May 28, 1957 C. H. DAUDT 2,793,740

WINCH

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Fig. 1

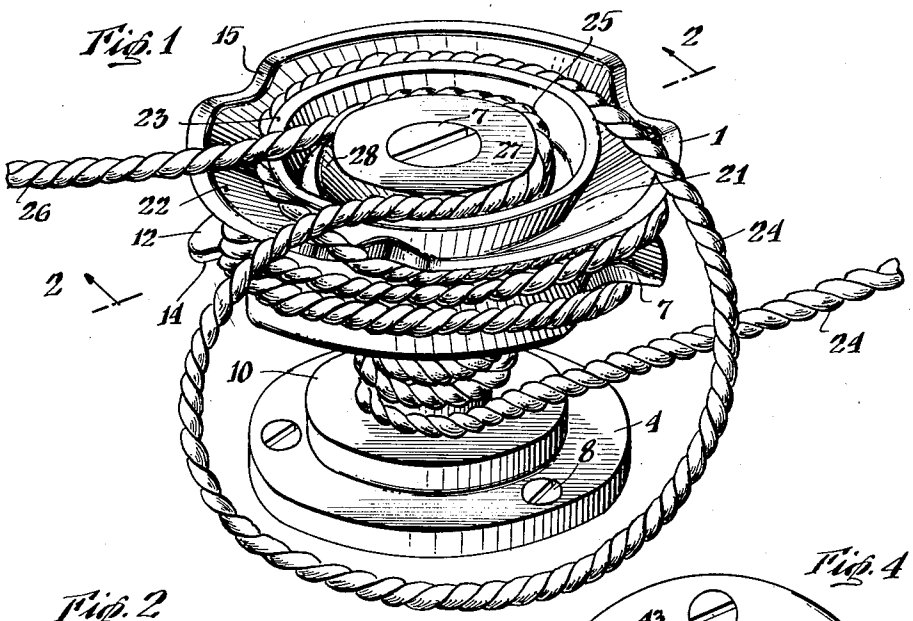


Fig. 2

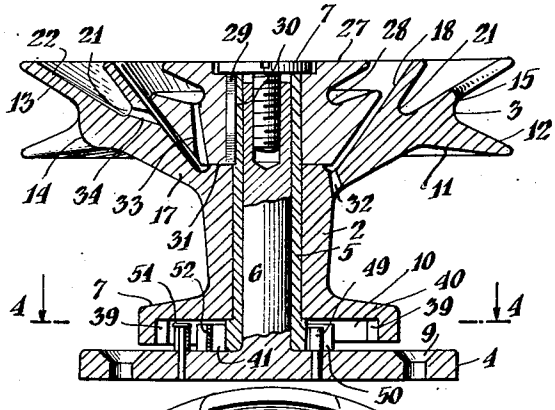


Fig. 4

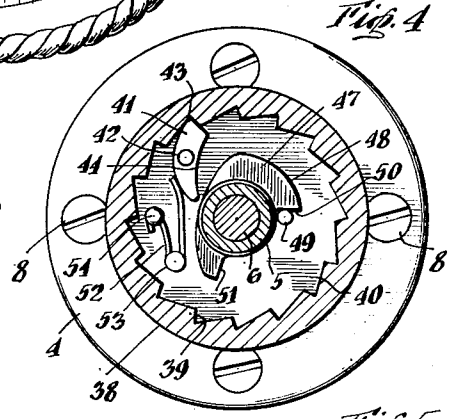


Fig. 3

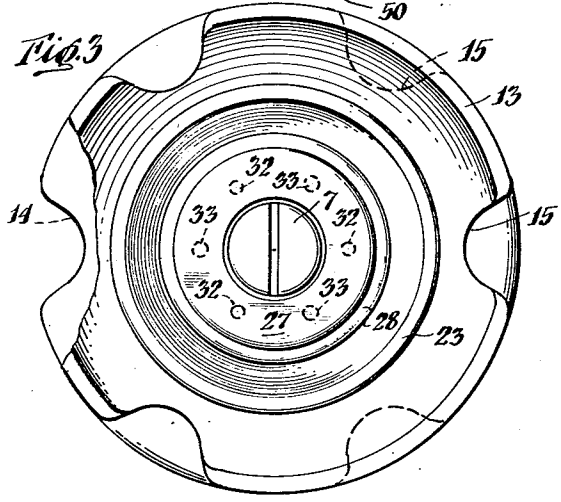
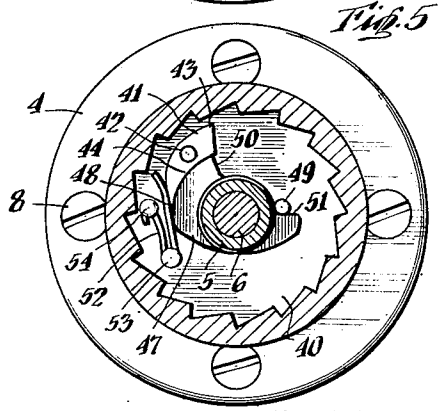


Fig. 5



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WINCH

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7 Claims. (Cl. 203—399)

This invention relates to a type of winch to be used in the handling of lines on boats, especially small sailing yachts.

One of the objects of this invention is to provide a winch which eliminates the need for a separate means, such as a crank, to provide additional leverage when taking in a line.

Another object of this invention is to provide a winch which has the usual ratchet means allowing rotation of the winch in only one direction but which has a simplified means for releasing the ratchet when it is desired that the winch rotate freely and in which the ratchet means is reset by itself when the winch is again used in the normal manner.

A further object of this invention is to provide a circular cleat operatively associated with the winch that is self-releasing when line is payed out.

A further object of the invention is to provide a winch having the above features and which can be released for paying out line from any position in the boat without the possibility of the line fouling on the winch or on any of its associated parts.

Other and further objects of the invention will be seen upon consideration of the below description, and the accompanying drawings.

These drawings are:

Fig. 1 is a perspective view of the winch with the line secured about it prior to release;

Fig. 2 is a section taken on line 2—2 of Fig. 1 but without the rope;

