

July 1, 1952

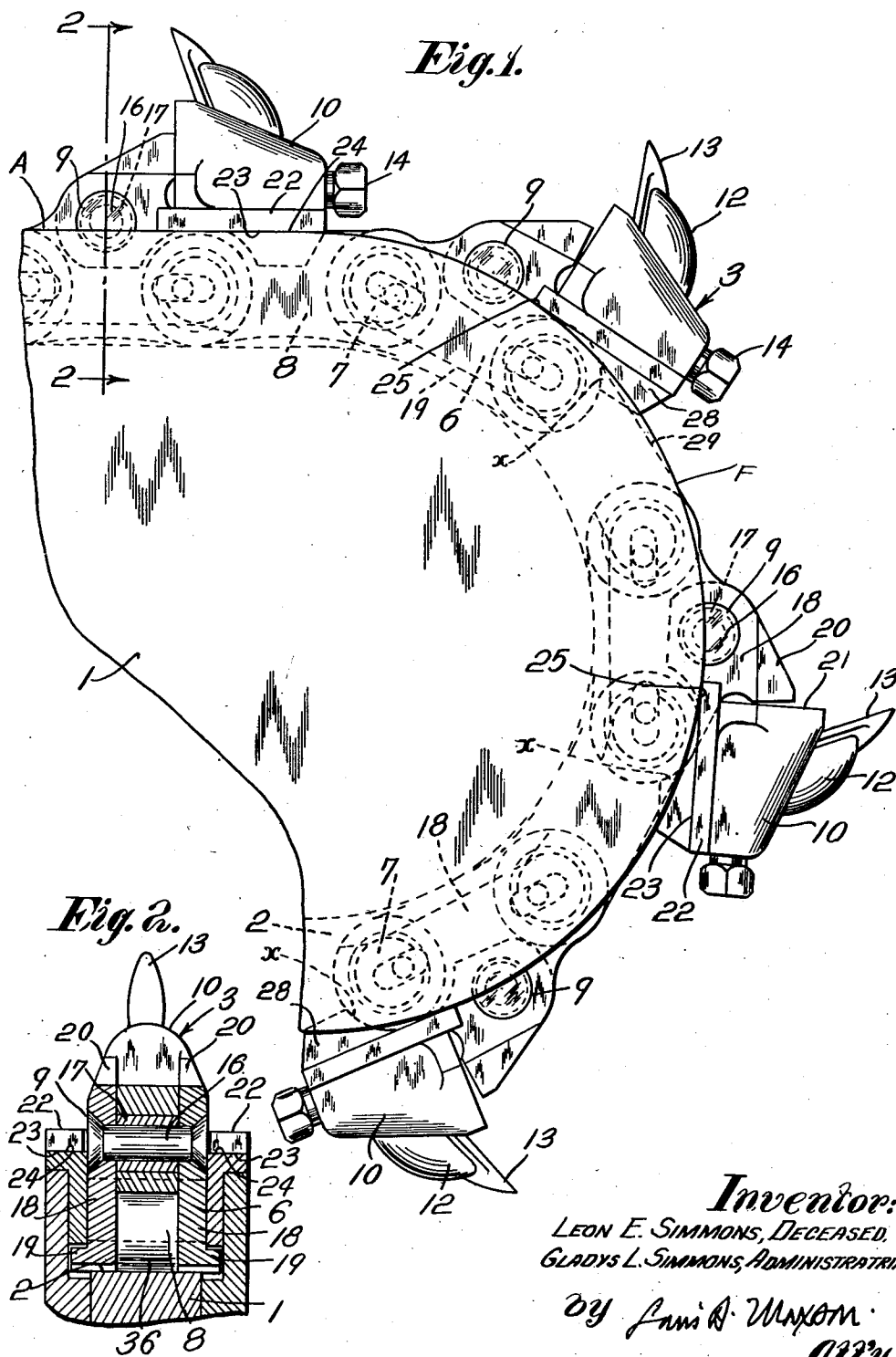
L. E. SIMMONS

2,601,978

CUTTER CHAIN

Original Filed Jan. 5, 1946

3 Sheets-Sheet 1



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CUTTER CHAIN

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3 Sheets-Sheet 2

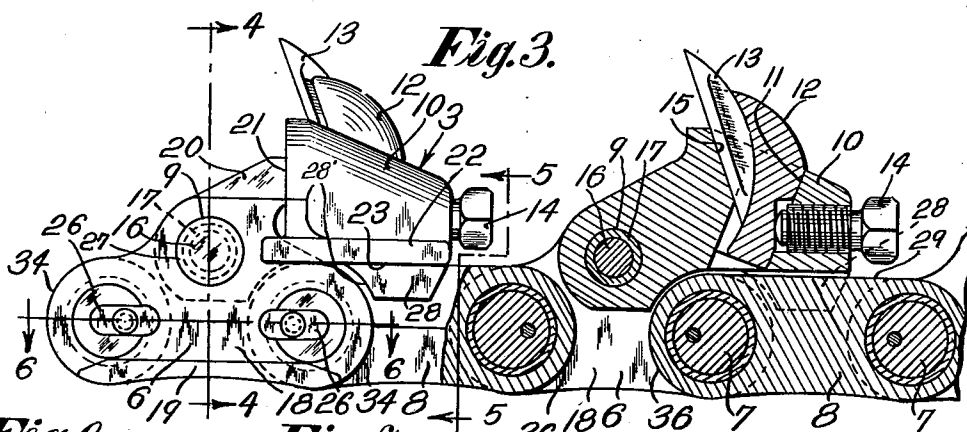


Fig. 4.

