March 6, 1934. J. M. BENSON 1,950,289

SCAFFOLD HOIST

Filed March 22, 1933 2 Sheets-Sheet 1

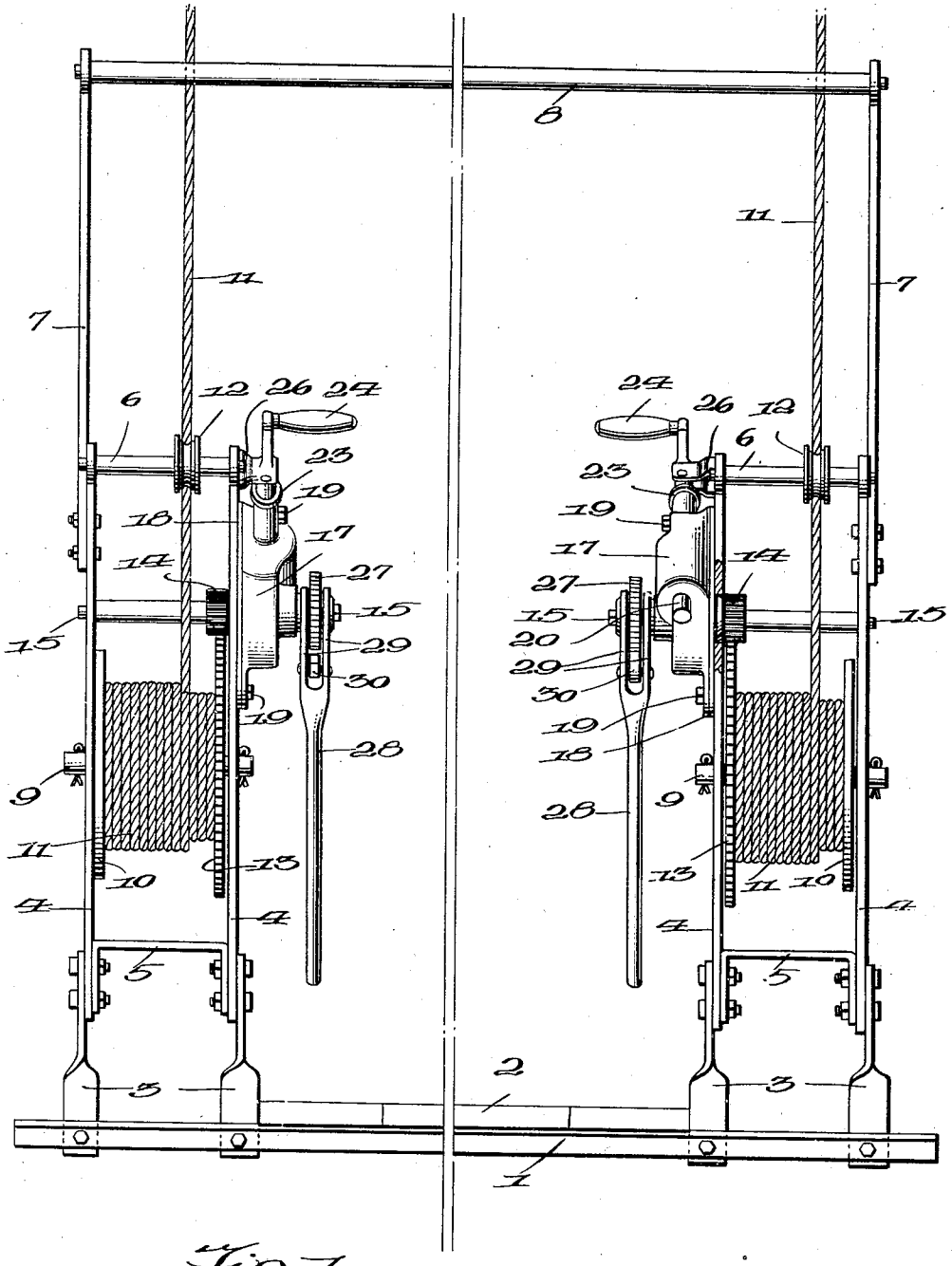


Fig. 1.