Fig. 3 is a top elevation of the winch, partially cut away to show additional structure;

Fig. 4 is a section taken on line 4—4 of Fig. 2 showing the winch in its locked or ratchet position;

Fig. 5 is a section taken along line 4—4 of Fig. 2 showing the winch in its released position.

In general, this invention relates to a winch **1**, as shown in Fig. 1, which has a lower winding drum **2** for receiving a line **24**, the line being for instance the jib sheet of a sailing vessel. Above the winding drum, and preferably integral therewith, is a second drum, a leverage drum **3**, about which the line may be wound after passing about the lower winding drum. Since the diameter and circumference of the leverage drum is greater than the diameter and circumference of the winding drum, a mechanical advantage is obtained when the line is pulled after having passed about both drums rather than just about the winding drum.

As is usual in winches used for this purpose, this winch is preferably designed to be used with the line wound in a clockwise direction, as viewed from above and as shown in Fig. 1. That is, the ratchet means ordinarily locks and prevents rotation of the drums in a counterclockwise direction. Under these circumstances, the line may be secured in the winch jam cleat located above but concentric with the leverage drum, after it has been passed around the leverage drum.

The winch has a second type of jam cleat structure **28** located in a space within the first. This jam cleat, formed upon a releasing drum **27**, serves as the means of releasing the main ratchet means. When it is rotated in a counterclockwise direction, it allows the leverage and winding drums to rotate freely in a counterclockwise direction, by a mechanism to be later described. The cleat on this releasing drum allows the drum to be secured to a line and so enables the winch to be released at a distance.

