Oct. 21, 1958 R. FILLION 2,857,137

WINCH

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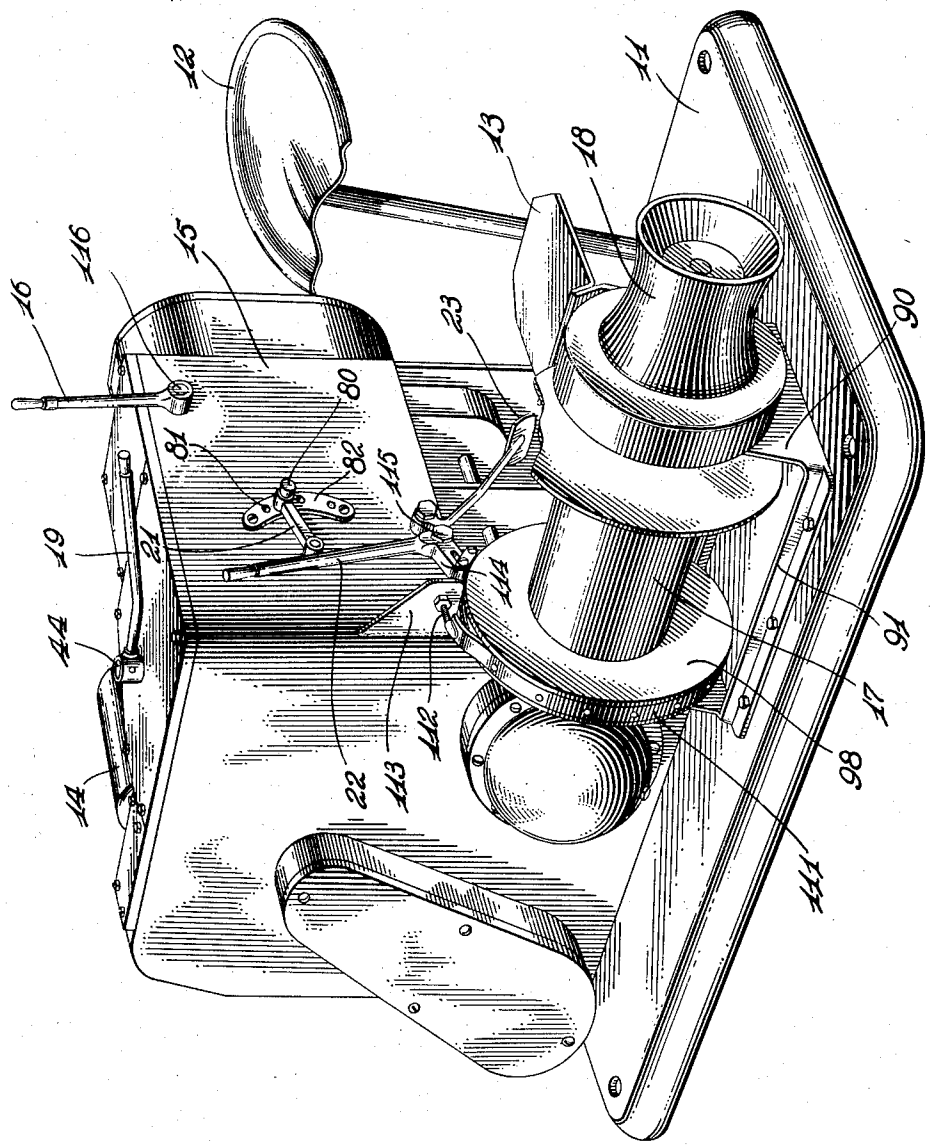