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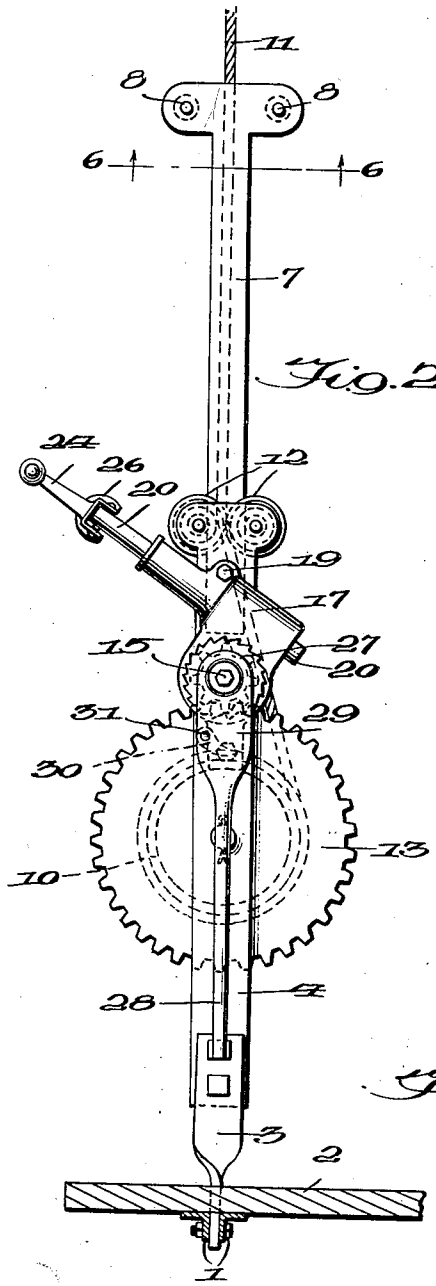


Fig. 2.

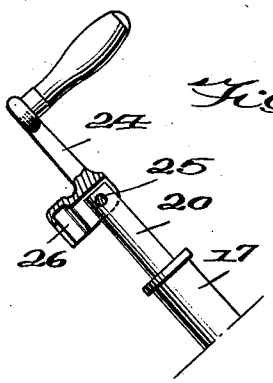


Fig. 3.

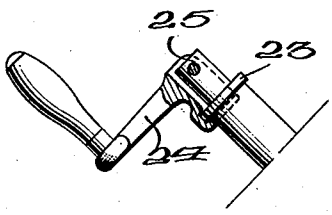


Fig. 4.

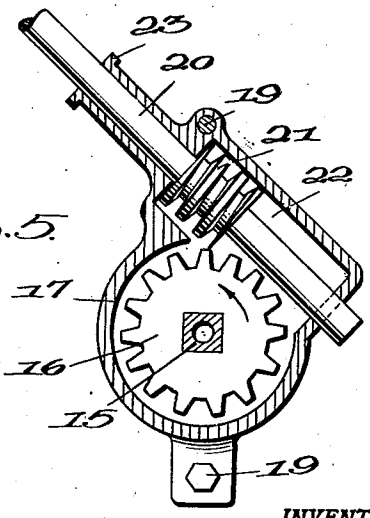


Fig. 5.

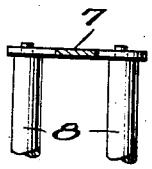


Fig. 6.

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Patented Mar. 6, 1934

1,950,289

UNITED STATES PATENT OFFICE

1,950,289

SCAFFOLD HOIST

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Application March 22, 1933, Serial No. 662,172

24 Claims. (Cl. 254—167)

This invention relates to an improvement in scaffold hoists for a scaffold of the type involving a series of cross pieces upon which the planking forming the platform of the scaffold is laid, the hoist frames being connected with the ends of the cross pieces and carrying drums on which the cables are wound.

