Feb. 16, 1932. W. J. McDUFF 1,845,758

LINK-BY-LINK PULLING MECHANISM

Original Filed March 7, 1929

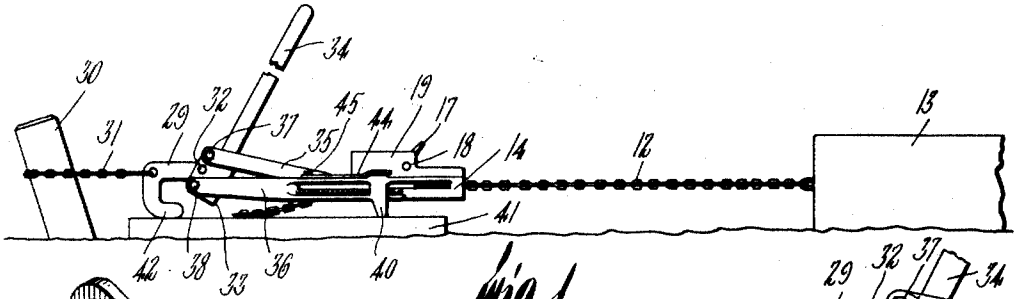


Fig. 1.

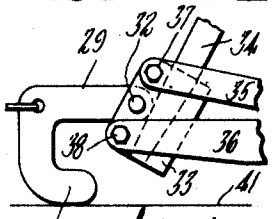


Fig. 1a

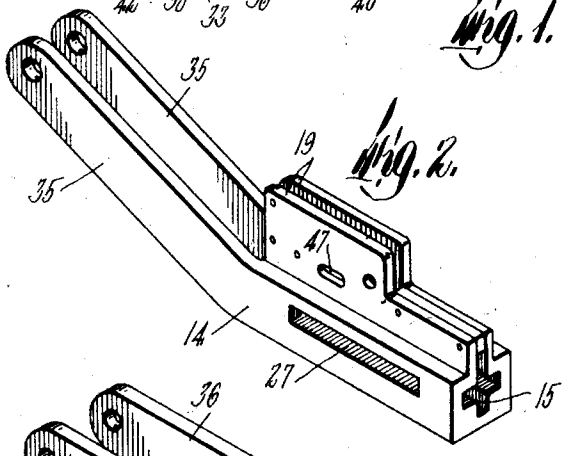


Fig. 2.

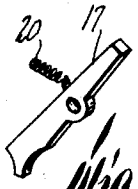


Fig. 4.

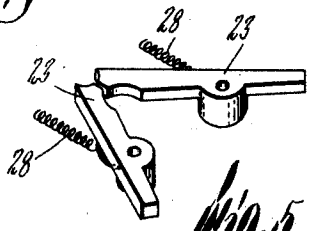


Fig. 5.

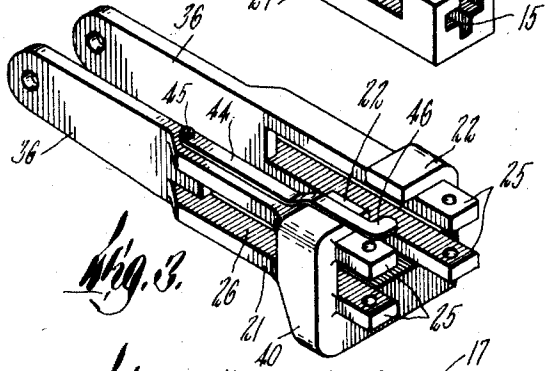


Fig. 3.

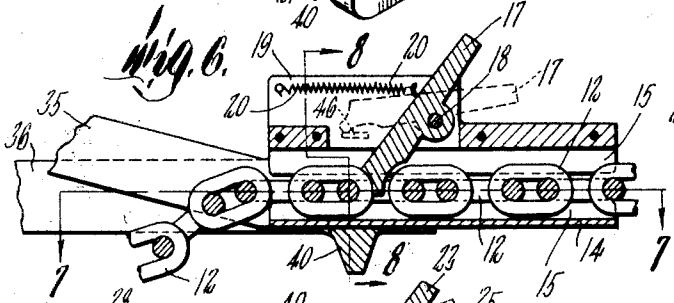


Fig. 6.