Fig. 1

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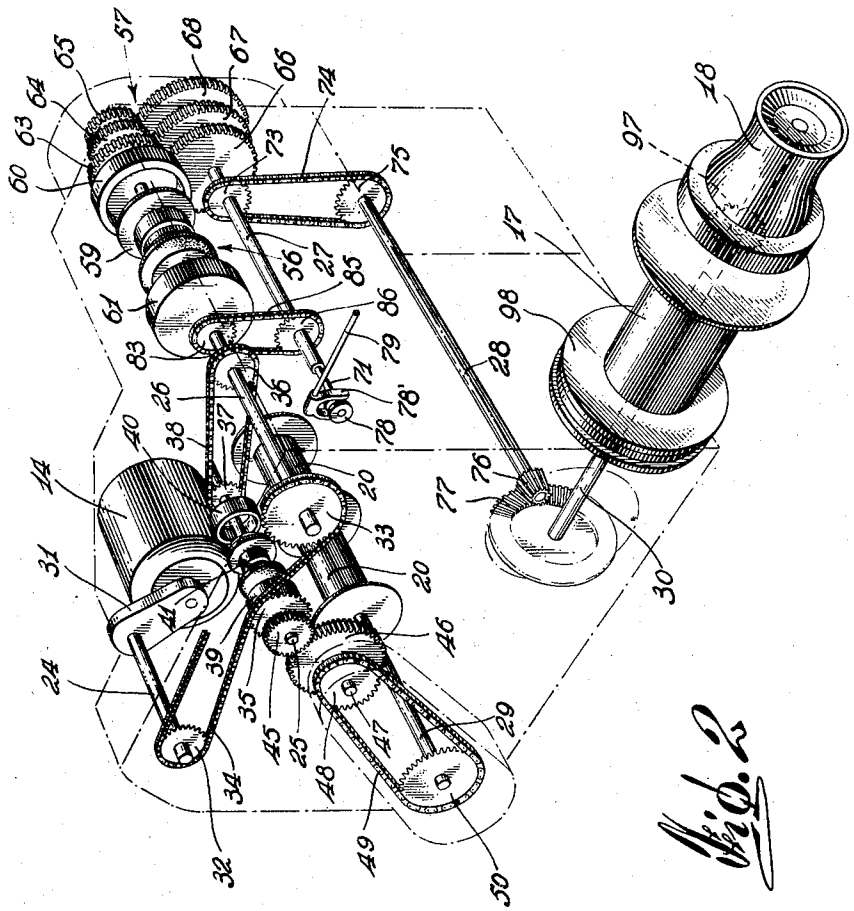


Fig. 2

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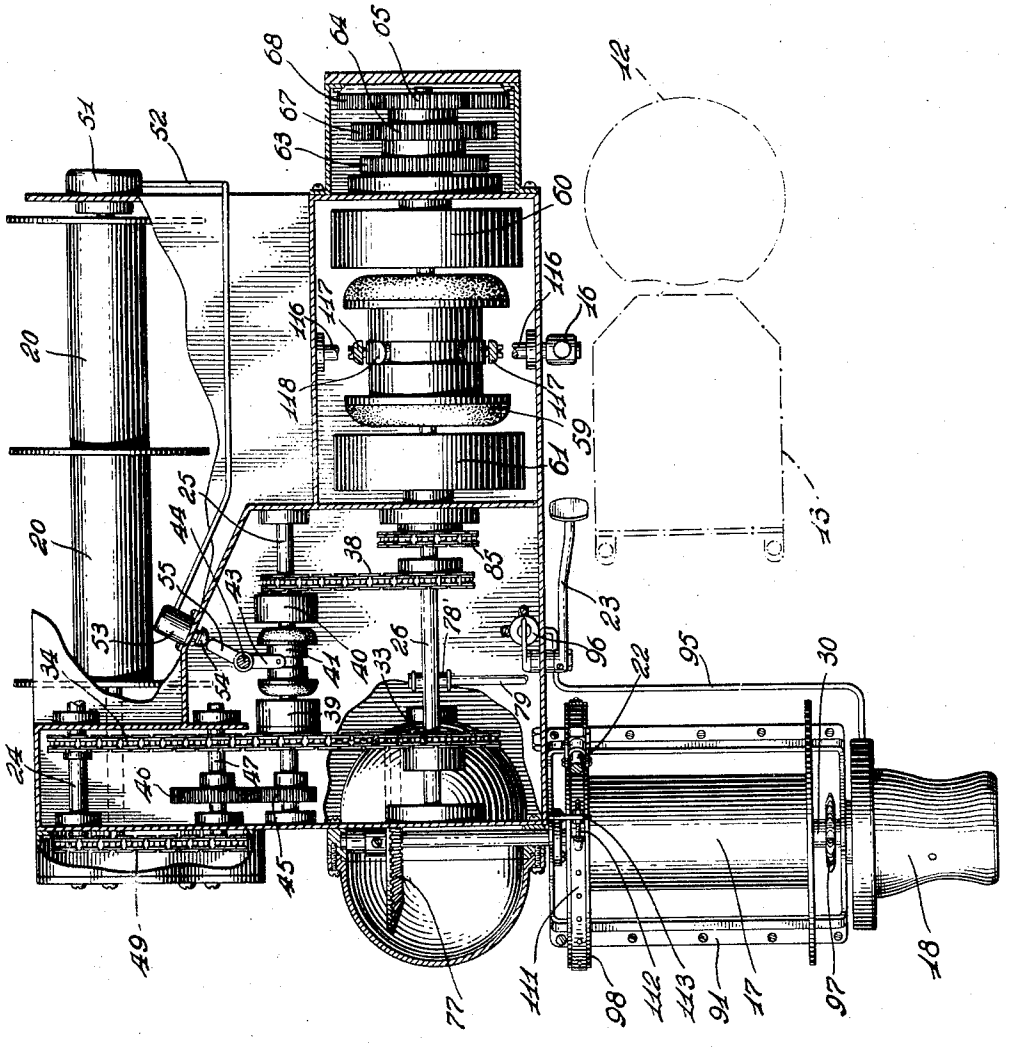