As shown in the drawings and especially in Fig. 1 and Fig. 2, the winch of this invention is depicted generally by the numeral **1**. This winch has a winding or lower drum **2** and a leverage or upper drum **3** of greater diameter. Preferably the diameter of the leverage drum will be three times that of the winding drum. As shown, the winding and leverage drums are formed of one piece **17**. This unitary structure **17** is rotatably mounted on axle **6**; and axle **6** is preferably unitary with the base portion **4**. Base **4** is secured to the deck of the vessel or at any other desired place by screws **8** passing through screw holes **9**. A retaining screw **7** is mounted in the upper portion of axle **6** and the head of screw **7** retains sleeve **5** and releasing drum **27** in position.

The drum structure **17** and the sleeve **5** are free to rotate about axle **6** and are independent of each other. However, for purposes to be described below, it is desirable that there be some frictional contact between sleeve **5** and piece **17**. This friction need not be great as long as the total frictional resistance between part **17** and sleeve **5** is greater than that between sleeve **5** and axle **6**.

The lower winding drum **2** is adapted to receive the line **24** to be wound around the winch. It has a flange **10** at its lower edge and a flange **11** at its upper edge for retaining the line on winding drum **2**. The winding drum **2** preferably has a slight taper, with its lower diameter slightly smaller than its upper diameter so that the line **24** will wind more evenly about the drum.

Flange **11** is enlarged outwardly from winding drum **2** to form an upper or leverage drum **3**, of greater diameter than winding drum **2**. Leverage drum **3** has lower flange **12** and upper flange **13** to retain the line **24** upon drum **3**.

Formed about flange **13** but preferably also being part of unitary structure **17** is the circular jam or pinch cleat **21**. This cleat is formed by the annular surfaces **22** and **23**, the former being preferably simply the upper side of retaining flange **13**. As shown in Fig. 2, surfaces **22** and **23** converge generally toward each other as they approach their axis. The distance between surfaces **22** and **23** at the inner portion of jam cleat **21** should be less than the normal diameter of the line **24** that is used on the winch, enabling the cleat **21** to grip and hold a line forcibly placed within the cleat.

Flanges **12** and **13** of the leverage drum **3** are provided with line-admitting notches **14** and **15**, respectively, as best shown in Figs. 1, 2 and 3. These notches, as will be described below, prevent the line from slipping along the circumferences of flanges **12** and **13** as the line **24** is passed from winding drum **1** to leverage drum **3** and from leverage drum **3** to the circular cleat **21**. This is especially important when the line is under tension.

Mounted about sleeve **5** above piece **17**, and preferably in a space **18** defined within the circular jam cleat **21**, is a line-gripping releasing drum **27**. This releasing drum **27** is held in position on sleeve **5** by the head of the retaining screw **7**. It is keyed to sleeve **5** by key **29** fitting in key slot **30**, thus preventing relative rotary motion between the releasing drum **27** and sleeve **5**. Releasing drum **27** has an annular pinch cleat or slot **28** so dimensioned as to grip and hold the line **24** when forced within the slot **25**. The structure and gripping action of cleat **28** are comparable to that of the circular jam cleat **21**.

Preferably the lower surface of drum **27** rests upon

the upper surface of the winding leverage drum unit **17** at point **31**, as shown in Fig. 2.

It can be seen, therefore, that the releasing drum **27** may be rotated independently of the winding and leverage drum unit **17** and axle **6** but not independently of sleeve **5**.

Drain holes **32**, **33** and **34** are provided to allow drainage of any water entering the space **18**, the cleat **28** or the cleat **21**, respectively, as shown in Fig. 2. Preferably there are three of each of these holes located 120° apart. It is preferable that holes **32**, **33** and **34** be in the form of truncated cones with their wider diameters in their lower portions to allow for the more ready release of any small particles which may enter into space **18**, cleat **21**, or cleat **28**.

