Sept. 29, 1953 L. E. SIMMONS 2,653,808

CUTTER CHAIN

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Fig. 1.

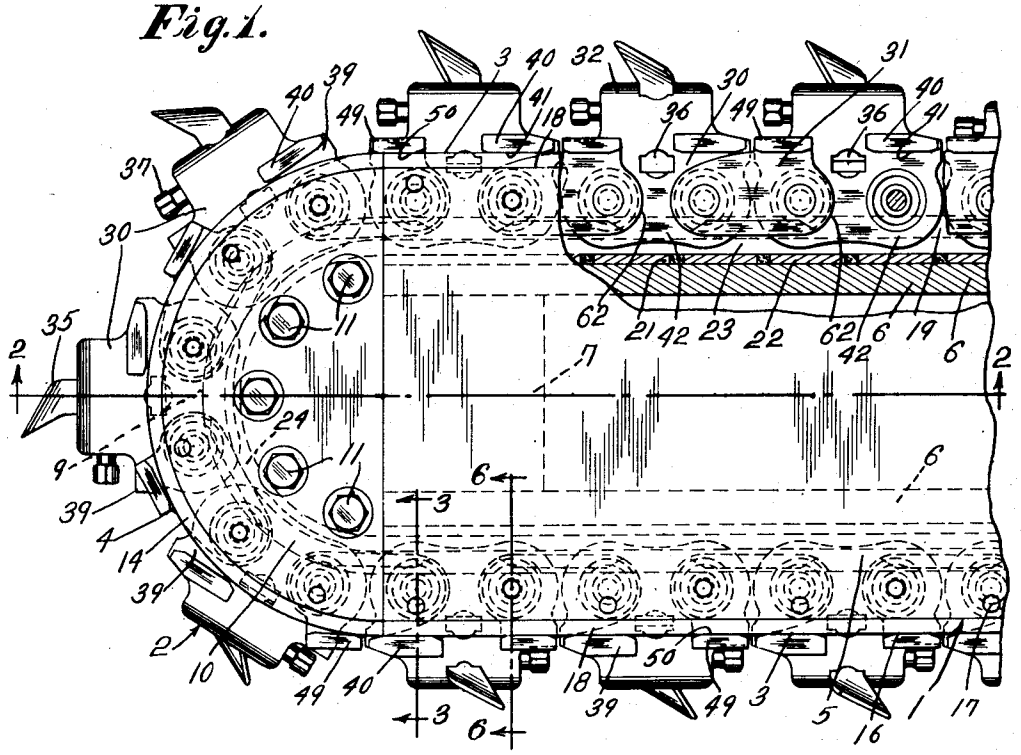

Fig. 2.

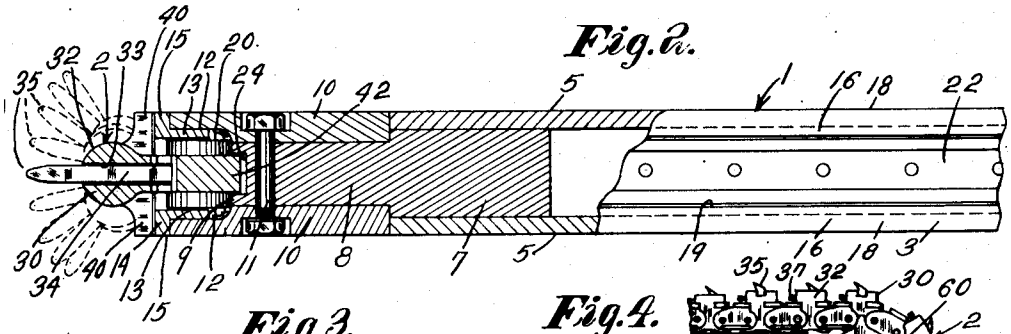

Fig. 3.

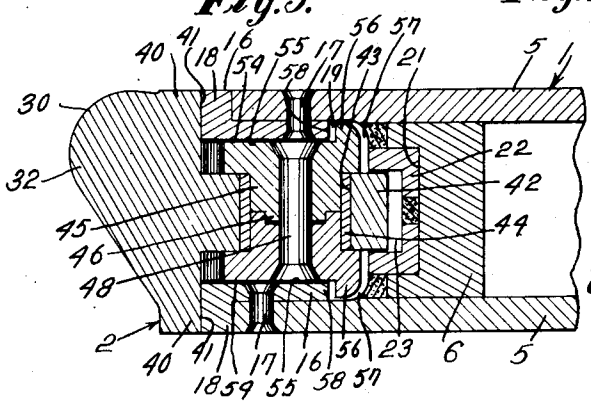

Fig. 4.