Fig. 3

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WINCH

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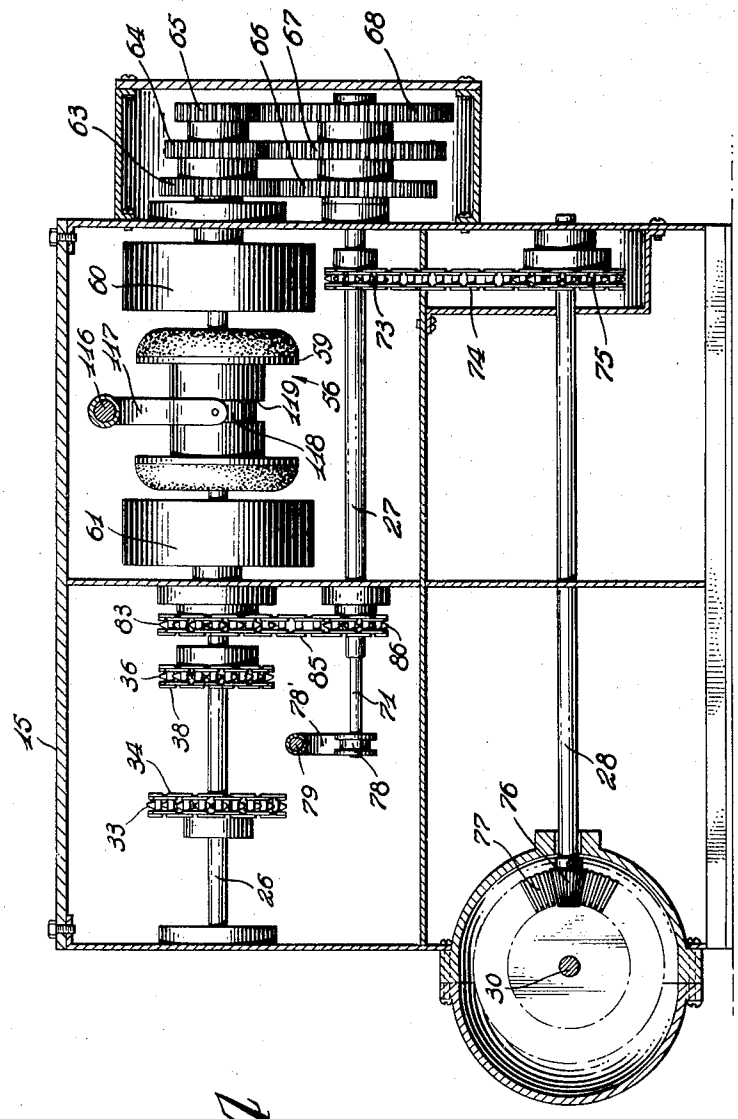