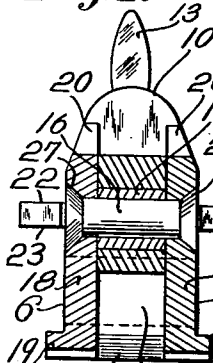


Fig. 5.

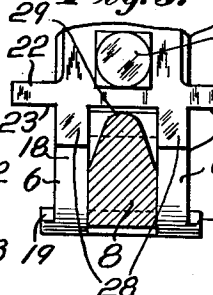


Fig. 6.

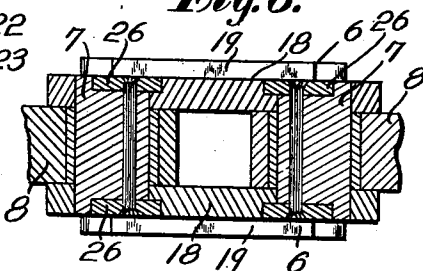


Fig. 9.

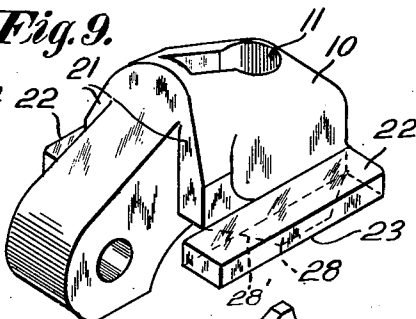


Fig. 7.

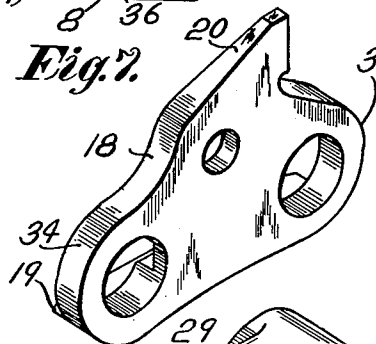


Fig. 8.

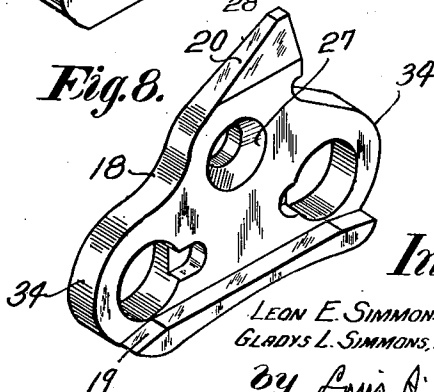
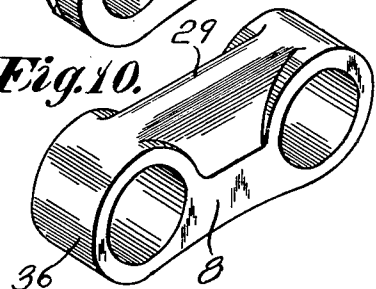


Fig. 10.



