April 30, 1935. M. P. HOLMES 1,999,193

CUTTER CHAIN

Filed April 17, 1930.

Fig. 1.

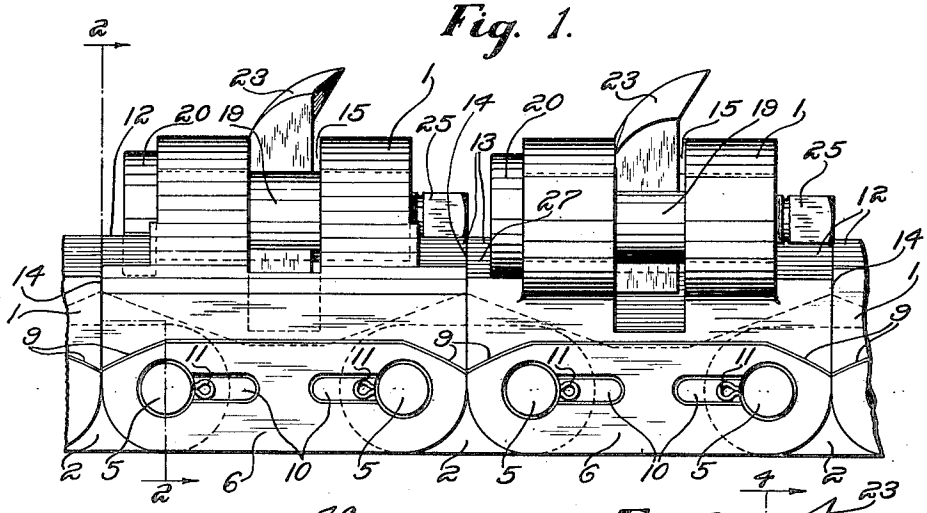


Fig. 2.

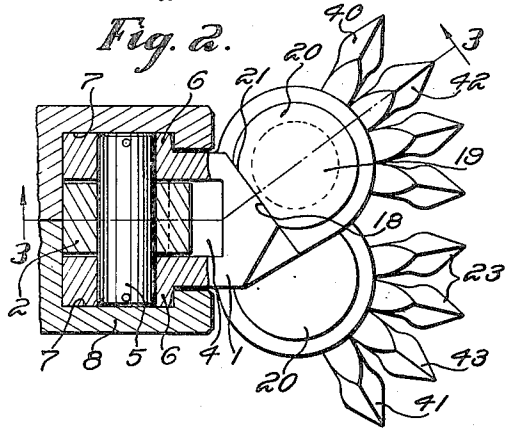


Fig. 3.

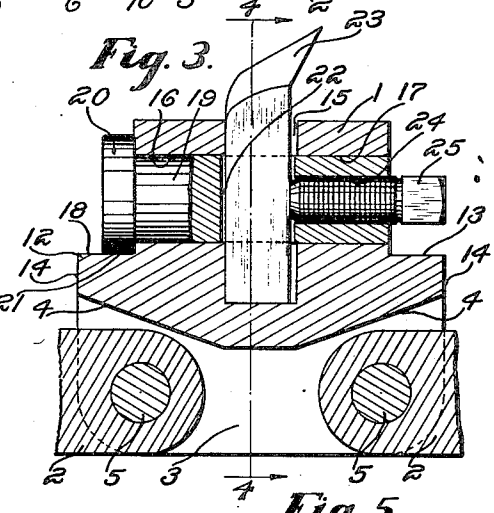


Fig. 4.

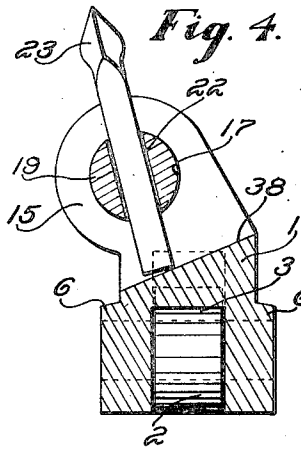


Fig. 7.