Fig. 4

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Fig. 7

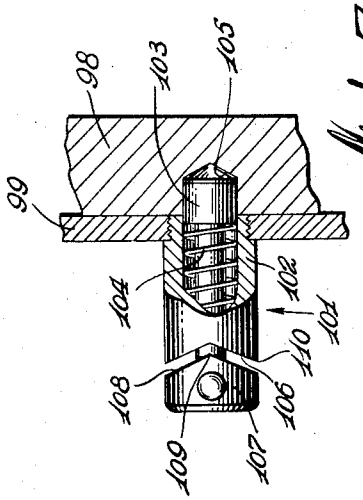


Fig. 6

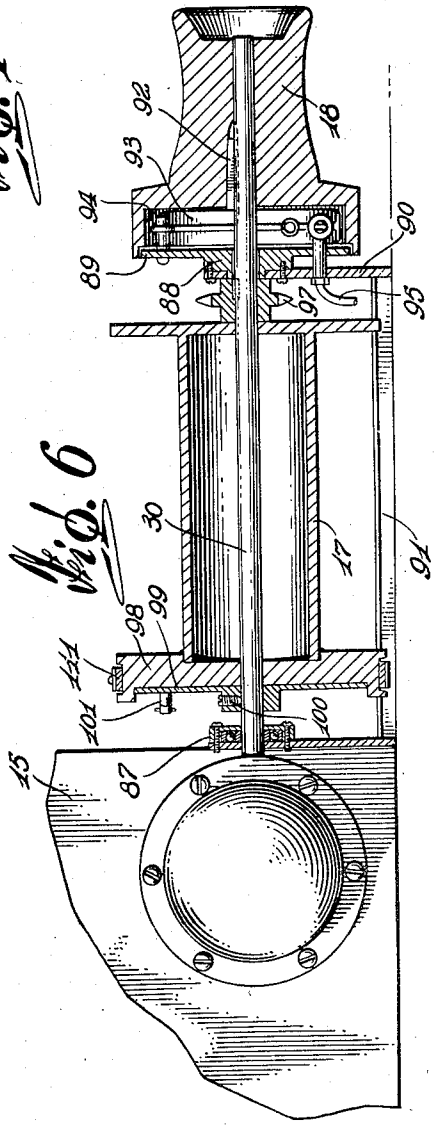
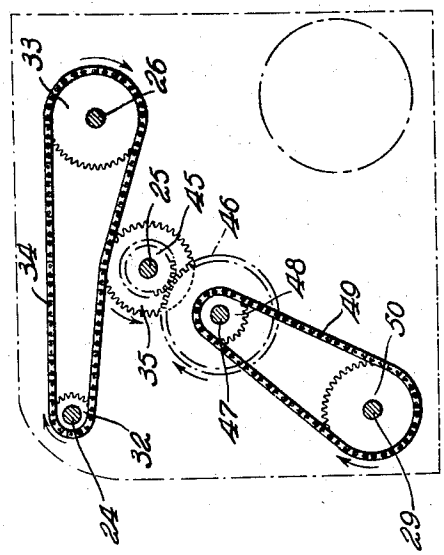


Fig. 5



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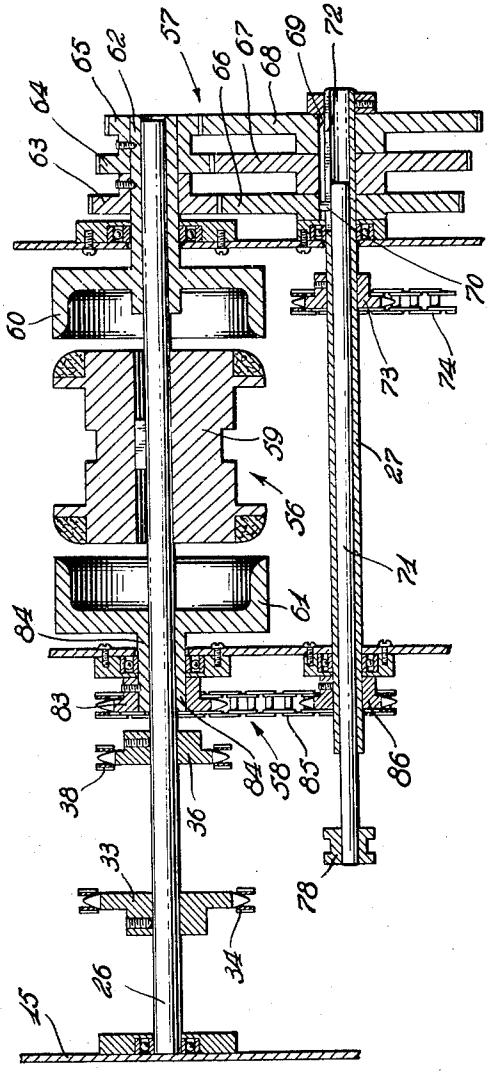