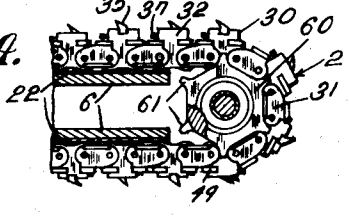

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Fig. 5.

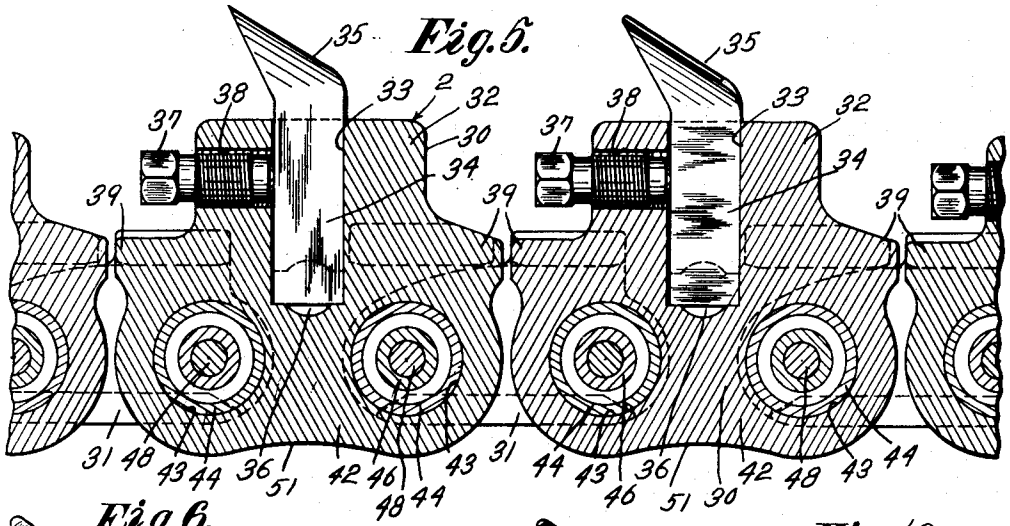


Fig. 6.

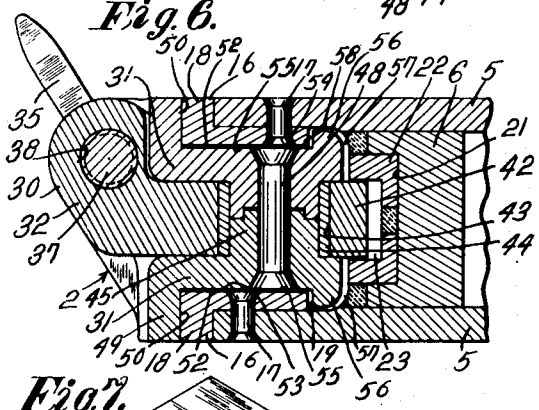


Fig. 10.

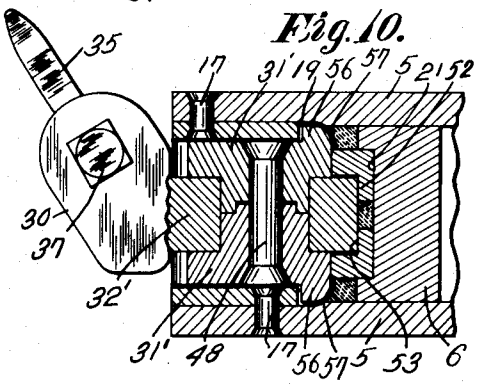


Fig. 7.

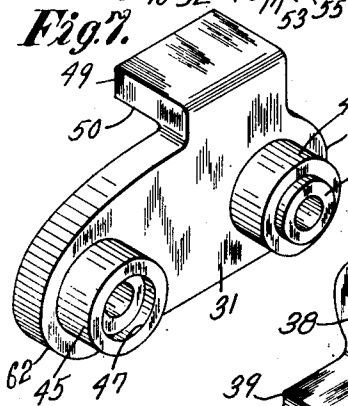


Fig. 8.