The object of my invention is to provide a hoist which is safe against the danger of falling, as sometimes occurs with hoists of the type now commonly used. I utilize a worm and worm wheel for operating the hoist in one direction and a ratchet for operating it in the other direction ordinarily, although the worm may be used, if desired, for both directions. The worm serves as a lock against falling of the hoist, whether the hoist is operated by the worm and worm wheel or by the ratchet, since the worm wheel is connected with the drum driving shaft and provision is made for automatically disengaging the worm from the worm wheel when the shaft is operated by the ratchet, but when the turning action of the ratchet on the shaft ceases, the worm automatically moves into engagement with the worm wheel to lock said worm wheel against rotation in the opposite direction, and thereby in effect acts as a pawl to hold the parts against accidental reverse rotation.

In the accompanying drawings,

Fig. 1 is an end elevation of a scaffold showing my invention applied thereto;

Fig. 2 is a side elevation of one of the hoists;

Fig. 3 is a side elevation partly in section of the worm turning handle structure, the handle being in an unlocked position;

Fig. 4 is a similar view with the handle in locked position;

Fig. 5 is a sectional view partly in elevation through the worm drive mechanism; and

Fig. 6 is a detail sectional view on the line 6—6, of Fig. 2.

I have shown my invention applied to a scaffold of the four-point suspension type, wherein a hoist and cable is arranged at each corner of the scaffold, since this is sometimes required. However, it will be understood that my improvements are also applicable to a structure having only a single hoist at each end of the scaffold.

In the construction shown, the scaffold has cross pieces 1, upon which the flooring boards 2 forming the platform are placed. The opposite ends of the cross pieces 1 are supported by spaced strips 3, suspended from the frame work of each hoist. The hoist frame comprises side plates 4 braced at the lower ends by braces 5, and having spacing rolls 6 connecting the same together at their upper ends. One of these hoist frames is arranged at each opposite side of the scaffold and connected with the ends of the cross pieces 1. The side plates 4 on the outer sides of the scaffold have strips 7 extending upwardly therefrom and secured thereto, which strips have their upper ends connected together by spaced rods 8, thus forming the frame structure, as shown in Fig. 1. The hoists are similar in construction and operation and one will be described for the sake of clearness. A shaft 9 is mounted in the side plates 4, on which shaft is journaled a housing drum 10, receiving one end of a cable 11, which is wound thereon, and said cable extends upwardly from the drum 10 between interfitting guiding rollers 12, slidably mounted on the spacing rolls 6, thence between the rods 8, to an upper portion of the building where the upper end of the cable is fastened in the usual manner of supporting a scaffold.

One end of the drum 10 has a gear 13 fixed thereto meshing with a pinion 14 fixed to a shaft 15, which is journaled in the side plates. One end of the shaft 15 extends through the hoist frame and is squared to receive a worm wheel 16, which is fitted thereto, as shown in Fig. 5. The worm wheel 16 is rotatably mounted in a casing 17 having a cover plate 18 on the inner side thereof, closing said side. The casing 17 and cover plate 18 are secured to the adjacent plate 4 by screws or bolts 19.

Slidably and rotatably mounted in a projecting portion of the casing 17 is a shaft 20, carrying a worm 21 adapted to mesh with the worm wheel 16, and an extended portion of the chamber 22, within which the worm is located permits said worm 21 to move out of mesh with the worm wheel 16, as shown in Fig. 5, whereby the worm wheel may turn without restriction by the worm 21. The casing 17 surrounding the shaft 20 has a collar 23 thereon. A handle 24 is pivoted as at 25 to the extreme end of the shaft 20 and said handle 24 has a clamping yoke 26 at one side of the pinion, grooved on its inner side to receive the collar 23, and said clamping yoke is somewhat greater than a semi-circle to be held in interlocked relation with the collar but to rotative relative thereto.

The outer end of the shaft 15 has a ratchet wheel 27, fixed thereon. A hand lever 28 has a bifurcated end, the arms 29 of which are pivotally mounted on the shaft 15 to turn thereon. Mounted between the arms 29 is a pawl 30 pivoted at

31 in position to engage the teeth of the ratchet wheel 27, as the hand lever 28, swings in an arc around the shaft 15, in order to turn said shaft in one direction.