Fig. 8

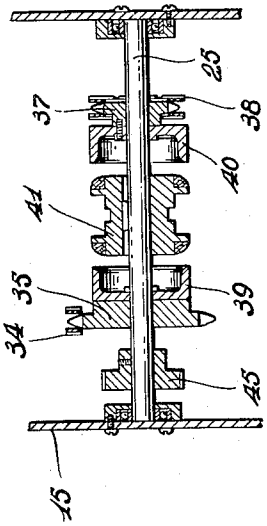


Fig. 9

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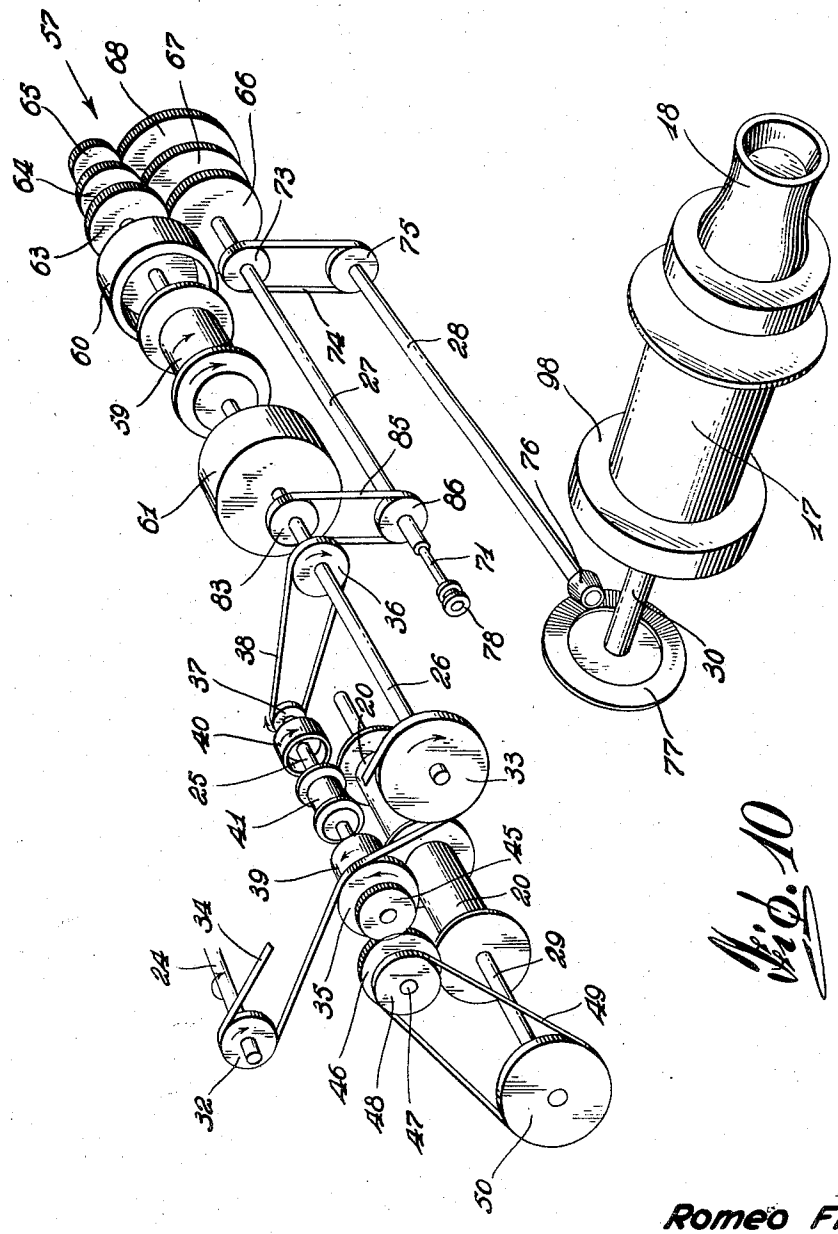


Fig. 10

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United States Patent Office 2,857,137 Patented Oct. 21, 1958

2,857,137

WINCH

Romeo Fillion, Quebec, Quebec, Canada

Application April 20, 1956, Serial No. 579,616

1 Claim. (Cl. 254—185)

The present invention relates to a winch and more particularly to a winch adapted to be used on ships for actuating derricks and the like.

The main object of the present invention is the provision of a winch of the character described having means for actuating the lift of the derrick and also for swinging sideways the boom of the derrick.

An important object of the present invention is the provision of a winch of the character described in which the winch drum for the lift of the derrick is arranged at right angles to the drums for swinging the derrick thereby resulting in a simplification of the rope or cable layout between the winch and the derrick.

Still another important object of the present invention is the provision of a winch arrangement of the character described by which a single operator is able to control both the swinging movement of the boom and the load lifting means of the derrick associated therewith.

Yet another important object of the present incention is the provision of a winch of the character described which provides three forward speeds for the lift drum and one reverse speed for both swing and lift drums.

A further important object of the present invention is the provision of a winch of the character described in which the swing and lift drums are operated independently of one another.

A still further important object of the present invention is the provision of a winch arrangement of the character described in which the swing drums are automatically braked when declutched from the driving means in order to prevent accidental unwinding of said drums.

Still another important object of the present invention is the provision of a winch of the character described provided with a power take-off for connection to a windlass or the like.

Still another important object of the present invention is the provision of a winch of the character described more partcularly adapted for use on small cargo ships for operating the derricks and also the windlass and to draw the ship alongside a quay.

The foregoing and other important objects of the present invention will become more apparent during the following disclosure and by referring to the drawings in which:

Figure 1 is a perspective view of the winch according to the present invention;

Figure 2 is a perspective view of the transmission arrangement of the winch;

Figure 3 is a top sectional view of the winch;

Figure 4 is a longitudinal section of part of the same;

Figure 5 is a diagrammatic view of the gears for actuating the swing drums;

Figure 6 is a longitudinal section of the lift drum and warping drum or nigger head;

Figure 7 is a cross-section showing the means for locking and unlocking the lift drum to the driving disk;

Figure 8 is a longitudinal section of the main clutch and change speed gears;

Figure 9 is a longitudinal section of the clutch for the swing drums; and

Figure 10 is a diagramatic perspective view of the driving elements of the winch.