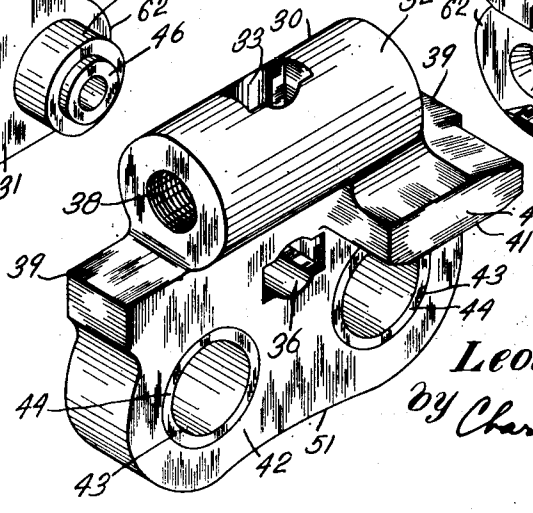
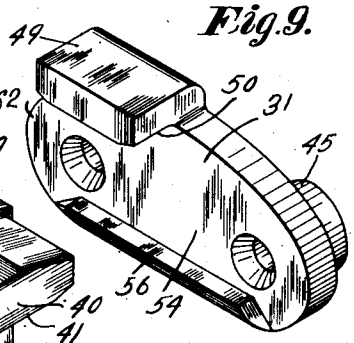


Fig. 9.



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UNITED STATES PATENT OFFICE

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CUTTER CHAIN

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Application December 16, 1947, Serial No. 792,054

3 Claims. (Cl. 262—33)

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This invention relates to kerf cutting means and more particularly to an improved cutter bar and cutter chain especially designed for use in a kerf cutting mining machine for cutting coal or similar materials in mines.

In conventional cutter chains and cutter bars of the kind designed for use in coal cutting machines, the cutter bar usually has a guideway extending about its margin, in which the cutter chain is guided for circulation in an orbital path, and the cutter chain has bit-carrying blocks pivotally connected together by strap links, with the bases of the blocks and strap links provided with gibs which run in the bar guideway. The cutter chain is usually driven by a drive sprocket disposed within the orbit of the chain at one end of the bar, and such sprocket usually has a single central row of teeth which enter pockets in the block bases, resulting in a relatively long-pitch chain. The strap links are sometimes provided at their pivots with projecting pivot portions which are received within bores in the block bases and which are held together by rivets. The bit-carrying blocks have lateral lugs, some of which are centrally located and others of which are inclined laterally at different angles at opposite sides of the median line of the chain, and these lugs have openings normal to the path of travel of the chain for receiving the shanks of conventional single pointed cutter bits held in place by conventional set screws on the lugs. By so arranging the block lugs at different inclinations with respect to the median line of the chain, proper lacing or staggering of the bits is provided so that a kerf may be formed in the coal of a width sufficient to receive the cutter bar as the latter is advanced into the coal. In such known types of cutter chains and cutter bars, the side bits of the bit lacing receive, during cutting, tremendous lateral thrusts which tilt the chain laterally in one direction or the other, sometimes causing springing or twisting of the strap links, and subjecting the rivets to substantial shearing stresses. Also, the gibs at the bases of the blocks and strap links, due to their location at the bottom of the bar guideway, fail to provide adequate lateral guiding support for the chain.

The present invention contemplates improvements over such known types of cutter chains and cutter bars in that the bit-carrying blocks and strap links have lateral guide flanges spaced outwardly from the inner surfaces of the bases of the blocks and strap links so that guide flanges travel about and are slidingly guided by