When using the scaffold, the cables 11 have their upper ends attached to an upper portion of the building in the usual manner, while their lower ends are wound onto the drums 10, in order to raise the scaffold. The operator first swings the handle 24 from the position shown in Fig. 4 to a position corresponding with a position shown in Fig. 3, so as to disengage the clamping yoke 26 from the collar 23, and permit the shaft 20 and worm 21 to move longitudinally relative to the casing 17, enabling the worm 21 to move out of engagement with the worm wheel 16. The operator then oscillates the hand lever 28 and each movement of said lever in a counter-clockwise direction with the pawl 30 in engagement with the teeth of the ratchet wheel 27, imparts rotation to the shaft 15, and through the pinion 14, and gear 13, to the drum 10, winding up the cable 11, thereon and causing the scaffold to be raised.

As the shaft 15 rotates it turns the worm wheel 16, therewith in the direction shown by the arrow in Fig. 5, and said worm wheel pushes the worm 21 out of mesh therewith, but as soon as each counter-clockwise movement of the lever 28 ceases, the weight of the drum 10 will act, through the gear 13, pinion 14, and shaft 15, to move the worm wheel 16 in the opposite direction, and the worm 21 will immediately be permitted to move down into mesh with the worm wheel 16 and will thereby lock the worm wheel 16 against rotation and thus hold the parts against accidental motion in the cable unwinding direction and in effect serve as a locking pawl for the worm wheel and shaft.

When it is desired to lower the scaffold, the worm 21 is permitted to be moved into mesh with the worm wheel 16, and the handle 24 is turned to the position shown in Fig. 4, with the clamping yoke 26 engaging around the collar 23 to hold the parts in the relation shown. Upon turning of the handle 24, the shaft 20 is rotated to turn the worm 21, worm wheel 16, and shaft 15, and thus unwind the cable to lower the scaffold. If desired, the handle 24 and worm 21 may be used for moving the drum 10 in both directions, although it is usually desired to raise the scaffold by means of the hand lever 28, and to use the handle 24 and worm 21 to lower it, thereby obtaining greater speed in the raising operation and absolute safety in the lowering operation.

While I have described my improvements in connection with a hoist for a scaffold, nevertheless, it will be understood that my invention may be applied to other types of hoists which are normally operated manually, and it is not intended that the invention be limited merely to use with scaffolds.

I claim:

1. In a hoist, the combination with a drum, of means for operating said drum comprising ratchet mechanism having operative connection with the drum, a worm wheel having operative connection with the drum, a worm for said worm wheel, and means mounting the worm for automatic disengaging from the worm wheel upon manipulation of the ratchet mechanism.

2. In a hoist, the combination with a drum, of ratchet mechanism arranged to turn the drum, a worm wheel arranged to turn the drum independently of the turning thereof by the ratchet mechanism, a worm arranged to mesh with said worm wheel, and means mounting the worm for automatic disengagement with the worm wheel upon rotation of the drum by the ratchet mechanism.

3. In a hoist, the combination with a drum, of ratchet mechanism arranged for rotating the drum, a worm wheel arranged for rotating the drum independently of the ratchet mechanism, a worm in position to mesh with the worm wheel, manually actuated means for driving said worm, and means mounting the worm in position to be disconnected from the worm wheel automatically upon actuation of the drum by the ratchet mechanism.

4. In a hoist, the combination with a drum, of ratchet mechanism arranged for operating the drum, a worm wheel arranged for independent actuation of the drum and connected with said ratchet mechanism to be turned thereby, a worm in position to mesh with said worm wheel, manually actuated means for operating said worm, and means mounting the worm in position to be disengaged from the worm wheel automatically upon turning of said worm wheel by actuation of said ratchet mechanism.

5. In a hoist, the combination with a drum, of operating means therefor comprising a shaft having a ratchet wheel and a worm wheel connected therewith, said shaft having operative connection with the drum for turning said drum, ratchet mechanism for operating the ratchet wheel for actuating the shaft, a worm arranged in position to mesh with the worm wheel, and means mounting the worm for disengagement from the worm wheel automatically on actuation of the shaft by the ratchet mechanism.