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3 Sheets-Sheet 3

Fig. 11

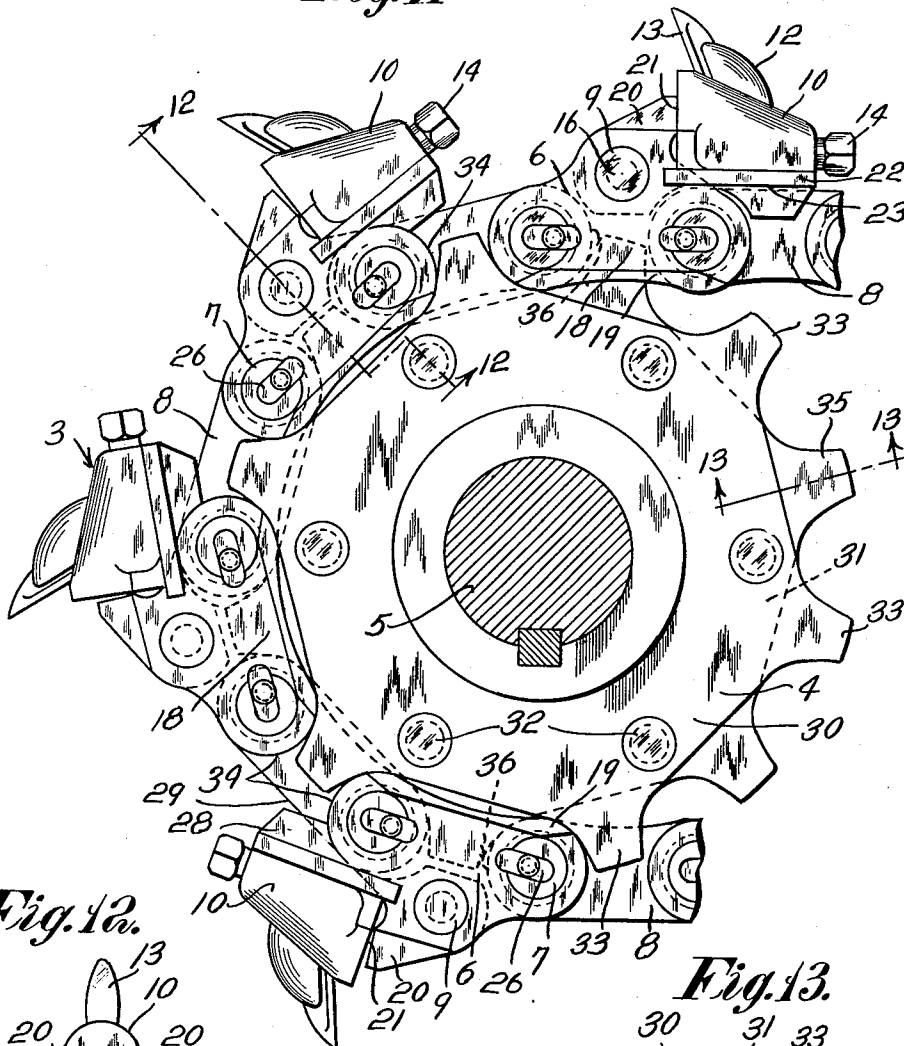


Fig. 12.

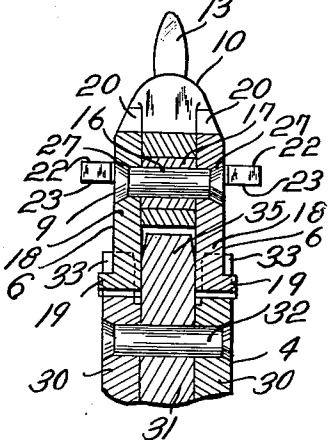
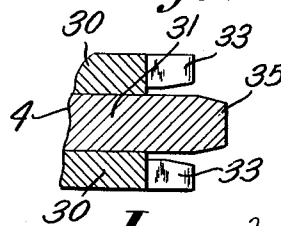


Fig. 13.



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UNITED STATES PATENT OFFICE

2,601,978

CUTTER CHAIN

Leon E. Simmons, deceased, late of Claremont, N. H., by Gladys L. Simmons, administratrix, Claremont, N. H.; said Leon E. Simmons assignor to Joy Manufacturing Company, a corporation of Pennsylvania

Continuation of application Serial No. 639,344, January 5, 1946. This application February 7, 1951, Serial No. 209,746

7 Claims. (Cl. 262—33)

1

This invention relates to cutter chains and to kerf-cutting devices of the cutter chain type, and more particularly to improvements in kerf-cutting devices including a cutter-bit-carrying-cutter chain designed for use in the mining of coal.

