagement for driving the spool clockwise, when the lever 122 is shifted so that the pawl 56 is resiliently thrown into engagement with the wheel 50, the tendency of the springs 98 is to resiliently urge the clutch out of driving engagement with the wheel. This will be resisted by the action of the load on the spool, which will keep the driving faces of teeth 60 and 62 in engagement until the pawl is actually engaged against the undercut surface 54 and is taking the load. This condition will exist until the drive is reversed so that the spool is rotated counterclockwise, when the pawl will engage the surface 54 and take the load. The pressure on the square faces of teeth 60 and 62 will then be relieved, so that the springs 98 will snap the jaw 64 out of engagement with the spool 44.

When the pawl is in engagement and the clutch is out of engagement, assume that it is then desired to lower the load and engage the clutch with the spool. The lever 122 is shifted so that the jaw 64 is resiliently urged into engaging position, but the pawl will continue to engage the undercut surface 54 until the spool is driven clockwise a sufficient distance to relieve the pawl. When the pawl is relieved, the springs 98 will snap the pawl out of engagement and the clutch jaw is already in position to take the load by engagement between the square faces of teeth 60 and 62. The drive may then be reversed to lower the load, or may continue in the same direction to raise the load, as desired.

The remaining elements of the winch now to be described are elements in conventional winch constructions and will not be described in minute detail but will be described in general so that the construction and operation of the complete winch will be understood.

The spool 42 includes a pair of facing drum flanges 160 and 162 rigidly connected together by a drum barrel or ring member 164. The drum 160 has an integral annular brake surface 166 which is engaged by a brake band 168. The ends of the band 168 are connected to a pin 170 which in turn is connected to a brake operating mechanism 172. The brake operating mechanism 172 is conventional in construction and need not be described in detail, it being sufficient to say that upon actuation of the mechanism 172 the brake band 168 is tightly drawn into frictional engagement with the brake surface 166 to slow down or stop rotation of the spool 42.

The mechanism 172 is actuated by a pivot shaft 174 which may be suitably mounted within aligned openings in the frame members 12. An operating lever 176, similar to the lever 114 is fixedly secured to the shaft 174 at the top of the lever; and has an adjustable link 178 pivotally attached to the lower end thereof by means of a pivot pin 180. The rear end of the link 178 is pivotally connected to the lower end of operating lever 126. By shifting the lever 126, the braking mechanism 172 is actuated through the link 178 and lever 176 to tighten or release the brake band 168.

The spool or drum 42 is mounted for rotation relative to the shaft 22, but may be driven by the shaft 22 through a sliding clutch 182. The clutch 182 is illustrated as being generally similar in construction to the clutch 64 except that the engaging teeth are preferably square and do not have the beveled back faces as in clutch 64, and includes square teeth 184 which cooperate with square teeth 186 on the spool 42 to drive the spool. Other types of clutch means, such as a friction type, could be used as well, depending upon the particular use to which the winch is to be put. The clutch element 182 is secured to the shaft 22 for rotation therewith and for sliding

movement therealong by means of a suitable key connection.

The clutch 182 is shifted along the shaft 22 by means of a bell crank member 188 which is similar in construction to the bell crank member 66, above described. That is, the bell crank lever 188 has forked arms terminating in inwardly directed fingers which engage within an annular groove 190 in the clutch element 182. The bell crank member 188 is pivotally mounted to the winch frame by means of a pin 192 and has its lower arm pivotally connected by a pivot pin 194 to a downwardly extending link 196. The link 196 is pivotally connected to a crank arm 198, which is similar to the crank arm 82 above described. The crank arm 198 is fixedly secured to a shaft 200 which may be pivotally mounted within the frame members 12. The shaft 200 has fixedly secured thereto a lever 202 which is similar to lever 114, and which has an adjustable connecting link 204 pivotally connected to the lower end thereof, at its forward end and pivotally connected at its rearward end to the lower end of lever 124. By shifting the lever 124, the clutch element 182 is shifted into and out of driving engagement with the spool 42.

Formal changes may be made in the specific embodiment of the invention described without departing from the spirit and substance of the invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. A winch construction comprising a frame, a drive shaft mounted on said frame, a spool rotatably mounted on said shaft, said spool having a ratchet wheel connected thereto, a pawl associated with said wheel, a sliding clutch element operatively connected to said shaft and adapted to co-operate with complementary clutch elements on said spool to provide a driving connection between said spool and said shaft, a single operating lever movable to operating positions, and means operatively connecting said lever to said pawl and to said sliding clutch, said last named means including resilient means so constructed as to urge said pawl into engagement with said wheel and to urge said clutch element out of engagement with said co-operating clutch elements when said lever is moved to one of its operating positions and so constructed as to urge said pawl out of engagement with said wheel and to urge said clutch element into engagement with said co-operating clutch elements when said lever is moved to another of its operating positions, the construction being such that said pawl remains in engagement with said wheel until after said clutch element is in engagement with said co-operating clutch elements and said clutch element remains in engagement with said co-operating clutch elements until after said pawl is in engagement with said wheel.

