E. D. CUMMINGS.

PAWL AND RATCHET.

APPLICATION FILED AUG. 31, 1920.

1,412,013.

Patented Apr. 4, 1922.

2 SHEETS—SHEET 1.

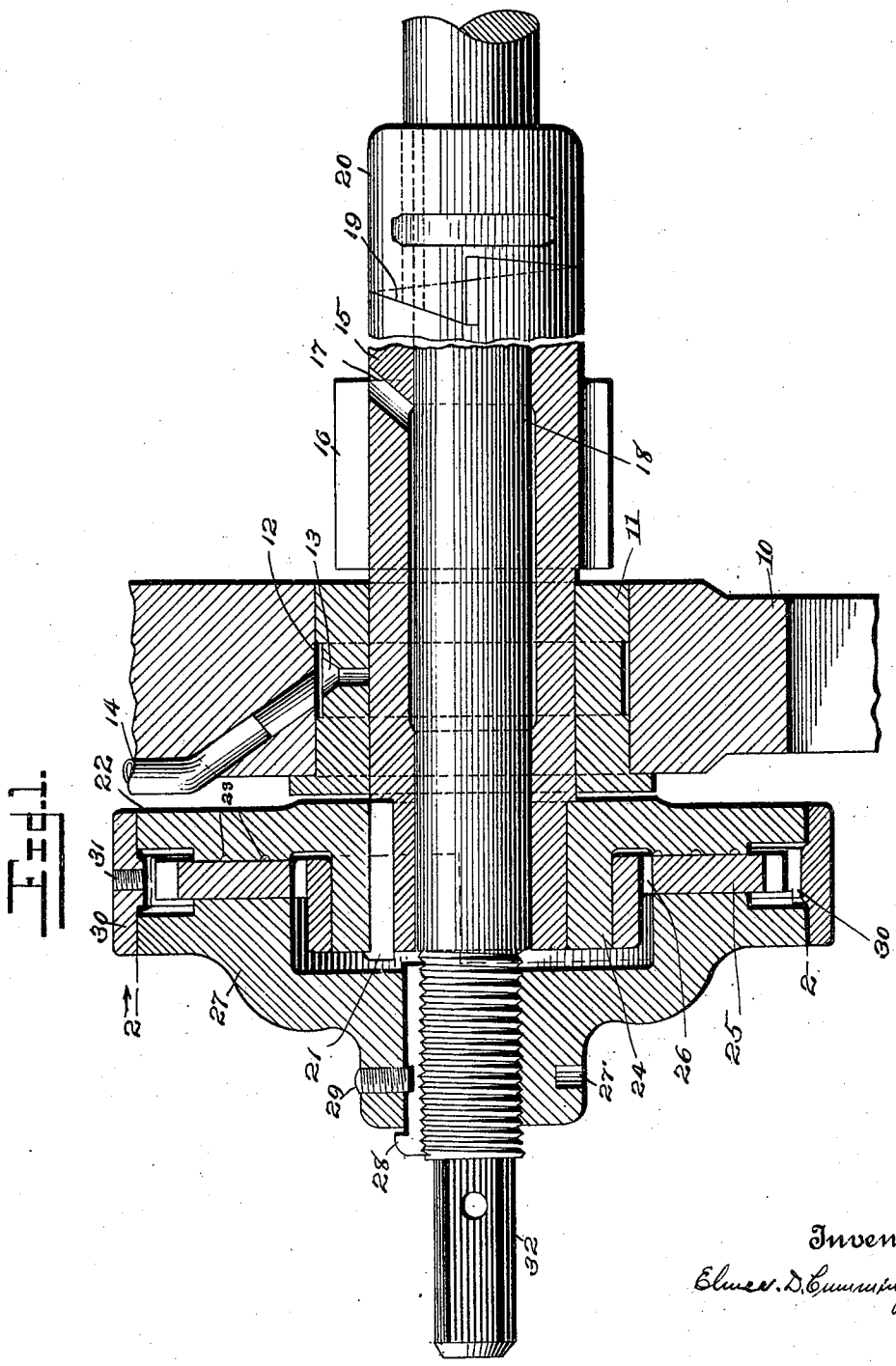


Fig. 1.