Referring now more particularly to the drawings in which like reference characters indicate like elements throughout, reference numeral 11 indicates a base or platform on which is mounted the winch according to the present invention, together with an operator's seat 12 and a footrest 13. The winch is provided with a driving engine shown at 14, which may be an electric motor or an internal combustion engine such as a gasoline or a diesel engine. The driving gears are housed in housing 15 and the following controls are accessible at the operator's station defined by the seat 12: a control lever 16 for controlling the direction of rotation of the lift drum 17 and niggerhead 18; a control lever 19 for controlling the direction of rotation of the swing drums 20, shown in Figure 2; a speed adjusting lever 21 for controlling the forward speeds of the lift drum 17 and niggerhead 18; a hand brake lever 22 for braking the lift drum 17 and a foot brake lever 23 for the niggerhead or warping drum 18, and for the lift drum 17.

Referring to Figure 2, it will be seen that the transmission gears and clutches are mounted on five parallel spaced shafts 24, 25, 26, 27 and 28; said shafts are parallel to the shaft 29 on which the swing drums 20 are secured and are perpendicular to the shaft 30 on which the lift drum 17 and niggerhead 18 are mounted. The driving shaft 24 is rotated by the motor 14 through a speed reduction box 31 and drives a chain pulley 32 which is connected to the chain pulley 33 by the chain 34. The chain pulley 33 is secured to the shaft 26 which thus rotates in the same direction as the driving shaft 24. The gear chain 34 also meshes with the chain pulley 35 which is freely rotatable on the shaft 25 and turns in a direction opposite to the direction of rotation of the driving shaft 24. A chain pulley 36 is secured to the shaft 26 and drives through gear chain 38 a chain pulley 37 which is mounted for free rotation on the shaft 25. A double clutch unit is mounted on the shaft 25, the female parts 39 and 40 of which are secured to the chain pulley 35 and chain pulley 37 respectively; and the male part 41 of which is keyed to the shaft 25 but is arranged for longitudinal sliding movement thereon to either engage the female part 39 or the female part 40 or to be in neutral position disengaging both said female parts. The male part 41 of the double clutch is controlled through a forked lever arrangement by the control lever 19 shown in Figure 1. The forked lever actuating the male part 41 of the double clutch unit is shown at 43 in Figure 3, said forked lever being secured to a shaft 44 which is journalled in the housing 15 and the projecting end of which mounts the control lever 19 as shown in Figure 1.

It will be understood that when the control lever 19 causes the male part 41 to engage with the female part 40, the shaft 25, together with the gear wheel 45 secured thereto, will be rotated in the same direction as the driving shaft 24 through the following elements: shaft 24, chain pulley 32, chain 34, chain pulley 33, shaft 26, chain pulley 36, chain 38, chain pulley 37, female part 40 which is rigid with the chain pulley 37, male part 41, shaft 25 and gear wheel 45.

If the male part 41 is shifted into engagement with the female part 39 of the double clutch unit, the shaft 25 and gear wheel 45 will be rotated in a direction opposite to the direction of rotation of the driving shaft 24 through the following elements: driving shaft 24, chain pulley 32, chain 34, chain pulley 35, female part 39, male part 41, shaft 25 and gear wheel 45.

The gear wheel **45** is in meshing engagement with a larger gear wheel **46** secured to an intermediary stud shaft **47**, which also mounts a smaller chain pulley **48** in driving connection with the swing shaft **29** through chain **49** and chain pulley **50**. Thus it will be apparent that the swing drums **20** may be rotated forwardly or backwardly or may be kept idle. There is only one forward speed and one reverse speed for the swing drums and the latter are completely controlled by the control lever **19** which actuates the double clutch unit **39**, **40** and **41**. In order to lock the swing drums **20** against rotation when declutched an automatic hydraulic brake system disposed in a housing **51** (see Figure 3) is controlled through a fluid line **52** by a hydraulic actuator **53**, the piston head **54** of which is pressed by a finger **55** when the male part **41** of the double clutch unit is in neutral position. The finger **55** is secured to the spindle **44**.

The lift drum **17** and warping drum **18** are actuated from the same motor **14** as that used for actuating the swing drums **20**. But the drums **17**, **18** have three forward speeds and one reverse speed and their operation is completely independent from that of the swing drums **20**.

The means for actuating the lift drum and warping drum consist of the following elements: a double clutch unit **56**, a change speed mechanism **57**, and a reverse drive unit **58**.