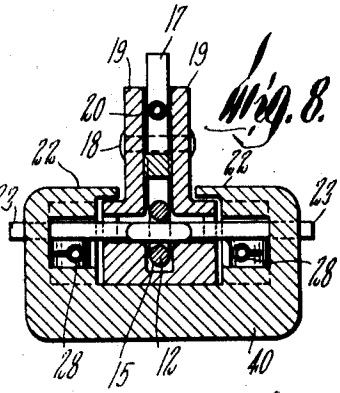


Fig. 8.

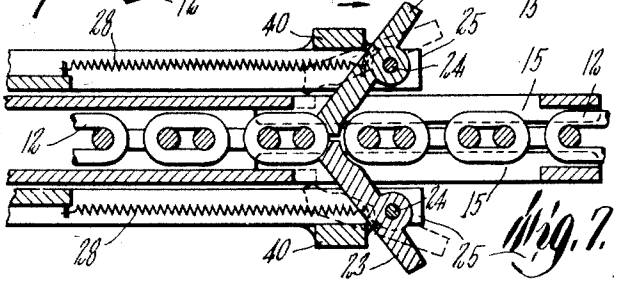


Fig. 7.

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UNITED STATES PATENT OFFICE

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LINK-BY-LINK PULLING MECHANISM

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This invention relates to manually or power operable means, including a chain, for pulling a load progressively link-by-link and retaining the load at each point to which it is advanced.

The chief object of the invention is to provide a pulling mechanism including an element which is a chain of common form attachable at one end to a load to be pulled, and a manually or power-operable element including two dog-supporting members having dogs pivoted thereto movable relative to each other, and provided with a chain-receiving passage to receive the chain, together with means for moving said members relative to each other. In this device the chain constitutes the equivalent of a ratchet which is engageable by the dogs so that as the two members are moved relative to each other the dogs on the two members alternately have operative engagement with the links of the chain, whereby the pulling element and chain are moved relatively to each other. When the chain is attached to the load to be pulled and the pulling element is attached to a fixed anchorage the operation of the device will move the load forward. It is also possible to use the device by attaching the chain to the fixed anchorage and the pulling device to the load to be moved.

Another feature of the invention resides in the fact that each time any dog is moved into a new operative position it will engage a link which is under tension, that is, a link which is situated between the link operatively engaged by another dog and the load.

Other objects will hereinafter appear.

Of the accompanying drawings forming a part of this specification,—

Figure 1 is a side elevation of a pulling mechanism embodying the invention, in condition for use.

Figure 1*a* is an enlargement of a portion of Figure 1.

Figures 2 and 3 are perspective views of the primary and secondary slides hereinafter described.

Figure 4 is a perspective view of the dog shown by Figure 6, associated with the primary slide.

Figure 5 is a perspective view of the two dogs shown by Figure 7, associated with the secondary slide.

Figure 6 is a fragmentary sectional view, showing the slides and a portion of the chain.

Figure 7 is a section on line 7—7 of Figure 6.

Figure 8 is a section on line 8—8 of Figure 6.

The same reference characters indicate the same parts in all of the figures.

The chain element of my pulling mechanism is herein shown as being of the straight link type and includes links 12, so assembled that when the chain is under tension, each link is in a plane at right angles to the plane of the next link, so that the chain presents alternating shoulders and recesses, adapted to cooperate with the dogs hereinafter described, the shoulders formed by the ends of the links constituting the equivalent of ratchet teeth. One end of the chain may be attached in any suitable way to a load 13, shown conventionally by Figure 1.

The other element of the mechanism is a manually or power operable puller, adapted to pull the chain progressively link by link, and to prevent backward movement of the chain.

The puller comprises two dog-supporting members movable relative to each other and so fashioned that there is a chain-receiving passage extending through the puller in which the chain is received together with a dog carried by each member and constructed to directly engage a link of the chain, and means for moving said members relative to each other in the direction of the length of the chain. One of the dog-supporting members, which I will refer to as a primary slide, is shown separately by Figure 2, and includes an oblong body 14, which has a longitudinal chain-receiving passage or guideway 15, in which the chain is freely movable endwise, said guideway being cross-shaped in transverse section, as best shown by Figure 2, and formed to guide a limited portion of the chain, and prevent said portion from turning or twisting, so that each link of the guid-

ed portion is maintained at right angles with the next link, as best shown by Figure 8.

A dog 17 is connected by a pivot bolt 18 with spaced apart ears 19 on the primary slide, and projects into the guideway in position to engage a link as shown by Figure 6, the dog being normally held in its operative position by a spring 20, and adapted to be displaced, as shown by dotted lines.