Inventor

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Fig. 3.

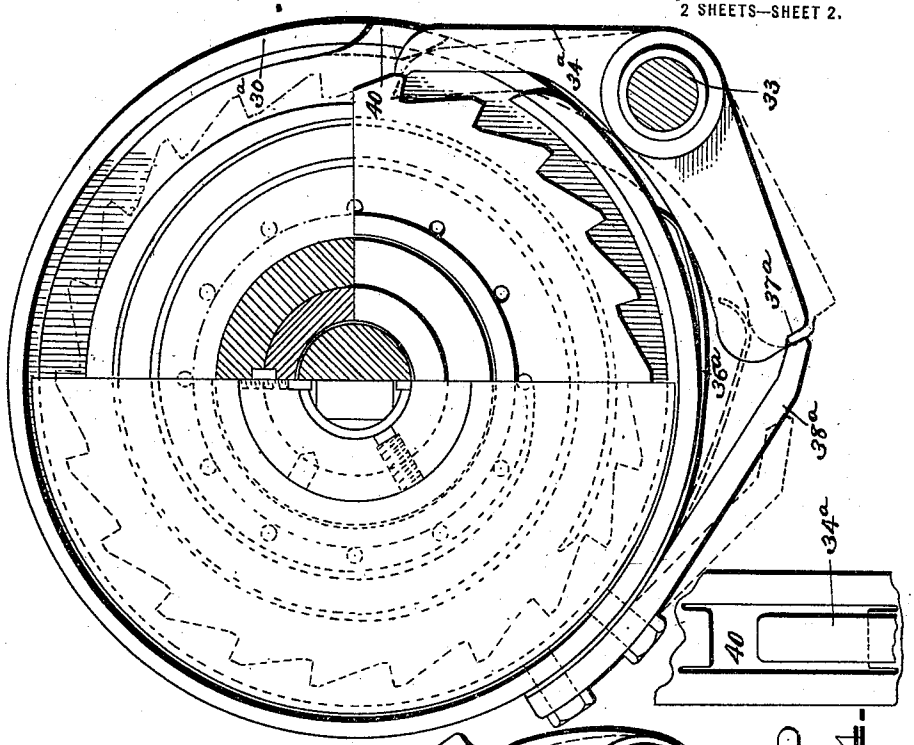


Fig. 4.

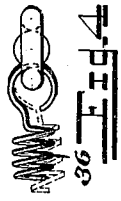


Fig. 2.

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UNITED STATES PATENT OFFICE.

ELMER D. CUMMINGS, OF WASHINGTON, DISTRICT OF COLUMBIA.

PAWL AND RATCHET.

1,412,013. Specification of Letters Patent. Patented Apr. 4, 1922.

Application filed August 31, 1920. Serial No. 407,265.

(FILED UNDER THE ACT OF MARCH 3, 1883, 22 STAT. L., 625.)

To all whom it may concern:

Be it known that I, ELMER D. CUMMINGS, a citizen of the United States, stationed at Washington, District of Columbia, have invented an Improvement in a Pawl and Ratchet, of which the following is a specification.

The invention described herein may be used by the Government, or any of its officers or employees in prosecution of work for the Government, or by any other person in the United States, without payment of any royalty thereon.

The subject of this invention is a pawl and ratchet constructed and designed especially for use with hoisting mechanisms for conveying explosive shells, or the like, from a lower to a higher level or vice versa.

In a hoisting mechanism of this character it is desirable and indeed necessary that the conveyor be capable of movement in either direction so that the projectiles may be raised or lowered. Reverse movement of the hoisting mechanism is especially needful to permit lowering and removal of projectiles which may be on the up-flight of the hoist when firing ceases and a further supply of projectiles becomes unnecessary.

While it is essential that the mechanism be capable of movement in each direction, it is also absolutely necessary that means be provided for locking the mechanism against movement in case some break should occur in the power supplying means thereby releasing the drive shaft to movement under the weight of projectiles on the hoist. Without means for so locking the mechanism, the hoist would, under such circumstances move in a reverse direction and the projectiles be thrown with more or less violence upon the loading floor thereby occasioning great danger due to explosion of the shells. The means used to prevent such reverse movement of the hoisting mechanism is a pawl and ratchet.