The double clutch unit **56** has the same construction as the double clutch unit used in conjunction with the swing drums **20**. Said double clutch unit **56** comprises a male part **59** keyed to the shaft **26**, but slidable thereon for longitudinal axial movement and selectively engageable with two endwise disposed female clutch parts **60** and **61** which are freely revolving on the shaft **26**. The female clutch part **60** is used for forward drive and is provided with an elongated sleeve **62** (see Figure 8) on which are secured three gear wheels of decreasing diameters **63**, **64** and **65** and respectively meshing with three gear wheels of increasing diameters **66**, **67** and **68**. The gear wheels **66**, **67**, and **68** are freely revolving on the tubular shaft **27** and are each provided with a keyway **69** selectively engageable by a radially extending pin **70** which is mounted on a speed selecting rod **71** slidable within the tubular shaft **27**. The pin **70** is slidable within a longitudinal slit **72** made in the tubular shaft **27**. In the position shown in Figure 8, the pin **70** engages the keyway of the gear wheel **66** whereby the latter rotates the tubular shaft **27** at the fastest forward speed. The tubular shaft **27** is drivingly connected to the shaft **28** through the chain pulley **73**, which is secured to the tubular shaft **27**, chain **74** and chain pulley **75** which is secured to one end of the shaft **28**. The other end of the shaft **28** is provided with a bevelled pinion **76** in meshing engagement with a bevelled gear **77** itself secured to the shaft **30** of the lift drum **17**.

From the foregoing it will be seen that when the male part **59** of the double clutch unit **56** is in engagement with the female part **60**, the lift drum **17** may be rotated at any one of three forward speeds which are determined by the selected position of the pin **70** controlled by the selector rod **71** through the means of a grooved wheel **78**, a fork **78'**, a rod **79** and the control arm **21** (see Figures 1 and 2). The rod **79** is journalled in and projects outwardly of the housing **15** and the arm **21** is secured to the projecting end thereof so that rotation of the arm **21** will rotate the shaft rod **79** about its own axis to thereby swing the fork **78'** in a plane containing the selector rod **71**. The adjusted position of the control arm **21** is maintained by means of a plunger finger **80** engageable with any one of the recesses **81** made in an arcuate plate **82** which is secured to the side of housing **15**.

When the male part **59** of the double clutch unit **56** is in engagement with the female part **61**, the lift drum **17** and warping **18** are rotated in the reverse direction and at a single speed through the following means: chain pulley **83**, secured to the sleeve **84** of the female part **61**, gear chain **85** trained on the chain pulley **83** and on a chain pulley **86** which is secured to the tubular shaft **27**, chain pulley **73**, chain **74**, chain pulley **75**, shaft **28**, pinion **76**, bevelled gear **77** and shaft **30**.

Figures 6 and 7 show the warping drum and lift drum arrangement. The shaft **30** is journalled in ball bearings **87** at the side of the housing **15** and projects from said housing to be journalled in a sleeve **88** of a stationary disk **89** which is secured to an upright plate member **90**, the latter being rigidly connected to a base plate **91** itself secured to the housing **15**.

The warping drum **18** or niggerhead is keyed to the shaft **30** by means of a key **92**. A brake band **93** is disposed within a cylindrical recess **94** of the warping drum **18** and is mounted on the stationary disk **89**. The brake band **93** is of conventional type and is actuated by pressure fluid supplied thereto through tubing **95** which is connected to an actuator piston and cylinder unit **96** operable by the foot pedal **23**, as shown in Figure 3. Thus, when the warping drum or niggerhead **18** is declutched, its unwinding movement may be controlled by the foot brake **23**, the latter also controlling the unwinding movement of the lift drum **17** when said lift drum is keyed to the shaft **30** as described hereinafter.

A sprocket gear **97** is keyed to the shaft **30** intermediate the lift drum **17** and the support member **90**; this sprocket gear **97** serves as a power takeoff for a windlass or the like.

The lift drum **17** is mounted for free rotation on the shaft **30** but is engageable therewith through the following means: the drum **17** is provided with an end disk **98** which is in face to face contact with a disk **99** which is itself secured to the shaft **30** as shown at **100**. Releasable latching means **101** are provided between the disks **98** and **99**. Said latching means are shown in more detail in Figure 7 and consist in a cylindrical member **102** threaded in an aperture made in the disk **99** and in which is mounted a plunger **103** normally urged by a spring **104** into locking engagement in a recess or short bore **105** made in the disk **98** of the lift drum **17**. The outer end face of the sleeve **102** has a V-shaped recess as shown at **106** and the head **107** of the plunger **103** has a complementary V-shaped end face **108** engageable with the end face **106** to allow the plunger **103** to take a locking position. When the plunger is turned through 90°, the apex edge **109** of the head **107** will contact the lateral edges **110** of the sleeve **102** so as to maintain the plunger in releasing position.