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the outer peripheral edges of the cutter bar exteriorly of the bar guideway. Also, there is provided a sliding guiding relationship between the bit-carrying blocks and the cutter bar about the margin of which the cutter chain is guided for circulation, in which a groove and a guide, each narrower than the width of the blocks, and one formed on the blocks and the other on the bar, coact to resist lateral thrusts. For example, the bottom of the guideway of the cutter bar may be provided with a relatively narrow channel or groove at its bottom surface, in which the lower portions of the bases of the bit blocks travel and are guided for receiving the lateral thrusts of the side bits of the chain so that substantial stress loads are removed from the strap links and rivets. Further, the bit-carrying blocks may be provided with end abutments intermediate the strap links which engage one another in end to end relation as the cutter chain travels along the straight sides of the cutter bar to prevent undesirable bending back of the chain from a straight line while permitting free outward bending of the chain. The cutter chain of the present invention may be driven by a double sprocket having parallel rows of side teeth which project between the adjacent ends of the strap links at the sides of the bit blocks and engage the rear curved ends of the strap links to drive the chain in its orbital path, resulting in a chain having a relatively small pitch. Thus, substantial advantages over chains and bars of the known types referred to are attained.

An object of the present invention is to provide improved kerf cutting means for cutting kerfs in coal or similar materials. A further object is to provide an improved cutter chain having improved guides for engaging the outer peripheral edges of the cutter bar exteriorly of the bar guideway. Still another object is to provide an improved cutter chain made up of pivotally connected bit-carrying blocks and strap links and having improved bar engaging guides on the blocks and links whereby improved guiding of the chain is attained. Yet another object is to provide an improved cutter chain and drive sprocket construction which enables a chain of small pitch to be obtained. A still further object is to provide an improved cutter chain and cutter bar construction having novel arrangements and combinations of parts. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown

for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a plan view of the outer portion of a cutter bar and cutter chain, constructed in accordance with a preferred illustrative embodiment of the invention.

Fig. 2 is a view in central longitudinal vertical section taken substantially on line 2—2 of Fig. 1, with a portion of the cutter bar shown in side elevation.

Fig. 3 is an enlarged detail cross-sectional view taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a detail view, partially in horizontal section and partially in plan, and on a reduced scale, showing the cutter chain drive sprocket in driving relation with the cutter chain.

Fig. 5 is an enlarged fragmentary central longitudinal sectional view through the cutter chain, with the cutter bar omitted.

Fig. 6 is an enlarged detail cross-sectional view taken on line 6—6 of Fig. 1.

Fig. 7 is a perspective view of the inner side of one of the strap links.

Fig. 8 is a perspective view of one of the bit-carrying blocks.

Fig. 9 is a perspective view of the outer side of one of the strap links.

Fig. 10 is a detail cross-sectional view similar to Fig. 6 but with parts in full, showing a modified construction.

In this illustrative construction, as shown in the drawings, the cutter bar, which is adapted for association with a coal cutting machine, is generally designated 1, and the endless cutter chain guided on the cutter bar is generally designated 2. While the cutter chain and cutter bar disclosed are especially adapted for use in the cutting of coal, evidently, they may be used for other purposes and may be associated with machines other than coal mining machines.

The cutter bar 1 is herein of the narrow elongated plane type having parallel side edges 3 and a curved tip end 4, and comprises top and bottom plates 5, 5 which are maintained in parallel spaced relation by longitudinal side bars 6, 6, to which the plates 5 are rigidly secured as by welding or otherwise. Secured to the inner sides of the outer portion of the plates 5, 5 intermediate the side bars 6 is a rectangular portion 7 of an end plate 8 having an arcuate or semi-circular outer surface 9. Arranged at the top and bottom sides of the end plate 8 are semi-circular outer plates 10, 10 rigidly secured to the end plate, as by bolts 11. The inner sides of the outer plates 10 near their peripheral edges are cut away to provide arcuate recesses 12 for receiving the inner flanges 13 of semi-circular wear strips 14 of angular cross section. The outer peripheral flanges 15 of the wear strips extend around the outer semi-circular edges of the plates 10, as shown in Fig. 2. Straight wear strips 16, similar in cross section to the wear strips 14, are rigidly secured along the inner surfaces of the bar plates 5 as by rivets 17. The arcuate wear strips 14 are secured to the plates 10 likewise by rivets. The outer flanges 18 of the wear strips 16 engage the straight peripheral edges of the bar plates 5 and join with the ends of the semi-circular wear strips 14. The plates 5, 5 and side bars 6 cooperate to provide straight guideways 19 along the parallel sides of the cutter bar, and the plates 8 and 10 cooperate to provide a semi-circular guideway 20 about the tip end of the bar and joining with the guideways 19. The parallel outer surfaces of the parallel side bars 6 are longitudinally grooved at 21 to receive wear strips 22 which are secured to the bars 6 as by welding. The wear strips 22 are generally U-shaped in cross section and provide relatively narrow longitudinal channels or grooves 23 which extend along the bottoms of the guideways 19. The curved end of the plate 8 has a curved channel or groove 24 of the same cross section as the channel 23 and extending arcuately about the outer surface 4 of the bar along the bottom of the curved guideway 20 and joining with the channels 23.