With the usual pawl and ratchet structure the pawl is continually clicking over the ratchet during operation of the device causing considerable noise which is undesirable.

The present invention aims to provide a pawl and ratchet structure which will permit the proper movements above set forth but will prevent clicking of the pawl over the ratchet.

With the foregoing and other objects in view, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

Practical embodiments of the invention are shown in the accompanying drawings, wherein:—

Fig. 1 is a fragmentary view in vertical longitudinal section, parts in elevation, of a pawl and ratchet constructed in accordance with the invention;

Fig. 2 is a view in elevation, partly in section on the line 2—2, of Fig. 1;

Fig. 3 is a similar view showing a slightly modified form of the invention; and

Fig. 4 is a fragmentary view in elevation of the pawl controlling ring.

A standard is indicated by numeral 10, which is apertured to receive a bushing, 11, formed with an annular channel, 12, in its outer surface, which channel is in communication with the central aperture of the bushing through oil ducts, one of which is shown at 13. An oil inlet tube, 14, has its discharge end positioned in a duct formed in the standard, 10, for the purpose of supplying oil to the channel, 12, and ducts, 13.

A tubular shaft or sleeve, 15, is journaled in the bushing, 11, and teeth, 16, may be provided on the inner end of the sleeve to furnish a driving pinion through which movement may be transmitted to suitable mechanism, such as an ammunition hoist. An oil duct or opening, 17, is formed in the sleeve, 15, to supply lubricant to a shaft, 18, which is journaled in the sleeve. The inner end of the sleeve, 15, is cut to form a helix, 19, which is engageable with the complemental end of a collar, 20, which collar is keyed or otherwise secured to the shaft, 18, to rotate therewith.

Secured on the outer end of the sleeve, 15, as by means of a key, 21, is a disk, 22, the outer face of which is provided with a spiral lubricant distributing groove, 23. The disk, 22, has an outwardly extending hub, 24,

upon which is loosely mounted a ratchet, 25, provided with suitable oil holes or ducts, 26.

A portion of the shaft, 18, adjacent its outer end, is threaded to receive a disk, 27, which engages the outer face of the ratchet wheel, 25, and the disk, 27, may be provided with a socket, 27′, to receive a spanner by which the disk is threaded on or off the shaft. The disk is locked to the shaft in any suitable manner, as by means of a key, 28, which may be retained in place by a set screw, 29.

From a consideration of Fig. 1, it will be seen that the disks, 22, and, 27, are flanged to provide an annular groove therebetween into which the rim of the ratchet wheel 25, projects. Upon the periphery of these disks rests a split ring, 30, formed with a centrally disposed rib extending longitudinally of its inner face, which rib extending into the annular groove, prevents lateral movement of the ring with respect to the disks. The ring may be tapped as at 31, for the reception of an oil cup, not shown, through which oil is supplied to the moving parts.

The extending end, 32, of the shaft, 18, is reduced and is of angular cross section for the reception of a crank or other power applying element through which movement may be transmitted to the shaft.

Through means of a pin, 33, which is suitably connected to the standard, 10, a pawl, 34, is pivotally connected in position to engage with the teeth of the ratchet, 25. The pawl is formed with a weighted arm, 35 which, through the action of gravity, tends to hold the pawl in engagement with the teeth of the ratchet and this tendency may be aided by a retractile spring, 36, which is suitably connected between the pawl and the standard, 10. The pawl is positioned at the aperture formed by the spaced apart ends of the split ring, 30, and is formed with a notch 37, adapted to receive one end, 38, of the split ring, 30.

From the foregoing, it will be seen that, when power is applied through the shaft, 18, the helical end of the collar, 19, will, because of the inertia of the sleeve, 15, and its connected parts, move with respect to the complemental end of the sleeve sufficiently to force the sleeve longitudinally of the shaft and clamp the ratchet, 25, between the disks, 22 and 27, so that the ratchet will be turned with said disks and the shaft.