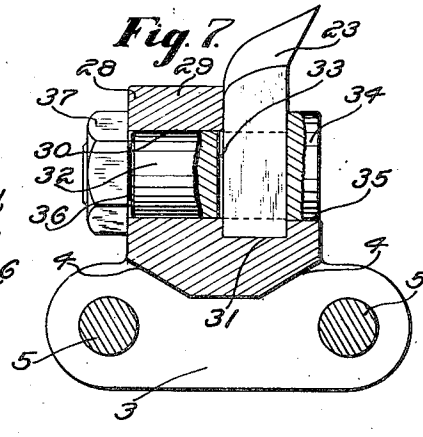
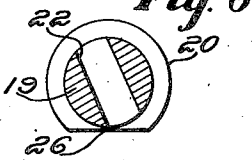


Fig. 5.



Fig. 6.



INVENTOR:
MORRIS P. HOLMES.
BY Louis A. Watson.
ATT'Y.

Patented Apr. 30, 1935

1,999,193

UNITED STATES PATENT OFFICE

1,999,193

CUTTER CHAIN

Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Company, a corporation of Massachusetts

Application April 17, 1930, Serial No. 445,141

38 Claims. (Cl. 262—33)

This invention relates to improvements in cutter chains including the method of forming the same and more particularly has reference to improvements in cutter chains for coal mining machines.

An object of this invention is to provide an improved cutter chain and more particularly an improved cutter block and improved means for holding the cutter bits in the cutter block. Another object is to provide an improved cutter chain block and improved cutter bit holding means whereby the cutter bit may be carried and held in an improved manner at the same time that an exceedingly simple, positive, and rugged construction is retained. A further object is to provide an improved construction and arrangement of clamping means for the cutter bit in the cutter block. A still further object is to provide an improved cutter chain wherein a single cutter block is used for supporting the cutter bits in all positions, thereby eliminating the necessity of many different cutter blocks and minimizing the cost of manufacture and repair. Yet another object is to provide an improved cutter chain having improved cutter block and improved strap construction for connecting the cutter blocks. Yet another object is to provide an improved cutter block having an improved guide construction for engaging the guide grooves on the cutter chain support or bar. These and other objects and advantages of this invention will, however, hereinafter more fully appear.

In the accompanying drawing there is shown for purposes of illustration two forms which the invention may assume in practice.

In this drawing,—

Fig. 1 is a side elevational view of the illustrative embodiment of the improved cutter chain.

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

Fig. 3 is a horizontal sectional view taken centrally through one of the cutter blocks and its connecting straps.

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

Figs. 5 and 6 are detail sectional views illustrating a portion of the bit holding structure.

Fig. 7 is a view similar to Fig. 3 showing a modified form of construction.

In the embodiment of the invention illustrated in Figs. 1 to 6 there is shown a cutter chain made up of a series of cutter blocks 1 of improved construction connected together in an improved manner by a series of connecting links 2. The cutter blocks are longitudinally slotted at 3 centrally between the sides to form lateral ears, the outer ends of the slots being inclined as at 4. The slot or recess 3 receives the connecting links 2 between the lateral ears and the links are pivotally connected to the blocks by transverse pins 5 passing through perforations in the ears. In the present construction there are formed on the opposite sides of the cutter block, laterally projecting, longitudinally extending guide lugs 6 receivable during normal operation of the chain in guiding groove 7 formed on a cutter chain support or bar 8, as shown in Fig. 2. These guiding surfaces have a width materially greater than the diameter of the connecting pins thus affording not only a guiding lug of substantial proportions, but also a substantial bearing for the connecting pins. It is also seen from this improved arrangement, that the distance from the upper guiding surfaces to the point of the cutter bit provides a minimum turning arm, thereby effectively resisting tendency of the links to buckle. The guiding surfaces are also tapered as at 9 as by a straight taper on the upper surface, while the corresponding portion on the lower surface is curved. It will be noted that the curved and straight tapers commence at points not far from vertical alinement with the axis of the pins 5, although in accordance with the theory of operation of my improved arrangement the guides could be shorter than the distance between the centers of the pins of any one block. By having the guiding surfaces disposed on each side of the connecting pins and of not greater length than the distance between the centers there is no possibility of any portion of the guiding surfaces being pivotally swung outwardly against the guiding surfaces of the cutter bar as would be the case were the upper guiding surface, for instance, extended past vertical alinement with the pin center or if the upper guiding surface were disposed below the guiding pins and terminated in vertical alinement with the center thereof. In this latter case it will be seen that any tendency of the cutter block to rotate around the pin would cause the end of the guiding surface to swing about the pin as its center and into undue engagement with the cutter bar guiding surface.