The cutter chain 2 comprises a series of bit-carrying blocks 30 pivotally connected together by strap links 31. The blocks have lateral lugs 32 formed with openings 33 normal to the path of travel of the chain and terminating at their bottoms within the solid bases of the blocks, and these openings receive the shanks 34 of conventional single pointed cutter bits 35. The openings 33 are preferably formed by broaching, and communicate at their inner ends within the blocks with transverse openings 36, similarly preferably formed by broaching and opening outwardly through the sides of the solid block bases. Conventional set screws 37, threaded within openings 38 in the lugs, engage the forward edges of the bit shanks to secure the cutter bits on the lugs. Certain of the lugs on different blocks are centrally disposed while others are relatively angularly disposed with respect to the median line of the chain to provide proper lacing or staggering of the bits, as shown in dotted lines in Fig. 2, to enable the cutting of a kerf in the coal of a width sufficient to receive the bar as the bar is advanced into the kerf. The blocks have centrally located front and rearward end abutments 39 which engage similar end abutments on adjacent blocks to prevent the chain from bending inwardly back from a straight line as it travels along the straight sides of the cutter bar while permitting free bending of the chain outwardly as it passes about the curved end of the bar and about the drive sprocket. Projecting laterally from the opposite sides of the rearward portions of the lugs are guide flanges 49 having inner guiding surfaces 41 which engage the outer peripheral edges of the cutter bar exteriorly of the bar guideway. The bases of the blocks project at 42 inwardly of the bases of the strap links and are received in the channels or grooves 23, 24. Each block-base has parallel transverse bores 43 in which cylindrical wear bushings or sleeves 44 are tightly fitted. The strap links 31 are arranged in pairs at opposite sides of the block bases and have circular bearing portions 45 at their inner sides, which are received in the bores of the bearing bushings or sleeves 44. A bearing portion at one end of each strap link has a reduced circular projection 46, while the other bearing portion of each link has a circular bore 47, and the bores 47 of a pair of links, when in assembled relation, receive the projections 46 to provide an interlock between the strap links. The bearing portions of the strap links are formed with aligned openings which receive rivets 48 which hold the strap links together in pairs. The circular projections 46 fitted in the bores 47 of the strap links to provide the interlock between the strap links provide a rigid construction for absorbing certain lateral stress loads, thereby to remove substantial shearing stresses from the rivets 48, as later explained. Projecting laterally

from the tops of the rearward portions of the strap links and extending rearwardly of the front ends of the trailing block lugs are guide flanges **49** having inner guiding surfaces **50** which engage the outer peripheral edges of the cutter bar exteriorly of the bar guideway, and which cooperate with the guide flanges **40** on the blocks in the guiding of the chain about the margin of the bar. A transverse vertical plane, which includes the axis of the front pivot of each block, cuts through the guide flanges of a pair of strap links. The side bits of the bit lacing receive tremendous inward thrusts during the cutting operation, and a portion of such thrusts is received by the block-bases **42** engaging the side walls of the channels or grooves **23** and **24**. The rear end abutments **39** of the blocks project rearwardly a short distance from the rear surfaces of the guide flanges **40**, as clearly shown in Fig. 8. As shown in Fig. 6, the inner surfaces of the block-bases **42** are spaced a small distance from the bottoms of the channels **23**, **24** so that the entire inward thrust of the chain is absorbed by the lateral guide flanges **40** and **49** which engage the outer peripheral edges of the bar. The bottom surfaces of the bases of the blocks are curved at **51** to provide adequate clearance as the blocks pass about the curved outer end of the bar. In the modification shown in Fig. 10, the lateral guide flanges **40** and **49** are omitted so that the entire inward thrust of the chain is absorbed by the bases of the strap links **31'** engaging the bottom of the bar guideway and the inner surfaces **52** of the blocks **32'** engaging the bottom surfaces **53** of the guide channels. The outer side surfaces **54** of the strap links **31** engage the inner side surfaces **55** of the wear strips **14** and **16**, and the bases of the strap links are formed with lateral gibs **56** which run in side grooves **57** of the bar guideway inwardly of the inner edges **58** of the wear strips, as shown in Fig. 6.