As the ratchet is rotated, pawl, 34, is elevated by the adjacent tooth until its point rests upon that of said tooth as shown in Fig. 3. Concomitant with the movement of the pawl, 34, the free end, 38, of ring, 30, which latter is actuated through frictional contact with the peripheries of disks 22 and 27 is brought into engagement with the edge of notch, 37. As the movement of ring, 30, continues until its free end, 38, is completely seated in notch, 37, the pawl is lifted to afford complete clearance of the ratchet. In this connection it is to be noted that the notch, 37, must be of a predetermined depth to permit instantaneous releasement of the end, 38, upon reverse rotation of the ratchet, otherwise, action of the pawl is delayed and several of the ratchet teeth permitted to pass before the pawl actually becomes operative. By the preceeding arrangement the action of the pawl is absolutely silent, and one of the principal objections associated with mechanisms of this character, that is to say, clicking of the pawl as it passes over the ratchet teeth, is eliminated.

Should power be applied through the shaft in the reverse direction the helical end of the collar, 20, moving in the reverse direction with respect to the complemental end of the sleeve, 15, will release pressure on the sleeve and permit the disk, 22, to move inwardly from the ratchet wheel, 25, thereby releasing the ratchet wheel. This same movement of the shaft, sleeve and the disks will cause a movement of the ring, 30, in the reverse direction thereby releasing the pawl to engage the ratchet and hold the same stationary, the shaft being free, however, to turn because of the loose mounting of the ratchet.

In case the power to drive the mechanism in a reverse direction should be transmitted through the weight of material on the up flight of the hoist, the sleeve would become the element through which the power would be transmitted and, because of the inertia of the shaft, 18, the helical end of the sleeve would move with respect to the complemental end of the collar, 20, causing the sleeve to clamp the ratchet, 25, between the disks, 22, and 27, and carrying the ratchet in a reverse direction with the disks. This movement likewise moves the ring, 30, in a reverse direction and causes it to release the pawl for engagement with the ratchet which will effectually lock the mechanism against such reverse motion.

In the modified form, as shown in Figs. 3 and 4, the construction and operation are practically the same as those heretofore described with the exception that the ring, 30^a, which encircles the disks is a continuous ring provided with a slot, 40, through which the pawl 34^a, enters to engage the teeth of the ratchet, 25.

An arm, 38^a, is secured by screw bolts or otherwise to the ring, 30^a, and extends substantially tangentially therefrom to engage a notch, 37^a, formed in the pawl, 34^a, and in position to receive said arm when the pawl is lifted by the ratchet and the ring is rocked by rotation of the disks.

A leaf spring, 36^a, may be connected to the ring, 30^a, by the same means which connects

the arm, 38ª, the spring being interposed between the arm and the ring and in position to engage the inner face of the pawl so that, when the ring is moved in the reverse direction and the arm releases the pawl, the spring will force the pawl into engagement with the teeth of the ratchet.

Having described my invention what I claim as new and desire to secure by Letters Patent, is:—

1. In a device of the character described, the combination with a shaft, a sleeve loose on the shaft and means to effect longitudinal actuation of the sleeve through the instrumentality of the shaft thrust; of a pair of spaced disks, one being affixed to the shaft, the other to the sleeve, a ratchet intermediate the disks and frictionally engageable by the latter upon longitudinal actuation of the sleeve, a split annulus circumscribing the peripheries of the disks and rotatable thereby, a pawl mounted for engagement with the ratchet and means in connection with the annulus to engage and hold the pawl from contact with the ratchet when the annulus is rotated in a predetermined direction.

2. In a device of the character described the combination with a shaft, a sleeve loose on the shaft and means to effect longitudinal actuation of the sleeve through the instrumentality of the shaft thrust; of a pair of spaced disks, one being affixed to the shaft, the other to the sleeve, a ratchet housed between the disks and frictionally engageable by the latter upon longitudinal actuation of the sleeve, a split annulus circumscribing the peripheries of the disks and rotatable thereby, a pawl mounted for engagement with the ratchet and means in connection with the annulus to hold the pawl from contact with the ratchet when the annulus is rotated in a predetermined direction.