The guide lugs 6 are preferably slotted at 10 on only one side of the connecting pin holes, and are of such a length that the holding members, herein in the form of cotter pins 11 can be started into the cotter pin holes at an inclined position and then upon continued insertion of the cotter pin, it is allowed to spring into its recess 10. The normally free end of the cotter pin terminates within the connecting pin instead of projecting

therethrough and spread as usual. The cotter pin cannot work out of the pin due to having been sprung into the slot 10, it being understood that the length of the slot and pin are so relatively proportioned that during insertion of the pin it is not bent.

Formed on the ends of the cutter block are projections 12 and 13 and these projections and the lateral ears present abutment surfaces 14 which would prevent any backward tilting of the cutter blocks. It has also been found in practice that when a cutter chain is moving rapidly around a sprocket wheel (carried by the cutter chain support or bar 8 and driving or guiding the cutter chain) there is a tendency for the chain to follow the sprocket beyond the point where it should be disengaged therefrom to enter the guide grooves in the cutter bar. The abutment surfaces on the projections 12 and 13 and the lateral ears cause a positive disengagement of the chain and sprocket wheel at the desired point.

Now referring to the improved cutter block and its associated cutter bit holding structure, it will be noted that the cutter blocks are identical in design, thereby eliminating the necessity of a plurality of different cutter blocks for holding the cutter bits in their different positions. Each of the cutter blocks is transversely slotted at 15 and is provided with alined bores 16 and 17 in upstanding portions of the bit block spaced by the transverse slot. The rear upstanding projection is provided with a flat surface 18. Mounted in the bores 16 and 17 in the bit block is a cylindrical holding member 19 having an enlarged head 20 provided with a flattened surface 21 engageable with the surface 18 for preventing rotation of the bit holder about its axis. In the present design the bit holder 19 is transversely slotted at 22 to receive the shank of a usual cutter bit 23. As shown in Fig. 3, the bit holder 19 is axially threaded at 24 in its forward end to receive a standard set screw 25. It will be noted that to provide different positions of the cutter bits upon different blocks, a plurality of bit holding members are provided having their enlarged head portions 20 flattened at different points as at 26 in Fig. 6 so that the cutter bit held thereby may project at different angles from the bit holder, the bit herein having four positions at one side of the median line of the cutter chain. To provide four positions at the other side of the median line the bit block is merely turned end for end and the bit holder slipped into the bore at the other end of the bit block, there being provided projections 27 having flattened surfaces (engageable with the flattened surface on the bit holder) at its other end. It will thus be seen that eight positions of the cutter bits are obtainable with a plurality of bit blocks of identical design, it being only necessary in order to obtain these positions to flatten the enlarged head portions of the bit holders at different points to change the angle of the cutter bits. In order to obtain a greater or less number of cutter bit positions the holder heads 20 may be flattened at any angle relative to the cutter bit slots 22. In order to maintain the same width of kerf, whether the bits are disposed for reverse or forward operation, the relative angle between the flat portion of the head 20 and the cutter bit slot is such that the outer bit 40 will, when the holder 19 and cutter bit are reversed, be in the position of the cutter bit 41 and vice versa, while the bit 42 when reversed will be in the position of the bit 43 and vice versa. It is a further desirable feature in connection with my improved chain arrangement to have more cutter bits near the edge of the kerf than in the intermediate parts thereof. The result is that the desired width of kerf is maintained by a relatively small amount of fine cuttings while the relatively few intermediate bits tend to gouge out the coal in fairly large lumps between the edges of the kerf, thereby reducing the amount of small cuttings which have less value than the larger coal. It is seen that by my improved cutter blocks, bits may be disposed as close together as desired at the outer portions of the kerf merely by inserting a bit holder with the head thereof provided with a proper angularly disposed flat surface. Under certain emergency conditions it is clear that an operator may very readily grind further flat surfaces on the holder heads so as to obtain any position desired, it being also clear that if desired the head edges could be originally provided with a plurality of flat surfaces to permit a similar choice of positions but it is preferred to have only a single possible position for each holder to avoid the possibility of an improper number of similar positions.