The lift drum **17** is also provided with an emergency hand brake arrangement comprising a friction band **111** surrounding the disk **98** of the lift drum **17** and secured at one end to a bolt **112** serving as adjusting means and engaging a side plate **113** as shown in Figure 1. The other end of the friction band **111** is attached to a side arm **114** integral with the hand brake lever **22** which is pivoted at **115** on the side of the housing **15**.

The housing **15** forms a fluid-tight casing which will normally be filled with lubricating oil in which all the gear elements of the winch will be submerged for minimum wear.

From the foregoing it will be seen that the winch, according to the present invention, is very compact and that a single operator may control a derrick on a cargo ship which is contrary to the usual procedures in which at least three operators are required for controlling the lift drum and the two swing drums; the latter are normally disposed at some distance from each other.

Referring to Figure 1, it is seen that actuation of the lever **19** controls the swing drums as follows: in the neutral middle position of the lever **19**, the drums are kept inoperative and when the lever **19** is rotated from side

to side the drums are rotated forward or reverse. Similarly, the control lever **16** will control the lift drum **17** and warping **18**.

Lever **16** is secured to a shaft **116** (Figures 3 and 4) to which a fork **117** is also secured. Said fork **117** pivotally engages a band **118** which is in slidable engagement with an annular groove **119** made in the male part **59** of the clutch **56**.

When the lever **16** is in upright neutral position, the drums **17** and **18** will be kept inoperative, and when lever **16** is pushed forwardly or rearwardly, the drum **17** and **18** will be correspondingly rotated in forward or reversed direction. Finally, the speed control lever **21** is positioned to obtain the desired forward speed of the drums **17** and **18**.

When the winch is used to operate some other elements than the derrick with which it is normally associated, the lift drum **17** is declutched by the latching means **102**, and the lever **19** is maintained in neutral position, and, therefore, only the sprocket gear **97** and the warping drum **18** are operated and controlled by the speed control lever **21** and the control lever **16**.

Normally the winch drum, according to the present invention, is disposed such that the operator faces the derrick; thus the cable wound on the lift drum **17** can be run directly to the base of the boom of the derrick while, due to the fact that the swing drums are at right angles to the lift drum **17**, the cables wound thereon can be run directly to opposite sides of the ship and back again to the boom of the derrick whereby said boom may be swung through a maximum angle.

It will be noted that due to the fact that the control and operation of the swing drums is entirely independent from the control and operation of the lift drum, the boom associated with the winch, according to the present invention, can be operated in such a manner that swinging thereof may be effected simultaneously with the lifting of the load whereby operation of the derrick is effected at a much greater speed than if the boom is swung to the desired position before or after the lifting means are operated.

In the drawings and in the foregoing description, the two double clutch units are of the cone type, but it is obvious that other conventional types of double clutch systems may be used such as, for instance, the disc type double clutch.

While a preferred embodiment according to the present invention has been illustrated and described, it is understood that various modifications may be resorted to without departing from the spirit and scope of the appended claim.

What I claim is:

A winch for operating a derrick having a boom, a load lifting cable carried by said boom and boom swinging cables attached to said boom; said winch comprising a lift drum on which said lifting cable is wound, swing drums disposed at right angles to said lift drum and on which said boom swinging cables are wound, a single driving shaft connected to a single motive power supply and transmission means between said single driving shaft and said lift drum and swing drums, said transmission means comprising a first shaft connected by transmission means to said single driving shaft, a first double clutch unit mounted on said first shaft, a second shaft connected by transmission means to one of said drums, means operatively connecting one part of said double clutch unit with said second shaft to rotate said drum in one direction of rotation and additional means operatively connecting a second part of said clutch unit with said second shaft to rotate said second shaft in a direction to cause rotation of said one drum in the other direction of rotation, a third shaft connected by transmission means to the other of said drums, a second double clutch unit mounted on said third shaft and transmission means operatively connecting said first and third shafts and associated with two parts of said second double clutch unit to rotate said third shaft in either one of two directions of rotation to thereby cause corresponding rotation of said other drum, each double clutch unit comprising a male part keyed to its associated shaft but axially slidable thereon and two female parts spacedly disposed and facing the respective ends of said male part and freely rotatable on said associated shaft, and control lever means associated with said male part to displace the same on its shaft between end positions in which said male part drivingly engages a selected one of said female parts and a neutral position in which said male part is disengaged from both said female parts, said winch further including hydraulic brake means associated with said swing drums and a finger associated with the male part of said double clutch unit associated with said swing drums to operate said hydraulic brake means to lock said swing drums when said double clutch unit is in neutral position.

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