The ratchet means for this winch is shown in Figs. 2, 4 and 5. Ratchet teeth **39** are formed on the inner surface of the lower portion **38** of flange **10**. Pivotally mounted on the upper surface **40** of base **4** is a pawl **41** mounted on pivot **42**. Pawl **41** has an engaging edge **43** for engagement with teeth **39**. It is normally held against teeth **39** by leaf spring **52**, secured by pins **53** and **54**. The pins themselves are mounted in and through base **4** and surface **40**. Fig. 4 shows pawl **41** engaging one of teeth **39** and so preventing counterclockwise rotation of unit **17**.

Pawl **41** has an inner arcuate cam surface **44**. This surface is shaped to cooperate with cam surface **48** on releasing cam **47**. Releasing cam **47** itself is secured to sleeve **5**. Stop pin **49** is mounted in and through base **4** and surface **40** to limit the motion of the cam **47** between cooperating surfaces **50** and **51**.

In Fig. 5 cam surface **48** is shown in cooperating contact with cam surface **44** of pawl **41** so as to release the ratchet action of pawl **41** upon teeth **39**. Under these circumstances, unit **17**, including winding drum **2** and leverage drum **3**, is enabled to rotate freely counter-clockwise.

It will be seen that cam surface **48** engages with cam surface **44** throughout substantially the entire length of surface **44**. This serves to immobilize pawl **41** against any motion, avoiding any possibility of accidental engagement of pawl **41** and teeth **39**.

When the winch is to be used, the line **24** is wound clockwise about winding drum **2** in the usual manner. As is usual with simple winches, when slight tension is kept upon the free end **26** of line **24**, the friction between winding drum **2** and line **24** will serve to hold line **24** against motion relative to drum **2**. The line can then be pulled in on winding drum **2** and, since the drum will not now rotate counter-clockwise, can easily be held as trimmed.

In many instances, such as in trimming a jib sheet, it is necessary to have additional leverage for the last bit of trimming. This is accomplished by taking a few turns of the line about leverage drum **3** after it is passed around winding drum **2**. The line is led to leverage drum **3** from drum **2** through one of the notches **14**. Thus it can be seen that when the line **24** is pulled upon after having passed around both drums a mechanical advantage is provided as between the portion of the line actually pulled from the leverage drum by the person using the winch and the portion of the line forming the jib sheet proper.

After the sheet or other line has been trimmed sufficiently, the line may be led through notch **14** to circular jam cleat **21** and, by application of a small amount of force, wedged within cleat **21**, thus securing line **24** against its paying out.

Either at that time or just before it is desired to release line **24** from the winch, a bight **25** of the line **24** is secured to the cleat **28** in releasing drum **27** in a counter-clockwise direction, as shown in Fig. 1. Thus, by applying a small amount of force to the free end **26** of the line **24**, releasing drum **27** will be rotated in a counter-clockwise direction and will release the ratchet means, i. e. pawl **41**, of the winch, allowing drums **2** and **3** to rotate freely in a counter-clockwise direction.

The operation of the ratchet means is as follows: With the line **24** wound about winding drum **2** but not about releasing drum **27** and tension applied, the winding drum will be rotated. Here, the rotation will be in a clockwise direction since the tension is applied to free end **26**. Under these circumstances pawl **41** will allow the teeth **39** to pass by it. When rotation is stopped, however, spring **52**, acting upon pawl **41**, will cause the engaging portion **43** of the pawl to mesh with one of teeth **39** and to prevent counter-clockwise rotation of unit **17** of which teeth **39** are a part.

When, however, releasing drum **27** is rotated in a counter-clockwise direction, either with the hand or by means of tension on bight **25** of the line **24**, as above described, it will rotate sleeve **5** counter-clockwise, since it is carried by and attached to that sleeve. This counter-clockwise rotation accordingly rotates releasing cam **47** and causes cam surface **48** of releasing cam **47** to engage with the inner arcuate cam surface **44** of pawl **41**. This rotation may be continued until stop surface **51** engages with pin **49** as shown in Fig. 5. When releasing cam **47** in this position, pawl **41** has been pressed against the action of spring **52** and thereby edge **43** is disengaged from teeth **39**. This action releases the winch unit **17**, allowing it to move freely in a counter-clockwise direction as a result of tension in line **24**.