In the modified form shown in Fig. 7 a cutter block 28 is provided with an upstanding portion 29 having a bore 30. The bit block is recessed at 31 with either an arcuate or flat bottom surface, to receive the inner end of the bit shank. Arranged within the bore 30 is a cylindrical holding member 32 having a transverse slot 33 receiving the cutter bit and an enlarged head portion 34 at the front side of the bit block. This head portion is flattened at 35 for engagement with a flat surface on the bit block. The rear end of the bit holder is threaded at 36 and carries an adjusting nut 37 which engages the rear vertical face of the bit block.

In the use of the preferred form of the invention shown in Figs. 1 to 6 inclusive, when it is desired to clamp a cutter bit in position within the bit block the body of the bit is passed through the slot 22 in the bit holder 19 and the set screw 25 then adjusted to rigidly clamp the rear surface of the cutter bit against the bit block. As the set screw is tightened, turning of the bit holder 19 is prevented by engagement of the flat surfaces on the head 20 and the projections 18 or 27 on the bit block. The cutter bit may be released simply by loosening the set screw. In the form of the invention shown in Fig. 7 the cutter bit is merely inserted within the slot 33 in the bit holder and rigidly clamped in position by tightening of the adjusting nut 37. It is to be noted that the backing surface 38 against which the cutter bit is adapted to rest as shown in Fig. 4 has the same degree of inclination as the surfaces 18 thereby permitting all of these surfaces to be finished with one milling operation.

As a result of this invention it will be noted that an improved cutter chain is provided of extremely simple and rugged construction wherein the necessity of a plurality of separate bit blocks to obtain the different positions of the cutter bit is unnecessary. It will further be noted that due to the arrangement of the bit holders in the bit blocks it is possible by a simple rearrangement of the parts to vary the position of the cutter bits, it only being necessary to insert different bit holders within the cutter blocks to obtain these positions. It will further be noted that the cutter bit is held within the cutter block by a simple clamping action, it being only necessary to adjust a single element to clamp and release the bit. It will also be noted that by arranging the

cutter blocks in end abutting relation and by providing projections on the blocks having abutment surfaces all tendency of the cutter chain to follow the sprocket wheels or to tilt backward is prevented. These and other uses and advantages of the improved cutter chain will be clearly apparent to those skilled in the art.

While there is in this application specifically described two forms which the invention may assume in practice, it will be understood that these forms of the same are 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 link having a longitudinally extending bore, and cutter bit positioning means for supporting and holding a cutter bit including a member insertable in said bore and having a flattened surface engaging with a corresponding flattened surface on the link for determining the angular relation of the bit with respect to the chain link and for positively holding the bit in such relation.

2. A cutter chain link having a longitudinally extending bore, and means for supporting a cutter bit in any one of a plurality of angularly disposed positions including interchangeable members insertable in said bore.

3. A cutter chain link having a longitudinally extending bore, and means for supporting and holding a cutter bit in any one of a plurality of angularly disposed positions including an interchangeable member disposed within said bore and having provision adapted for cooperation with said link for determining the angular relation of the bit to be held.

4. A cutter chain link having a longitudinally extending bore terminating adjacent a face of the link body, and means for clamping a cutter bit against said face including a member insertable in said bore and having an opening to receive the cutter bit, and contactable surfaces on said member and link for holding said member in a single predetermined position in said bore and for determining the angular relation of the bit with respect to the link body.