3. In a device of the character described the combination with a shaft, a sleeve loose on the shaft and means to effect longitudinal actuation of the sleeve through the instrumentality of the shaft thrust; of a pair of spaced disks, one being affixed to the shaft, the other to the sleeve, a ratchet intermediate the disks and frictionally engageable by the latter upon longitudinal actuation of the sleeve, a split annulus circumscribing the peripheries of the disks and rotatable thereby, a pawl mounted to normally engage the ratchet, the pawl and annulus cooperating to enable said pawl to be held in disengaged relation with respect to the ratchet when the annulus is rotated in a predetermined direction.

4. In a device of the character described, the combination with a shaft, a sleeve loose on the shaft and means to effect longitudinal actuation of the sleeve through the instrumentality of the shaft thrust; of a pair of spaced disks, one being affixed to the shaft, the other to the sleeve, a ratchet housed between the disks and frictionally engageable by the latter upon longitudinal actuation of the sleeve, a split band circumscribing the peripheries of the disks and rotatable thereby, a pawl mounted to normally engage the ratchet, and means to hold the pawl from contact with the ratchet when the annulus is rotated in a predetermined direction.

5. In a device of the character described, the combination with a shaft, a sleeve loose on the shaft and means to effect longitudinal actuation of the sleeve through the instrumentality of the shaft thrust; of a pair of spaced disks, one being affixed to the shaft, the other to the sleeve, a ratchet housed between the disks and frictionally engageable by the latter upon longitudinal actuation of the sleeve, a split band circumscribing the peripheries of the disks and rotatable thereby, a pawl mounted to normally engage the ratchet, the pawl being formed with a seat and means in connection with the annulus to engage said seat and hold the pawl from contact with the ratchet when the annulus is rotated in a predetermined direction.

6. In a device of the character described, the combination of a shaft, a sleeve loose on the shaft and means to effect longitudinal actuation of the sleeve through the instrumentality of the shaft thrust; of a pair of spaced complemental disks, one being affixed to the shaft, the other to the sleeve, a ratchet intermediate the disks and frictionally engageable by the latter upon longitudinal actuation of the sleeve, a split band circumscribing the peripheries of the disks and frictionally rotatable thereby, a pawl mounted intermediate its ends and having one extremity projecting through the opening in the band and normally engaging the ratchet and coacting means between the split band and the free extremity of the pawl to hold the latter from contact with the ratchet when the split band is actuated in a predetermined direction.

7. The combination of a shaft, of a collar affixed to the shaft, a sleeve loose on the shaft and engaged by the collar to be thrust longitudinally of the shaft when the latter is revolved in one direction, a pair of spaced disks, one being affixed to the sleeve, the other to the shaft, a ratchet loosely mounted intermediate the disks to be clamped there between when the sleeve is thrust longitudinally of the shaft, a pawl mounted for engagement with the ratchet, an annulus circumscribing the peripheries of the disks and frictionally operable thereby and means to position the pawl in disengaged relation with respect to the ratchet when the annulus is rotated in one direction.

8. The combination of a shaft, of a collar affixed to the shaft, a sleeve loose on the shaft and engaged by the collar to be thrust

longitudinally of the shaft when the latter is revolved in one direction, a pair of spaced disks, one being affixed to the sleeve, the other to the shaft, a ratchet loosely mounted intermediate the disks to be clamped there between when the sleeve is thrust longitudinally of the shaft, a pawl mounted for engagement with the ratchet, a split band circumscribing the peripheries of the disks and frictionally operable thereby, the band and pawl cooperating to effect disengagement of the pawl when said band is rotated in one direction.

9. The combination of a shaft, of a collar affixed to the shaft, a sleeve loose on the shaft and engaged by the collar to be thrust longitudinally of the shaft when the latter is revolved in one direction, a pair of spaced disks, one being affixed to the sleeve, the other to the shaft, a ratchet loosely mounted intermediate the disks to be clamped there between when the sleeve is thrust longitudinally of the shaft, a split band circumscribing the peripheries of the disks and frictionally operable thereby, one extremity of the band cooperating with a notch formed in the pawl to position the pawl in disengaged relation with respect to the ratchet when the band is rotated in one direction.

ELMER D. CUMMINGS.