In cutter chains used for mining purposes, it has been found that guiding of the chain blocks along parallel inner and outer guide surfaces on the cutter bar is desirable. In chain constructions heretofore provided, it was found practically impossible to guide the chain blocks along parallel inner and outer guide surfaces without considerable loss of efficiency due to binding. Also, frequently but one of the inner and outer guide surfaces functioned, resulting in inadequate guiding of the chain. Further, in previous known devices considerable difficulty has been encountered in the proper clearing away of the cuttings, causing the latter to pack in between the cutter chain and the cutter bar, resulting in a great loss in efficiency. In known types of cutter chains, the chain blocks are usually made up in a single piece, so that the cost of replacement is comparatively high. Also, to change the "lacing" of the cutter bits it is necessary completely to detach the blocks from the strap links.

An object of the present invention is to provide an improved cutter bar-cutter chain arrangement which, to a substantial extent, overcomes the disadvantages of previous known structures. Another object is to provide an improved cutter chain-cutter bar combination wherein the load stresses transmitted to the chain guides are evenly distributed over a relatively wide area.

Still another object is to provide an improved cutter bar-cutter chain combination wherein the chain blocks, as they pass around the curved outer end of the cutter bar, tend to scrape off the cuttings, instead of digging into and pocketing the cuttings, thereby serving to clear its own path.

A further object is to provide an improved cutter chain incorporating a "trailer" link structure wherein the lug which carries the cutter bit trails along with respect to the base of the chain block in engagement with the outer surface of the cutter bar both during movement along the straight advancing side and during movement around the curved forward end of the bar.

How these and other objects are accomplished, and the advantageous features of the invention, will be best understood from the following detailed description wherein a preferred and illus-

2

trative embodiment is disclosed, reference for the purpose being had to the accompanying drawings, in which:

Fig. 1 is a fragmentary plan view of the forward end of a cutter bar equipped with an illustrative form of the improved cutter chain.

Fig. 2 is a detail sectional view taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a view partially in elevation and partially in longitudinal section illustrating details of the improved cutter chain.

Fig. 4 is a cross-sectional view taken substantially on line 4—4 of Fig. 3.

Fig. 5 is a detail sectional view taken substantially on line 5—5 of Fig. 3.

Fig. 6 is a longitudinal sectional view taken substantially on line 6—6 of Fig. 3.

Figs. 7 and 8 are perspective views of the side parts of one of the chain blocks.

Fig. 9 is a perspective view of the pivoted block lug.

Fig. 10 is a perspective view of one of the strap links.

Fig. 11 is a horizontal sectional view taken through the rearward portion of the cutter chain and showing the chain drive sprocket.

Fig. 12 is a detail sectional view taken substantially on line 12—12 of Fig. 11.

Fig. 13 is a detail sectional view taken substantially on line 13—13 of Fig. 11.

This application is a continuation of my pending application, Serial No. 639,344, filed January 5, 1946 as a continuation of my earlier application Serial No. 466,994, filed November 26, 1942, and now abandoned.

In the illustrative embodiment of the invention there is shown a cutter bar 1 having a guide channel 2 extending about its margin in which guide channel a cutter chain, generally designated 3, is guided for circulation in an orbital path. Arranged at the rear end of the cutter bar is a chain drive sprocket 4 of a novel design, which engages and drives the cutter chain in a manner to be more fully explained, and this sprocket is driven by a shaft 5 to which it is keyed. The cutter bar 1 has a straight advancing side A and an arcuate forward end F, the latter conforming to an arc of a radius equal to one-half the width of the bar in the arrangement illustrated.