5. A cutter chain link having a longitudinally extending bore terminating adjacent a face of the link body, means for clamping a cutter bit against said face including a member insertable in said bore and having an opening to receive the cutter bit, and means carried by said member and engaging said bit for tightening said cutter bit against said face and securing said insertable means within said bore.

6. A cutter chain link having a longitudinally extending bore, a bolt disposable therein, means whereby it is insertable within said bore at a predetermined angular position, and means carried by said member and engaging said bit for clamping a cutter bit against a portion of said link while positively subjecting said bolt to a holding force.

7. A cutter chain link having a pair of members, and means for clamping a cutter bit between said members including a set screw, said members having provision whereby one is removable bodily with said set screw.

8. A cutter chain link comprising a base, a lug projecting upwardly therefrom and having a longitudinally extending bore, a cutter bit positioning bolt extending through said bore and provided with a head and a slot in which a cutter bit is disposable, said head and link body having cooperating contactable relatively flat portions adapted to permit insertion of said bolt into said bore in only one position to thereby determine the angular relation of the bit with respect to the base and for positively holding said bit in such relation.

9. A cutter chain link comprising a base portion, a lug projecting upwardly therefrom and having a longitudinally extending bore, a cutter bit positioning bolt extending through said bore and provided with a head and a slot in which a cutter bit is disposable, said head and link having cooperating contactable relatively flat portions adapted to permit insertion of said bolt into said bore in a certain angular relation and for positively preventing angular movement of the bit with respect to the base portion, said flat portion on the head and the slot for receiving the cutter bit being disposed in a predetermined relative angular relation, and tightening means associated with said bolt and upstanding member for clamping the cutter bit in position.

10. A cutter chain having a base portion and an upwardly extending angularly disposed lug having a bore extending therethrough, a bolt having a transverse slot adapted to receive a cutter bit and also provided with a head, said bolt being insertable into said opening, and means carried by said bolt and engaging said bit for subjecting said bolt to a holding force and in turn clamping a cutter bit in said slot.

11. A cutter chain having a base and an upwardly extending angularly disposed lug provided with a bore extending therethrough, a cutter bit positioning bolt having a transverse slot adapted to receive a cutter bit and provided with a head, said bolt being insertable into said bore, and means for subjecting said bolt to a holding force to clamp a cutter bit in said slot, said bolt and base being provided with cooperating means whereby the bolt is adapted to have only a single predetermined position when inserted in said bore for determining the angular relation of the bit with respect to the base and for positively holding the bit in such relation.

12. A cutter chain having a base and an upwardly extending angularly disposed lug provided with a bore extending therethrough, a bolt having a transverse slot adapted to receive a cutter bit and provided with a head, said bolt being insertable into said bore from either of opposite directions, and means for subjecting said bolt to a holding force to clamp a cutter bit in said slot, said bolt and link being provided with cooperating means whereby the bolt is adapted to have only a single predetermined position when fully inserted in said bore.

13. A cutter chain having a plurality of identical cutter bit links and connecting links, and a removable member, associated with each of said cutter links and having only a single predetermined position with respect thereto, having provision for determining the angular relation of the cutter bit with respect to the median line of the link whereby a plurality of different cutter bit positions may be presented while using only a single type of cutter bit link.

14. A cutter chain having a plurality of identical cutter bit links and connecting links, and a removable member, associated with each of said cutter links, having provision for determining the angular relation of the cutter bit with respect to the median line of the link whereby a plurality of

different cutter bit positions may be presented while using only a single type of cutter bit link, said cutter bit links having provision whereby said removable members may be reversed to permit cutting in either direction.

15. An article of manufacture forming a part of a mining machine cutter chain comprising a cutter bit positioning bolt having a transverse slot therethrough adapted to receive a cutter bit, a head on said bolt provided with a flat surface having a predetermined angular relation to said slot for determining the angular relation of the bit with respect to said part and for positively holding the bit in such relation, and a threaded opening adapted to receive a set screw and angularly disposed to said transverse slot.

16. A cutter chain link having a longitudinally extending bore and a transverse slot formed intermediate the ends of said link and communicating with said bore, and means for supporting and holding a cutter bit positioned in said slot including a member insertable in said bore, said member affording means for determining the angular relation of the bit with respect to the chain link and for positively holding the bit in such relation.