Line **24** then freely pays off winding drum **2**, leverage drum **3** and jam cleat **21**, the latter occurring due to the counter-clockwise rotation and the tension on the line. It will be released from slot **28** of the releasing drum **27** by centrifugal and counter-clockwise force on that portion of line **26** between slot **21** of the circular jam cleat and slot **28** of the releasing drum **27**.

The friction between the inner surface of unit **17** and sleeve **5** serves to keep sleeve **5** tending in a counter-clockwise direction during the period that line is being unwound from winding drum **2** and leverage drum **3**. This counter-clockwise torque on sleeve **5** in turn keeps cam **47** engaged with pawl **41**, thus maintaining the ratchet in released position.

Due to the mushroom-like shape of the winch **1**, the line, in being released, moves upwardly and away from the winch and so avoids fouling. This action is believed to be caused by the centrifugal force on the line **24** resulting from the relatively high peripheral velocity of the leverage drum **3** unwinding the line with the loose end of the line **26** above winch **1**.

The next time it is desired to utilize the winch, the line is again wound clockwise around winding drum **2**. Upon the application of the pull necessary to trim in the line, winding drum **2** and unit **17** are rotated clockwise. Due to the friction between the inner surface of unit **17** and sleeve **5**, sleeve **5**, carrying releasing drum **27** and the releasing cam **47**, is rotated clockwise until surface **50** of cam **47** contacts pin **49**. With this rotation, releasing cam **47** is removed from operative engagement with the pawl **41**, and, due to the action of spring **52**, pawl **41** again engages with teeth **39**. Consequently, once again the winding drum **2** and the leverage drum **3** forming the unit **17** will be limited to clockwise rotation by the pawl **41** and teeth **39** combination and so act as a winch. The procedure above outlined for use of the leverage drum **3**, circular jam cleat **21** and releasing drum **27** may then be repeated.

As can be seen, the winding drum **2** may be rotated clockwise, to engage the pawl **41**, by hand as well as by use of line **24**, if desired. This hand rotation also applies to the counter-clockwise rotation of the releasing drum **27**, to release the pawl **21** for free rotation of winding drum **2**.

Various modifications of the above described invention may be made, of course, without departing from the spirit thereof.

I claim:

1. A device of the character described including a winch base, a winding drum rotatably mounted on said base, a ratchet associated with said winding drum normally allowing rotation of said drum in but one direction, and a ratchet releaser operatively associated with said ratchet, said winding drum and said ratchet releaser being frictionally associated so that rotation of said winding drum in its released direction serves to maintain said ratchet releaser in its releasing position and subsequent rotation of said winding drum in its normal direction disengages said ratchet releaser from said ratchet.

2. A winch including a base, an axle secured to said base, a sleeve rotatably and frictionally mounted on said axle, a winding drum rotatably and frictionally mounted on said sleeve, the friction between said drum and said sleeve being greater than the friction between said sleeve and said axle, ratchet means associated with said drum and said base normally allowing rotation of said drum in only one direction relative to said base, and ratchet releasing means rotatable with said sleeve and operatively associated with said ratchet means, so constructed and arranged that rotation of said sleeve in a direction opposite to that of free rotation of said winding drum causes said ratchet releasing means to release said ratchet means and rotation of said sleeve in the opposite direction makes said ratchet releasing means inoperative.