The cutter chain 3 comprises a series of chain blocks 6 pivotally connected by hinge pins 7 to connecting or strap links 8. Each of the chain blocks has pivotally mounted on its base, on a transverse hinge 9, a "trailer" lug 10 having a

3

socket 11. The hinge axes are parallel to the axes of the hinge pins 7. Arranged in the lug socket is a detachable holder 12 for a cutter bit 13 of the double-ended "throwaway" type. A set screw 14 arranged at the rear side of the lug engages the holder for clamping the cutter bit in cutting position with its front face resting against a front abutment surface 15 on the "trailer" lug. The specific cutter bit and its mounting and holding means need not be described in detail, as any suitable bit and mounting therefor on the "trailer" lug may be employed. The "trailer" lug hinge 9 includes a rivet 16 arranged midway between the block hinge pins 7, and surrounding this rivet is a bushing 17 (Fig. 4) extending between separate side parts 18, 18 of the base of the block. The block parts 18, as shown in Figs. 7 and 8, have lateral gibs 19 which are slidably received in the guide channel 2 of the cutter bar, and each block part has a rearwardly projecting portion 20 adapted abuttingly to engage at 21 front abutment surfaces on the pivoted block part 10. The cooperation of these surfaces will prevent the turning over of the lugs when the chain is reversely driven in freeing the latter. The pivoted lug part of each block has lateral guide flanges 22 having wide inner guide surfaces 23 which slidably engage at 24 the straight outer peripheral surface of the cutter bar. Due to the pivotal mountings for the "trailer" block lugs, the guide flanges 22 will not have any binding engagement with the peripheral bar surface, this resulting from the provision of some freedom of movement of the outer guide surfaces of the block with respect to the inner guide surfaces. It will thus be seen that by pivotally mounting the block parts which carry the outer guides 22, the chain load stresses are more evenly distributed over a relatively wide area, and undue canting of the blocks, as the chain travels around the cutter bar, is substantially prevented, thereby decreasing to a substantial extent the possibility of binding or jamming of the chain. Also, further to reduce binding, the pivoted cutter carrying lugs as they tend to tilt backwards, tend to raise the side parts 18, 18 of the blocks in their guides. As the cutter chain passes around the curved outer end of the cutter bar, in the manner shown in Fig. 1, the lugs rest, as at x in Fig. 1, on the bases of the blocks, with the forward ends of the inner surfaces 23 of the guide flanges 22 on the lugs engaging the outer surfaces of the cutter bar at 25, so that the cuttings are scraped off the bar by the chain, instead of the latter digging into and pocketing the cuttings. Thus the novel cutter chain serves to clear its own path as it passes around the curved end of the cutter bar and around the chain drive sprocket.

As above described, each chain block includes three main parts, namely the separate side parts 18, 18 and the pivoted "trailer" lug part 10 which carries the cutter bit, and these parts are, in part, held in assembled relation by the hinge pins 7. These hinge pins have suitable releasable locks 26, which are fully described in a patent of H. H. Vanderzee, No. 2,365,229, granted December 19, 1944. The hinge rivets 16, as shown in Fig. 4 are headed over as at 27 within conical bores in the outer sides of the blocks, and these rivets also aid in holding the block parts together. The strap links 8 are arranged between the side parts of the chain blocks in the manner shown in Fig. 6, and the "trailer" lugs have depending portions 28 projecting into the bar

4

channel at the opposite sides of the strap links. Thus the "trailer" lugs straddle the strap links and may, at times, rest at the points 29 on the strap links to prevent buckling of the chain. The portions 28 are curved at their inner sides at 28' for engagement at x with the side parts 18 of the blocks as the chain passes around the curved outer end of the bar and around the chain sprocket.

Now referring to Figs. 11, 12 and 13, it will be noted that the chain drive sprocket 4 is made up of three main parts comprising side plates 30, 30 and an intermediate plate 31, and these plates are held together as by rivets 32. Each of these plates has sprocket teeth, and the side plates have sprocket teeth 33 which are shaped to engage the curved ends 34 of the chain blocks. The intermediate plate has sprocket teeth 35 staggered with respect to the side plate teeth and shaped to engage the curved end surfaces 36 of the strap links. Thus certain of the sprocket teeth concurrently engage both the strap links and the blocks, resulting in a more efficient chain drive. The curved surfaces 28' of the portions 28 of the lugs are shaped to conform to the curved end surfaces 34 of the side parts of the chain blocks and are adapted to rest against the surfaces 34 in the manner shown in Figs. 1 and 11 as they pass around the curved end of the bar and around the chain sprocket.