17. A cutter chain link having a longitudinally extending bore and a transverse slot formed intermediate the ends of the link and communicating with said bore, and means for supporting and holding a cutter bit positioned in said slot including a member insertable in said bore, said member affording means for determining the angular relation of the bit with respect to the chain link and for positively holding the bit in such relation, said member also being transversely slotted to receive said bit.

18. A cutter chain link having a longitudinally extending bore, means for supporting and positioning a cutter bit including a member insertable in said bore, and means for clamping said member and bit in position including an adjustable clamping element carried by said member and engaging said bit.

19. A cutter chain link having a longitudinally extending bore, means for supporting and holding a cutter bit in either of two positions with respect to said link including a member insertable in said bore, said member being insertable within said bore from either end of the link to obtain two predetermined positions of the bit, and associated means cooperating with the link body for definitely locating the bit in aforesaid different predetermined positions with respect to its link.

20. A cutter chain link having a longitudinally extending bore terminating adjacent a face of the link body and a transverse slot formed intermediate the ends of the link and communicating with said bore, and means for clamping a cutter bit received in said slot against said face including a member insertable in said bore, said member affording means for determining the angular relation of the bit with respect to the chain link and for positively holding the bit in such relation, said member having an opening registering with said slot to receive the cutter bit.

21. A cutter chain link comprising a block having transverse openings therethrough adapted to receive pins to which adjacent links are connectible, means providing a lateral guiding surface above and another one below the plane containing the centers of said transverse openings, and means for preventing displacement of said pins from said openings including slots in said guide means for receiving holding elements engaging said pins.

22. A cutter chain link having a longitudinally extending bore, a member insertable in said bore for receiving a cutter bit and for holding the cutter bit in a predetermined angular relation with respect to the chain link, and adjustable means connected to said member and engageable with said bit for imparting to the bit a clamping force in a direction opposite to the direction of clamping movement of said member.

23. A cutter chain link having a longitudinally extending bore, a member insertable in said bore and having means for receiving a cutter bit and for determining the angular position of the bit with respect to the chain link, and means for clamping the bit in position in the chain link comprising a set screw threadedly connected to said member and abutting the forward face of the bit.

24. A cutter chain link having a longitudinally extending bore, a member insertable in said bore for receiving a cutter bit and angularly positioning the latter with respect to the link, and means engageable with said member for imparting to the bit a clamping force in a rearward direction.

25. A cutter chain comprising bit blocks and links pivotally connecting said blocks in end abutting relation, said blocks having lateral ears at each end thereof and said links being arranged between said ears, said ears on one block having surfaces abutting corresponding surfaces on the ears of the next adjacent block.

26. A cutter chain comprising bit blocks arranged in end to end abutting relation and straps pivotally connected to said blocks for connecting the blocks together, each block having end surfaces in end abutting engagement with corresponding surfaces on the next adjacent blocks, said abutting surfaces extending in a plane perpendicular to the longitudinal vertical plane of the block and of a width greater than the distance between the pivotal axes of said straps and the vertical center of the block.

27. A bit holding and positioning member for a cutter chain comprising a cylindrical body for holding and angularly positioning a bit and traversed by a bit receiving opening, and an enlarged head having a flattened positioning surface.

28. A bit holding and positioning member for a cutter chain comprising a cylindrical body for holding and angularly positioning a bit and traversed by a bit receiving opening, an enlarged head having a flattened positioning surface, and an axial threaded opening for receiving a clamping screw.

29. A cutter chain block having a longitudinally extending bore, a member insertable in said bore and having means for receiving a cutter bit and for determining the angular position of the bit with respect to the block, and means for holding said member in said bore comprising threads formed on one end of said member and a holding nut engaging said threads and acting on a face on said block.

30. A cutter chain block having a longitudinally extending bore, a member insertable in said bore and having means for receiving a cutter bit and for determining the angular position of the bit with respect to the block, said member having a threaded end portion, and means for clamping said member in said bore with the rearward face of said bit in abutting engagement with the forward face of said block including a clamping

nut engaging the threaded portion of said member and acting against the rearward face of said block.