3. A winch including a base, an axle secured to said base, a sleeve rotatably and frictionally mounted on said axle, a winding drum rotatably and frictionally mounted on said sleeve, the friction between said drum and said sleeve being greater than the friction between said sleeve and said axle, ratchet means associated with said drum and said base normally allowing rotation of said drum in only one direction relative to said base, ratchet releasing means rotatable with said sleeve and operatively associated with said ratchet means, so constructed and arranged that rotation of said sleeve in a direction opposite to that of free rotation of said winding drum causes said ratchet releasing means to release said ratchet means and rotation of said sleeve in the opposite direction makes said ratchet releasing means inoperative, the friction between said drum and said sleeve serving to maintain said ratchet releasing means in its releasing position when said winding drum is rotated in its released direction and serving to disengage said ratchet releasing means from said ratchet upon subsequent rotation of said winding drum in its normal direction.

4. A winch including a base, an axle secured to said base, a sleeve rotatably and frictionally mounted on said axle, a winding drum rotatably and frictionally mounted on said sleeve, the friction between said drum and said sleeve being greater than the friction between said sleeve and said axle, ratchet means associated with said drum and said base normally allowing rotation of said drum in only one direction relative to said base, ratchet releasing means rotatable with said sleeve and operatively associated with said ratchet means, so constructed and arranged that rotation of said sleeve in a direction opposite to that of free rotation of said winding drum causes said ratchet releasing means to release said ratchet means and rotation of said sleeve in the opposite direction makes said ratchet releasing means inoperative, and a circular cleat secured to said sleeve and having the same axis of rotation as said sleeve, said cleat being adapted to hold a line so that tension upon said line may be used to actuate said ratchet releasing means.

5. A winch including a base, an axle secured to said base, a sleeve rotatably and frictionally mounted on said axle, a winding drum rotatably and frictionally mounted on said sleeve, the friction between said drum and said sleeve being greater than the friction between said sleeve and said axle, ratchet teeth on said winding drum proximate to said base, a spring-pressed pawl pivotally mounted on said base and normally engaging with said teeth so that said drum may normally rotate in only one direction relative to said base, a releasing cam secured to said sleeve adjacent said base and capable of acting upon said pawl to disengage same from said teeth, stop means on said base limiting the arc of rotation of said cam, said pawl and said cam being so constructed and arranged that rotation of said sleeve in a direction opposite to that of free rotation of said winding drum causes said cam to engage with said pawl and to disengage the latter from said teeth and subsequent rotation of said winding drum in its normally free rotation will cause said sleeve and said cam to rotate and thereby disengage said cam and said pawl.

6. A winch including a base, an axle secured to said base, a sleeve rotatably and frictionally mounted on said axle, a winding drum rotatably and frictionally mounted on said sleeve, the friction between said drum and said sleeve being greater than the friction between said sleeve and said axle, ratchet teeth on said winding drum proximate to said base, a spring-pressed pawl pivotally mounted on said base and normally engaging with said teeth so that said drum may normally rotate in only one direction relative to said base, a releasing cam secured to said sleeve adjacent said base and capable of acting upon said pawl to disengage same from said teeth, stop means on said base limiting the arc of rotation of said cam, said pawl and said cam being so constructed and arranged that rotation of said sleeve in a direction opposite to that of free rotation of said winding drum causes said cam to engage with said pawl and to disengage the latter from said teeth and subsequent rotation of said winding drum in its normally free direction will cause said sleeve and said cam to rotate thereby disengaging said cam and said pawl, a circular cleat secured to said sleeve and having the same axis of rotation as said sleeve, said cleat being adapted to hold a line so that tension upon said line may be used to actuate said releasing cam, and a leverage drum integral with said winding drum and rotatable about the same axis as said winding drum, said leverage drum having a greater diameter than said winding drum.

7. A winch of the character described including a base, a winding drum rotatably secured to said base, a leverage drum secured against rotation relative to said winding drum and having a diameter greater than that of said winding drum, a circular jam cleat secured against rotation relative to said leverage drum, ratchet means associated with said base and with said drums normally preventing rotation of said drums in one direction, ratchet releasing means, and a second circular jam cleat actuating said ratchet releasing means upon rotation in a direction opposite to that of the direction of free rotation of said drums; said winding drum, said leverage drum, said cleat, and said second cleat all having the same axis of rotation.

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