2. A winch construction comprising a frame, a drive shaft mounted on said frame, a spool rotatably mounted on said shaft, said spool having a ratchet wheel formed integral therewith, a pawl associated with said wheel, a sliding clutch element operatively connected to said shaft and adapted to co-operate with complementary clutch elements on said spool to provide a driving connection between said spool and said shaft, a single operating lever movable to operating positions, and means operatively connecting said lever to said pawl and to said sliding clutch, said last named means including a shiftable rod, means resiliently connecting said shiftable rod to said pawl and to said sliding clutch element, the construction of said last named means being such as to urge said pawl into engagement with said wheel and to urge said clutch element out of engagement with said co-operating clutch elements when said lever is moved to one of its operating positions and so constructed as to urge said pawl out of engagement with said wheel and to urge said clutch element into engagement with said co-operating clutch elements when said lever is moved to another of its operating positions, the construction being such that said pawl remains in engagement with said wheel until after said clutch element is in engagement with said co-operating clutch elements and said clutch element remains in engagement with said co-operating clutch elements until after said pawl is in engagement with said wheel.

3. A winch construction comprising a frame, a drive shaft mounted on said frame, a spool rotatably mounted on said shaft, said spool having a ratchet wheel integrally formed therewith, a pawl associated with said wheel, a sliding clutch element operatively connected to said shaft and adapted to cooperate with complementary clutch elements on said spool to provide a drive connection between said spool and said shaft, a single operating lever movable to operating positions, and means operatively connecting said lever to said pawl and to said sliding clutch, said last named means including a shiftable rod, a link member slidably embracing said rod, resilient means operatively connected to said rod on opposite sides of said link member providing a resilient connection between said rod and said link member, means slidably connecting said pawl to said rod, resilient means operatively connected to said rod on opposite sides of said pawl providing a resilient connection between said rod and said pawl, the connection being such as to urge said pawl into engagement with said wheel and to urge said clutch element out of engagement with said co-operating clutch elements when said lever is moved to one of its operating positions and so constructed as to urge said pawl out of engagement with said wheel and to urge said clutch element into engagement wtih said co-operating clutch elements when said lever is moved to another of its operating positions, the construction being such that said pawl remains in engagement with said wheel until after said clutch element is in engagement with said co-operating clutch elements and said clutch element remains in engagement with said co-operating clutch elements until after said pawl is in engagement with said wheel.

4. A winch construction comprising a frame, a drive shaft mounted on said frame, a spool rotatably mounted on said shaft, said spool having a ratchet wheel connected thereto, a pawl associated with said wheel, a sliding clutch element operatively connected to said shaft and adapted to co-operate with complementary clutch elements on said spool to provide a driving connection between said spool and said shaft, a single operating lever movable to operating positions, and means operatively connecting said lever to said pawl and to said sliding clutch, said last named means including resilient means so constructed as to urge said pawl into engagement with said wheel and to urge said clutch element out of engagement with said co-operating clutch elements when said lever is moved to one of its operating positions and so constructed as to urge said pawl out of engagement with said wheel and

to urge said clutch element into engagement with said co-operating clutch elements when said lever is moved to another of its operating positions, the construction being such that said pawl remains in engagement with said wheel until after said clutch element is in engagement with said co-operating clutch elements at which time said pawl is snapped out of engagement with said wheel and said clutch element remains in engagement with said co-operating clutch elements until after said pawl is in engagement with said wheel, at which time said clutch element is snapped out of engagement with said co-operating clutch elements.

5. A winch construction comprising a frame, a drive shaft mounted on said frame, a spool rotatably mounted on said shaft, said spool having a ratchet wheel connected thereto, a pawl associated with said wheel, a sliding clutch element operatively connected to said shaft and having clutch teeth adapted to cooperate with complementary clutch teeth on said spool, both of said teeth having substantially square driving faces adapted to engage to provide a driving connection between said spool and said shaft and both of said teeth having complementary bevelled rear faces, a single operating lever movable to operating positions, and means operatively connecting said lever to said pawl and to said sliding clutch, said last named means including resilient means so constructed as to urge said pawl into engagement with said wheel and to urge said clutch element out of engagement with said co-operating clutch elements when said lever is moved to one of its operating positions and so constructed as to urge said pawl out of engagement with said wheel and to urge said clutch element into engagement with said co-operating clutch elements when said lever is moved to another of its operating positions, the construction being such that said pawl remains in engagement with said wheel until after said clutch element is in engagement with said co-operating clutch elements and said clutch element remains in engagement with said co-operating clutch elements until after said pawl is in engagement with said wheel.

RONALD K. HATCH.