The other dog-supporting member is in the nature of a secondary slide, which includes an oblong body 21, and is formed to guide the primary slide, the secondary slide including ears 22, which overhang the body 14 of the primary slide, as shown by Figure 8. The secondary slide is provided with two dogs 23, connected by pivot bolts 24 with ears 25 (Figure 3) formed on said slide, said dogs projecting into the guideway 15, through coinciding slots 26 and 27 (Figures 2 and 3) formed in the two slides. The dogs 23 are held by springs 28, in position to engage a chain link, as shown by Figure 7, and are adapted to be displaced from their operative positions, as shown by dotted lines. The dog 17 is situated in a plane at right angles to the dogs 23. The dog 17 is adapted to engage the alternate links of the chain, that is, the links which are in the same plane as said dog, while the dogs 23 are adapted to engage the other links of the chain, it being noted that the adjacent links of the chain are in planes at right angles to each other.

29 designates a fulcrum member having means whereby it may be anchored to any suitable fixed support toward which the load 13 is to be pulled, a support being conventionally shown by Figure 1, and designated by 30, the anchoring means here shown including a chain 31, connected at one end with the fulcrum member and at the opposite end with the support. The fulcrum member is, in this instance, an oblong bar, to one end of which the chain 31 is connected. To the other end of the fulcrum member is connected by a pivot 32, a two-armed lever 33, the arms of which project in opposite directions from the pivot, said lever being provided with a socket in which a lever extension 34 is removably inserted as seen in Fig. 1*a*.

Connections are provided between the arms of the lever 33 and the primary and secondary slides whereby, when the lever is manually or power oscillated, the slides are longitudinally reciprocated simultaneously in opposite directions. Said connections, in this instance, include arms 35 (Figure 2) formed on the primary slide, and arms 36 (Figure 3) formed on the secondary slide. The arms 35 are pivoted at 37 to the upper arm of the lever 33, and the arms 36 are pivoted at 38 to the lower arm.

Assuming that the chain 12 is anchored to a load 13 and the fulcrum member is anchored to a fixed anchorage 30 as shown in Fig. 1 and that the dog 17 carried by the primary slide 14 is in engagement with a link of the chain as shown in Fig. 6, it will be readily seen that if the fulcrum member 33 is oscillated anti-clockwise in Fig. 1 by swinging the handle 34 to the left, there will be a relative movement betwen the two dog-supporting members by which the dog-supporting member 21 will be moved to the right relative to the dog-supporting member 14 and during such movement the dogs 23 will wipe over a link of the chain which is under tension, or one which is located between the link engaged by the dog 17 and the load and will be brought into operative engagement with said link as shown in Fig. 7. If the fulcrum member 33 is pivoted to turn about an axis between the pivotal points 37 and 38 then during such swinging movement of the fulcrum member the load will be moved forward through the engagement of the dog 17 with a link of the chain, and as stated above during such swinging movement the dogs 23 will be carried into a new operative position in engagement with another link. A swinging movement of the lever 34 and fulcrum member in the other direction or clockwise Fig. 1 will operate through the dog-supporting member 21 and the dogs 23 to draw the chain forward another step and during this movement the dog-supporting member 14 will be moved backwardly along the chain so as to carry the dog 17 from its former operative position into a new operative position in engagement with another link. The dogs on the two dog-supporting members are thus alternately moved into operative position and when each dog assumes a new operative position it is in operative engagement with a link that is under tension, or, in other words, a link which is located between the load and the dog which is holding the load. In moving from one position into a new operative position to engage a link which is under tension the dog carried by either dog-supporting member will pass the dog carried by the other dog-supporting member. This movement of the dogs past each other is permitted because the dog 17 is in a plane at right angles to the dogs 23.

Assuming that the handle 34 is swung to the left from the position shown in Fig. 1 such movement will, through the arm 36, move the slide 21 backwardly and during such backward movement the dogs 23 will be withdrawn from a link which is ahead of the dog 17 and will be brought into engagement with a link in the rear of the dog 17. In other words, the dogs 23 will be carried from a position in front of the dog 17 to a position in the rear of said dog and in the new position the dogs 23 will engage a link between the link engaged by the dog 17 and the load, in other words, a link which is under tension. Similarly, when the handle 34 is moved in

the opposite direction the slide 14 will be moved to the rear to carry the dog 17 past the dogs 23 and into position to engage a link which is situated between the dogs 23 and the load, in other words, a link which is under tension.