The chain is driven by a double sprocket **60** (see Fig. 4) having parallel side rows of teeth **61** which project between the adjacent ends of the strap links **31** at the opposite sides of the solid block-bases inwardly of the guide flanges **40**, and these teeth engage the curved rear ends **62** of the strap links. By the provision of the improved cutter chain structure above described, and by driving the cutter chain by engagement of the sprocket teeth with the ends of the strap links, a chain with a relatively small pitch is attained.

As a result of this invention, an improved kerf cutting means is provided whereby the cutting of coal or similar material is effected in an improved manner. By the provision of the improved cutter chain structure and the cutter bar, the cutter chain is guided about the margin of the bar in an improved manner. The supplemental narrow guide channel extending along the bottom of the bar guideway receives a portion of the lateral loads of the cutter chain so that substantial stress loads are removed from the strap links, thereby preventing transmission of substantial shearing stresses to the rivets. By the provision of the guide flanges on both the bit-carrying blocks and the strap links which engage the outer peripheral edges of the cutter bar exteriorly of the bar guideway, improved guiding of the chain is afforded. The double chain drive sprocket having parallel side rows of teeth which straddle the chain blocks and engage the rear ends of the strap links substantially reduce the pitch of the chain. These and other advantages

of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A cutter chain comprising a series of bit-carrying blocks and strap links pivotally connecting said blocks together, means for pivotally connecting said strap links to the end portions of the bases of said blocks, said links disposed at the outer sides of said block bases, said blocks each having a centrally located lateral bit-carrying lug, the base of each block having integral end projections extending forwardly and rearwardly of said lug longitudinally between pairs of said strap links and providing end abutment surfaces engageable with similar end abutment surfaces of adjacent blocks to prevent inward bending of the chain from a straight line while permitting free outward bending of the chain, and lateral guide flanges having inner transverse guiding surfaces and projecting from the sides of the lug of each block outwardly beyond the outer portions of said strap links, said flanges extending rearwardly of said lug and in part formed integral with a rear end projection, said rear end projection of each block extending a slight distance rearwardly of the rear surfaces of said guide flanges between the outer sides of the latter and the inner side surfaces of said strap links, the front surfaces of said guide flanges being disposed a substantial distance rearwardly of a point disposed longitudinally midway between the ends of the block.

2. An endless cutter chain comprising a series of chain blocks disposed in close adjacency in substantially end to end abutting contact and pivotally connected together by strap links disposed at their outer sides, pivotal connections between said links and the opposite end portions of the bases of said blocks and providing a pair of pivotal axes on each block-base, said blocks having lateral bit-carrying lugs formed with said guide flanges along their rearward portions with said flanges projecting rearwardly of said lugs, the front surfaces of said flanges located a substantial distance rearwardly of a point longitudinally midway between the ends of the block, and said strap links having similar side guide flanges projecting rearwardly of the forward ends of said block lugs and so arranged with respect to each block that a transverse vertical plane which includes the front pivot axis of the pivotal connection of each block with its strap links, cuts through the guide flanges of a pair of strap links, said lug and strap link flanges having inner guiding surfaces and cooperating in the guiding of the chain.

3. An endless cutter chain comprising a series of chain blocks each having a lateral bit-carrying lug and guide flanges projecting laterally from the sides of each lug and rearwardly from the rear surface of said lug with the front surfaces of said guide flanges located a substantial distance rearwardly of a point disposed longitudinally midway between the ends of said blocks, and a pair of strap links pivotally connected to the rearward portion of the base of the block,

each link having a lateral guide flange located rearwardly of the block and disposed rearwardly of and in close adjacency to said block guide flanges, and said link flanges cooperating with said block flanges in the guiding of the chain.

LEON E. SIMMONS.

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