31. A cutter chain comprising a bit block having a longitudinally extending bore, a bolt receivable in said bore for determining the angular position of a cutter bit with respect to the bit block and having an opening to receive a cutter bit, one end of said bolt having an enlarged head and the other end thereof having threads thereon, said opening traversing the bolt adjacent its head end, and a nut threaded on the threaded end of said bolt for clamping the bolt and bit in position in the block.

32. A cutter chain comprising a bit block having a longitudinally extending bore, a bolt receivable in said bore for determining the angular position of a cutter bit with respect to the bit block and having an opening to receive a cutter bit, one end of said bolt having an enlarged head and the other end thereof having threads thereon, said opening traversing the bolt adjacent its head end, and a nut threaded on the threaded end of said bolt for clamping the bolt and bit in position in the block, said bolt head having a flattened surface engaging a flattened surface on the block for holding the bolt against rotation.

33. A cutter chain comprising a plurality of links flexibly connected upon axes transverse to the medial plane of the chain, a plurality of said links being bit-carrying links having a longitudinally extending bore and traversed by a bit receiving slot communicating with said bore and permitting lateral adjustment of a bit with respect to its link, and means for supporting and holding a cutter bit within said slot in either of two positions with respect to the axial center of said link bore including a member insertable in said bore, said member being insertable within said bore from either end of the link to obtain two predetermined positions of the bit within said slot, some of said longitudinally extending bores being arranged upon one side of the medial plane of the chain and some upon the opposite side.

34. A cutting chain comprising a plurality of flexibly connected bit-carrying links each of said links having bit holding means, bit locating means cooperating with the link body for definitely locating the bit in different predetermined positions with respect to its link, and an associated bit adjustable by said holding means about an axis substantially parallel with the length of the chain into aforesaid predetermined positions, some of said adjustment axes being upon one side of the medial plane of the chain and some upon the opposite side.

35. A cutting chain comprising a plurality of flexibly connected bit-carrying links, each of said links having bit holding means, bit locating means cooperating with the link body for definitely locating the bit in different predetermined positions with respect to its link, and an associated bit adjustable about an axis at a substantial angle to the flexure axes of the links whereby the positions of the cutting points of the bits may be adjusted into aforesaid predetermined positions laterally relative to the medial plane of the chain, some of said adjustment axes being upon one side of said medial plane and some upon the opposite side.

36. A cutter-carrying chain comprising a plurality of links flexibly connected upon axes transverse to the medial plane of the chain, a plurality of said links being each provided with bit holding means permitting adjustment of the cutting portions of associated bits laterally of the medial plane of the chain upon an axis arranged at a substantial angle to the link axes, and associated bit locating means cooperating with the link body for definitely locating the bit in different predetermined positions with respect to its link, some of said bit-carrying links having their bit holding means arranged upon one side of the medial plane of the chain and some upon the opposite side.

37. A cutting chain comprising a plurality of bit-carrying links flexibly connected upon axes transverse to the medial plane of the chain, a plurality of said links carrying bits grouped about an axis parallel with the medial plane of the chain and laterally offset to one side, and a plurality of said links carrying bits grouped about an axis parallel with the medial plane of the chain but laterally offset to the other side of said medial plane, and bit locating means cooperating with the body of each link for definitely locating the bit in different predetermined positions with respect to its link and for holding the bit in such predetermined positions.

38. A cutting chain comprising a plurality of bit-carrying links flexibly connected upon axes transverse to the medial plane of the chain, a plurality of said links having means for supporting bits in various angular relations about an axis substantially parallel with the medial plane of the chain and offset to one side thereof, and a plurality of said links having means for supporting bits in various angular relations about an axis substantially parallel with the medial plane of the chain and laterally offset to the opposite side of said medial plane, and bit locating means associated with said supporting means and cooperating with the link body for definitely locating a bit in different predetermined positions with respect to its link.

MORRIS P. HOLMES.