It will also be seen that the guided portion of the chain is confined with its links in predetermined relation to each other, so that said links constitute the equivalent of ratchets which are movable link by link by the dogs.

The connections between the lever 33 and the slide are organized to permit sufficient amplitude of endwise movement of the slides to compensate for any elongation of the chain links caused by strains thereon, so that the pulling mechanism cannot be rendered inoperative by elongation of the links.

The relative arrangement of the lever and slides, and the connections between the lever arms and the slides, is such that resistance to the reciprocating movements of the slides by frictional contact of one slide with the other, is reduced to a minimum. By utilizing the chain as a ratchet cooperating directly with the dogs or pawls, I reduce to a minimum the number of parts required. A chain of any desired length may be employed, the forward links of the chain emerging from the guideway 15, being allowed to accumulate loosely, as indicated by Figure 1.

The described mechanism may be used to pull loads horizontally, vertically, and at various inclinations. It may also be used to lower a suspended load link by link.

The secondary slide may be provided with a short leg 40, adapted to bear on a supporting base 41, and the fulcrum member may be provided with a longer leg 42, adapted to bear on said base. The secondary slide may be provided with a detent 44 (Figure 3) pivoted thereto at 45, and having an ear 46 at its free end adapted to enter a slot 47 (Figure 2) in the primary slide, and hold the dog 17 displaced, as indicated by dotted lines in Figure 6, while the chain is being inserted in the guideway 15. The dogs 23 may be held displaced at the same time by resting on the outside of the primary slide 14.

Although I have shown two dogs 23 on the secondary slide, it is obvious that said slide may be provided with only one dog, if desired, and that each slide may have more than one dog. It will also be obvious that since the movement between the elements 13 and 30 in Fig. 1 is a relative movement the device would work equally well if the chain 12 were attached to a fixed anchorage and the fulcrum member 33 were attached to the load.

I claim:

1. A pulling mechanism of the character stated, including a chain whose links present alternating dog-engaging shoulders and dog-receiving recesses, the chain being attachable to a load to be pulled, and a manually or power operable puller adapted to pull the chain progressively step by step, said puller comprising a primary slide having means for guiding a limited portion of the chain and maintaining the links thereof in predetermined relative positions, a secondary slide movably engaged with the primary slide, each slide having a dog normally engaging the chain, a fulcrum member having means whereby it may be anchored to a fixed support, a two-armed operating lever pivoted between its arms to the fulcrum member, and connections between the lever arms and the slides, the arrangement being such that when the chain is engaged with a load and the fulcrum member is anchored to a support, oscillation of the lever reciprocates the slides simultaneously in opposite directions, and causes each dog to alternately pull the chain forward and prevent backward movement thereof, the guided portion of the chain constituting ratchets which are directly engaged with the dogs and movable step by step thereby.

2. A pulling mechanism as specified by claim 1, the secondary slide and the fulcrum member being provided with feet adapted to bear on a supporting base.

3. A pulling mechanism as specified by claim 1, provided with a detent adapted to temporarily hold the dog of the primary slide in a displaced position.

4. A chain-pulling device comprising two dog-supporting members movable relative to each other and having an overlapping relation, there being a chain-receiving passage extending through said members in the direction of the relative movement thereof, means for moving said members relative to each other in the direction of the length of the chain, a dog carried by each member on the part thereof which overlaps the other member, one dog constructed to engage directly the alternate links of a chain occupying said passage and the other dog operating at right angles to the first-named dog and constructed to engage directly the other links of the chain, means for moving said members relative to each other in the direction of the length of the chain, each dog being positioned on its supporting member at such a point that said dog passes the other dog during the relative movement of said members, whereby during each relative movement the non-operative dog is carried from one side to the other of the operative dog thereby to be brought into engagement with a link situated between the operative dog and the load.

5. A chain-pulling device comprising two dog-supporting members having an overlapping relation and movable relative to each other, there being a chain-receiving passage extending through said members in the direction of the relative movement thereof, means for moving said members back and

forth relative to each other in the direction of the length of said passage, a dog carried by one member and constructed to engage directly alternate links of the chain, a second dog carried by the other member and operating in a plane at right angles to the first-named dog, the point of attachment of said second dog with its member being so located that during the relative reciprocating movement of the members the two dogs pass each other, whereby at each operative movement the non-operative dog is carried from one side to the other of the operative dog and is brought into engagement with a link situated between the operative dog and the load.

In testimony whereof I have affixed my signature.

WILLIAM J. McDUFF.