6. In a hoist, the combination with drums of operating means therefor comprising a shaft having a ratchet wheel and a worm wheel connected therewith, said shaft having operative connection with the drum for turning said drum, ratchet mechanism for operating the ratchet wheel for actuating the shaft, a worm arranged in position to mesh with the worm wheel, means mounting the worm for disengagement from the worm wheel automatically on actuation of the shaft by the ratchet mechanism, a casing enclosing the worm, a shaft connected with the worm and slidably mounted in the casing, and a handle connected with said shaft.

7. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having operative connection therewith, said shaft having a ratchet wheel and a worm wheel mounted thereon, ratchet mechanism for operating said ratchet wheel, a worm arranged in position to mesh with the worm wheel, and means mounting said worm for sliding movement into and out of mesh with the worm wheel, whereby said worm may be utilized to drive said worm wheel or serve as a back check lock permitting rotation of said worm wheel by said ratchet mechanism in one direction only.

8. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having operative connection with the drum, said shaft having a ratchet wheel and a worm wheel mounted thereon, ratchet means for operating said ratchet wheel, a worm arranged in position to mesh with the worm wheel, means for operating said worm, and means mounting the worm in position to be disengaged from the worm wheel automatically upon actuation of the shaft by the ratchet mechanism.

9. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having operative connection therewith, said shaft having a ratchet wheel, and a worm wheel mounted thereon, ratchet mechanism for operating the ratchet wheel to rotate the shaft, a worm arranged in position to mesh with the worm wheel and rotate the shaft, a shaft connected with the worm, and a casing for the worm, said worm shaft being slidably mounted in the casing in position for movement of the worm out of mesh with the worm wheel.

10. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having operative connection therewith, said shaft having a ratchet wheel and a worm wheel mounted thereon, ratchet mechanism for operating the ratchet wheel to rotate the shaft, a worm arranged in position to mesh with the worm wheel and rotate the shaft, a shaft connected with the worm, a casing for the worm, said worm shaft being slidably mounted in the casing in position for movement of the worm out of mesh with the worm wheel, the operation of the shaft and worm wheel by the ratchet mechanism causing disengagement of the worm from the worm wheel automatically, and a handle connected with the worm shaft for rotating the worm.

11. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having operative connection therewith, said shaft having a ratchet wheel and a worm wheel mounted thereon, ratchet mechanism for operating the ratchet wheel to rotate the shaft, a worm arranged in position to mesh with the worm wheel and rotate the shaft, a shaft connected with the worm, a casing for the worm, said worm shaft being slidably mounted in the casing in position for movement of the worm out of mesh with the worm wheel, a handle connected with the worm shaft for turning said shaft, and means for locking the worm in mesh with the worm wheel.

12. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having operative connection therewith, said shaft having a ratchet wheel and a worm wheel mounted thereon, ratchet mechanism for operating the ratchet wheel to rotate the shaft, a worm arranged in position to mesh with the worm wheel and rotate the shaft, a shaft connected with the worm, a casing for the worm, said worm shaft being slidably mounted in the casing in position for movement of the worm out of mesh with the worm wheel, a handle connected with the worm shaft for rotating said shaft, and means connected with said handle for engaging the worm casing to lock the worm in mesh with the worm wheel.

13. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having operative connection therewith, said shaft having a ratchet wheel and a worm wheel mounted thereon, ratchet mechanism for operating the ratchet wheel to rotate the shaft, a worm arranged in position to mesh with the worm wheel and rotate the shaft, a shaft connected with the worm, a casing for the worm, said worm shaft being slidably mounted in the casing in position for movement of the worm out of mesh with the worm wheel, said worm casing having a collar thereon, a handle pivotally connected with the worm shaft and having a clamping yoke on one side thereof in position to embrace the collar upon swinging of the handle to one extreme position and lock the worm in mesh with the worm wheel.

14. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having an operative connection therewith, a worm wheel connected with the shaft, a worm arranged in position to mesh with the worm wheel, a casing for the worm, a shaft carrying the worm and slidably mounted in the casing, said casing being constructed to mount the shaft and worm at an incline to the horizontal for movement of the worm out of mesh with the worm wheel by displacing movement of said worm wheel and whereby upon termination of said displacing movement of said worm wheel said worm will return to mesh with said worm wheel by action of gravity.

15. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having an operative connection therewith, a worm wheel connected with the shaft, a worm arranged in position to mesh with the worm wheel, a casing for the worm, a shaft carrying the worm and slidably mounted in the casing, said casing being constructed to mount the shaft and worm at an incline to the horizontal for movement of the worm out of mesh with the worm wheel by displacing movement of said worm wheel and whereby upon termination of said displacing movement of said worm wheel said worm will return to mesh with said worm wheel by action of gravity, a handle connected with the worm shaft for turning said worm shaft, and means for locking the worm in mesh with the worm wheel.

16. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having an operative connection therewith, a worm wheel connected with the shaft, a worm arranged in position to mesh with the worm wheel, a casing for the worm, a shaft carrying the worm and slidably mounted in the casing, said casing being constructed to mount the shaft and worm for movement of the worm out of mesh with the worm wheel, a handle pivotally connected with the worm shaft and having means for engaging the worm casing to lock the worm in mesh with the worm wheel.

17. In a hoist, the combination with a drum, of means for operating said drum comprising a shaft having an operative connection therewith, a worm wheel connected with the shaft, a worm arranged in position to mesh with the worm wheel, the worm casing having a collar thereon, and a handle pivotally connected with the worm shaft and having a clamping yoke thereon arranged in position to embrace the collar when the handle is turned to one position for locking the worm in mesh with the worm wheel while permitting rotation of the worm shaft and handle relative to the casing.

18. In a mechanical movement, the combination of a worm wheel and worm, a shaft carrying said worm, a casing mounting the shaft for longitudinal movement of the worm out of mesh with the worm wheel, and normally free means movable into engagement with a portion of said casing for locking the worm in mesh with the worm wheel.

19. In a mechanical movement, the combination of a worm and worm wheel, a shaft carrying said worm, a casing mounting the shaft and worm for longitudinal movement of the worm out of mesh with the worm wheel, a handle connected with the shaft, and means connected with the handle for locking the worm in mesh with the worm wheel.

20. In a mechanical movement, the combina-

tion of a worm and worm wheel, a shaft carrying the worm, a casing enclosing the shaft and mounting said shaft for longitudinal movement of the worm out of mesh with the worm wheel, said casing having a collar thereon, and a handle pivotally connected with the shaft and having a clamping yoke in position to engage the collar to hold the shaft against lengthwise movement while permitting rotation of the shaft relative to the casing.

21. A hoisting and lowering machine for scaffolds, comprising a drum, a frame supporting said drum, means adapted to operate said drum in hoisting direction, a worm wheel, and a worm adapted when enmeshed to cooperate with the drum to prevent or produce backward motion, said worm being freely slidable out of mesh with said worm wheel to permit hoisting movement of the drum and automatically returnable by gravity action to enmeshed relation with said worm wheel.

22. A hoisting and lowering machine for scaffolds, comprising a drum, a frame supporting said drum, means adapted to operate said drum in hoisting direction, a worm wheel, and a worm adapted when enmeshed to cooperate with the drum to prevent or produce backward motion, said worm being freely slidable out of mesh with said worm wheel to permit hoisting movement of the drum and automatically returnable by gravity action to enmeshed relation with said worm wheel, and manually shiftable means for temporarily locking said worm in mesh with said worm wheel whereby said worm may be utilized to produce or prevent rotation of the drum in either direction.

23. A hoisting and lowering machine for scaffolds, comprising a drum, a frame supporting said drum, means adapted to operate said drum in hoisting direction, a worm wheel, and a worm freely slidable into and out of mesh with said worm and constituting a sole means for preventing or producing backward movement of the drum while automatically permitting forward hoisting movement of said drum.

24. A hoisting and lowering machine for scaffolds, comprising a drum, a frame supporting said drum, means adapted to operate said drum in hoisting direction, a worm wheel, and a worm freely slidable into and out of mesh with said worm and constituting a sole means for preventing or producing backward movement of the drum while automatically permitting forward hoisting movement of said drum, and means to temporarily lock the worm in mesh with the worm wheel for optional additional use as a medium for imparting forward hoisting movement to said drum.

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