As the cutter chain is driven by the sprocket and is rapidly circulated in its orbit about the margin of the cutter bar, the "trailer" block lugs as they pass around the chain drive sprocket in a curved path are positioned, in the manner shown in Fig. 11, so that the cuttings are effectively thrown outwardly with a shovel-like action, thereby reducing the possibility of clogging. As the cutter chain travels about the cutter bar, the gibs 19 on the bases of the chain blocks and the guide surfaces on the guide flanges 22 of the pivoted "trailer" lugs concurrently engage the inner and outer guide surfaces of the cutter bar, so that the chain load stresses are distributed over a relatively wide area. By pivotally mounting the "trailer" lugs on the bases of the chain blocks, binding of the chain is substantially prevented. By pivotally arranging the "trailer" lugs as herein disclosed, with the lateral guide flanges 22 located wholly to the rear of the pivots 9, and positioning the pivots at a proper elevation with respect to the bottoms of the base portions or chain blocks 6, the full areas of the surfaces 23 may contact as at 24 with the straight advancing side of the bar as the blocks move outwardly of the bar along the latter, and, as clearance is provided as the blocks pass around the arcuate end of the bar, the guide flanges may drop inwardly slightly and engage with their forward ends the curved end surfaces on the bar while engagement at x between the surfaces 28' and the curved ends 34 of the side parts 18 provides support for the lug 10 when the flanges 22 are in "scraping" relation to the cutter bar. Also, by pivotally mounting the "trailer" lugs which carry the cutter bits on the bases of the chain blocks, it is possible, simply by removing the rivets 16, to rearrange the "trailer" lugs on the different blocks, thereby facilitating "lacing" of the cutter bits in an obvious manner.

As a result of this invention it will be noted that an improved structure is provided resulting in the more efficient cutting of coal. It will also be noted that by particular arrangement of the guide surfaces on the chain blocks and by pivotal-

5

ly mounting the "trailer" block lugs on the bases of the chain blocks, the chain load stresses are more evenly distributed over a relatively wide area. Further, by constructing the chain blocks in the manner disclosed, the cuttings are effectively cleared away, thereby reducing the possibility of clogging. Other advantages of the improved cutter chain 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 of the same 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 is claimed is:

1. In a cutter chain, a chain block comprising a base portion, and a cutter bit carrying lug pivotally mounted on said base portion for swinging movement with respect thereto and projecting rearwardly with respect to said base portion, said lug carrying a cutter bit in a cutting position near the rear end of said block and having forwardly facing abutment surfaces located a substantial distance rearwardly of the lug pivot, said block base portion having projections at the opposite sides of said lug and extending outwardly and rearwardly with respect to the lug pivot, said projections providing rearwardly facing abutment surfaces on their rearward extremities with which said forwardly facing abutment surfaces on said pivoted lug are engageable to limit outward swinging movement of said lug, and means for maintaining said lug in a position relative to said base portion in which said bit is in a cutting position.

2. In a cutter chain, a chain block comprising a base portion, and a cutter bit carrying lug pivotally mounted on said base portion for swinging movement with respect thereto and projecting rearwardly with respect to said base portion, said lug carrying a cutter bit in a cutting position near the rear end of said block and having forwardly facing abutment surfaces located a substantial distance rearwardly of the lug pivot, said block base portion having projections at the opposite sides of said lug and extending outwardly and rearwardly with respect to the lug pivot, said projections providing rearwardly facing abutment surfaces on their rearward extremities with which said forwardly facing abutment surfaces on said pivoted lug are engageable to limit outward swinging movement of said lug, said abutment surfaces being so arranged and positioned that when they are in engagement said cutter bit is in cutting position with respect to said block-base-portion.

3. In combination, a cutter bar having a straight, advancing side and straight guide surfaces extending along said side and also having a curved forward end with curved surfaces thereon in the same series of planes as said straight guide surfaces, said curved surfaces conforming to arcs struck with radii equal to one-half the width of the cutter bar at its forward end, from points midway between the sides of said bar, a cutter chain guided on the said bar, and means for effecting circulation of said cutter chain upon said cutter bar, said cutter chain including a plurality of chain blocks each having a base portion and a bit-carrying lug pivotally mounted on said base portion in trailing relation thereto for swinging movement with respect thereto, said

6

bar having surfaces between and inwardly disposed with respect to said straight guide surfaces and said curved surfaces engaged by said base portions during circulation of the chain, and said lugs having laterally spaced guide surfaces disposed wholly to the rear of the pivotal connection between said lugs and said base portions and engaging said straight guide surfaces throughout their own lengths as they traverse said straight guide surfaces and engaging said curved surfaces, but only at their own forward ends, while passing around the forward end of said bar, said lugs and the rearward ends of said base portions with which they are pivotally connected having surfaces mutually engaged with each other and supporting said lugs in the position in which only the forward ends of the guide surfaces on said lugs engage said curved surfaces.

4. In combination, a cutter bar having a straight, advancing side and straight guide surfaces extending along said side and also having a curved forward end with curved surfaces thereon in the same series of planes as said straight guide surfaces, said curved surfaces conforming to arcs struck, with radii equal to one-half the width of the cutter bar at its forward end, from points midway between the sides of said bar, a cutter chain guided on the said bar, and means for effecting circulation of said cutter chain upon said cutter bar, said cutter chain including a plurality of chain blocks each having a base portion and a bit-carrying lug pivotally mounted on said base portion in trailing relation thereto for swinging movement with respect thereto, said bar having surfaces between and inwardly disposed with respect to said straight guide surfaces and said curved surfaces engaged by said base portions during circulation of the chain, and said lugs having laterally spaced guide surfaces disposed wholly to the rear of the pivotal connection between said lugs and said base portions and engaging said straight guide surfaces throughout their own lengths as they traverse said straight guide surfaces and engaging said curved surfaces, but only at their own forward ends, while passing around the forward end of said bar, said lugs and the rearward ends of said base portions with which they are pivotally connected having surfaces mutually engaged with each other and supporting said lugs in the position of the latter in which only the forward ends of the guide surfaces on said lugs engage said curved surfaces, said mutual engagement being to the rear of forward ends of said guide surfaces on said lugs.

5. In combination, a cutter bar having a straight, advancing side and straight guide surfaces extending along said side and also having a curved end with curved surfaces thereon, the straight guide surfaces lying in planes tangent to the curved surfaces, a cutter chain, and means for effecting circulation of said cutter chain upon said cutter bar, said cutter chain including a plurality of chain blocks each having a base portion and a bit-carrying lug pivotally mounted on said base portion for swinging movement with respect thereto, said lugs having elongated guide surfaces slidably engaging said straight guide surfaces with extended surface contact during movement of said lug along said straight side of the cutter bar and engaging said surfaces only at their own forward ends during movement of said lug over the latter, and said base portion and said lug having surfaces spaced to the rear of the axis of pivotal mounting of the lug on the base portion and to the rear of the forward ends

7

of said guide surfaces on the lug engaged with each other when said guide surfaces on said lug overlie said curved surfaces and supporting said guide surfaces on said lug with their forward ends only in contact with said curved surfaces.

6. In combination, a cutter bar having a straight, advancing side and straight guide surfaces extending along said side and also having a curved end with curved surfaces thereon, the straight guide surfaces lying in planes tangent to the curved surfaces, a cutter chain, and means for effecting circulation of said cutter chain upon said cutter bar, said cutter chain including a plurality of chain blocks each having a base portion and a bit-carrying lug pivotally mounted on said base portion in trailing relation thereto for swinging movement with respect thereto, said lug having guide surfaces slidably engaging said straight guide surfaces with extended surface contact during movement of said lug along said straight side of the cutter bar, and said base portion and said lug having surfaces spaced to the rear of the axis of pivotal mounting of the lug on the base portion engaged with each other when said guide surfaces on said lug overlie said curved surfaces and supporting said guide surfaces on said lug with their forward ends only in contact with said curved surfaces.

8

7. In combination, a cutter bar having an arcuate forward end and a straight advancing edge providing surfaces successively acting as guides for chain elements traversing the bar, and a cutter chain including a plurality of chain blocks each having a base portion and a bit-carrying lug pivotally mounted on said base portion in trailing relation to the latter for limited swinging movement with respect to it, each of said lugs having an elongated straight guide surface lying to the rear of its pivotal connection with the base portion to which it is pivotally connected and successively engaging, (a) with contact only at its own forward end, the guide surface provided by said arcuate portion, and (b) with extended surface contact along its length, the guide surface provided by said straight advancing edge, and said chain blocks each having mutually engaging surfaces adjacent the rear end of said base portion and formed respectively on the latter and on said lug for supporting the lug with respect to the base portion during engagement (a) above.

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25 *Administratrix of the Estate of Leon E. Simmons, Deceased.*

No references cited.