April 7, 1936. F. L. FULKE 2,036,327

MINING CHAIN CUTTING BIT

Filed May 22, 1930 2 Sheets-Sheet 1

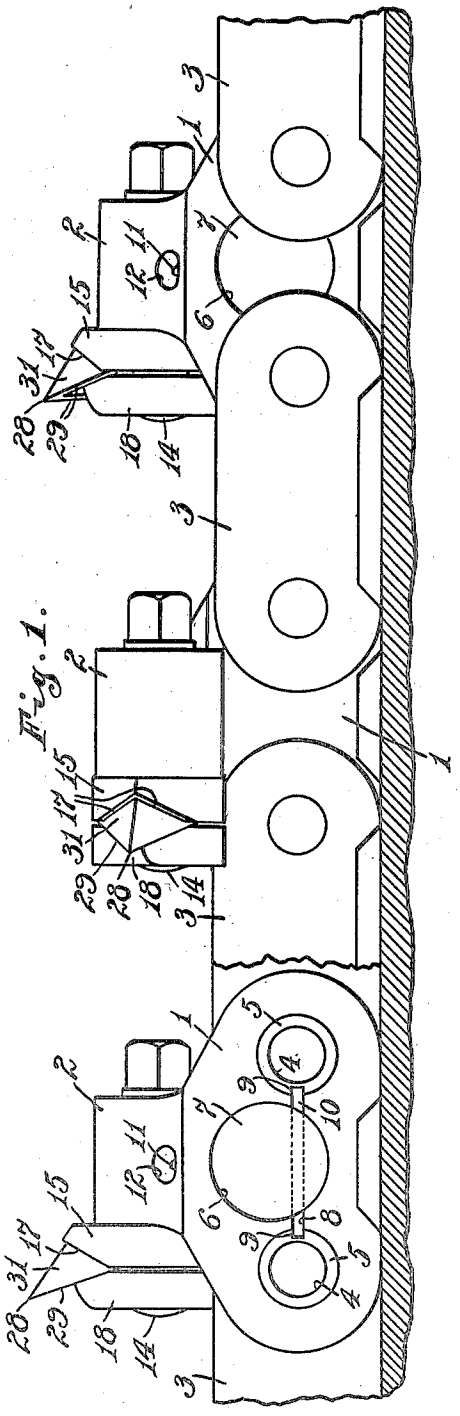


Fig. 1.

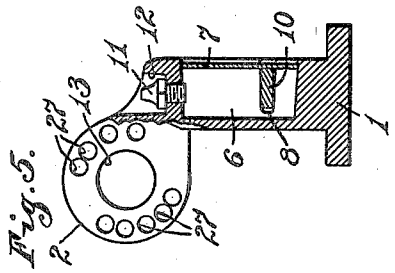


Fig. 5.

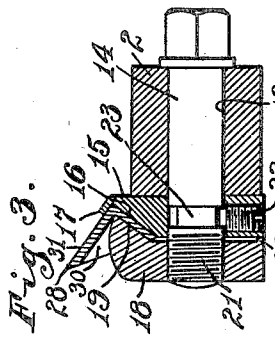


Fig. 3.

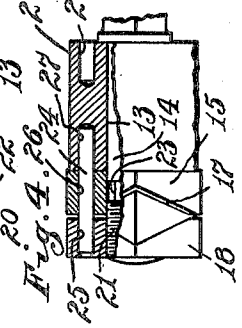


Fig. 4.

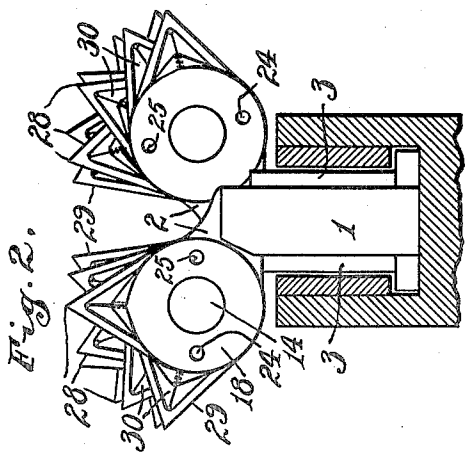


Fig. 2.

INVENTOR.
Frank L. Fulke,
BY
Hood & Hahn.
ATTORNEYS

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Fig. 6.

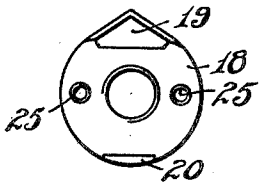


Fig. 7.

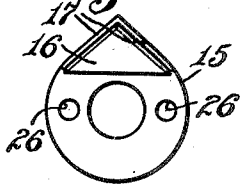


Fig. 8.

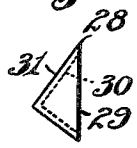


Fig. 9.

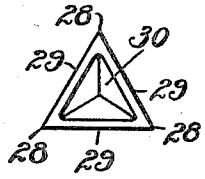


Fig. 10.

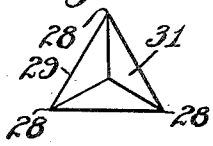


Fig. 11.

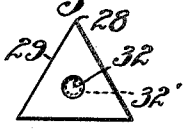


Fig. 12.

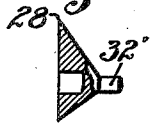


Fig. 13.

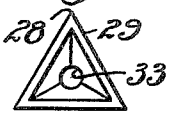


Fig. 14.



Fig. 15.

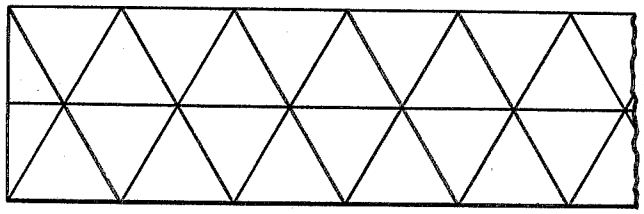


Fig. 16.

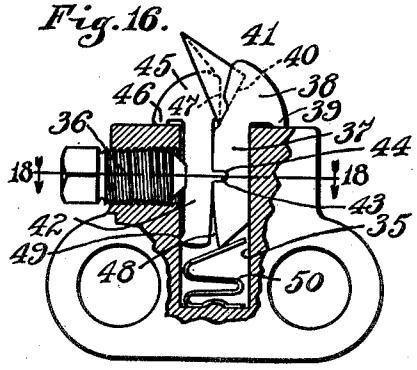


Fig. 17.

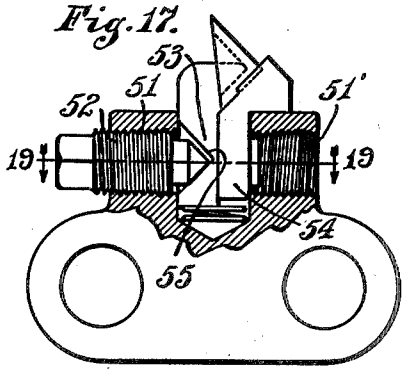


Fig. 18.

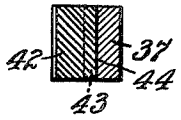


Fig. 19.



INVENTOR.
Frank L. Fulke,
BY
Hood & Hahn.
ATTORNEYS

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UNITED STATES PATENT OFFICE

2,036,327

MINING CHAIN CUTTING BIT

Frank L. Fulke, Terre Haute, Ind., assignor, by direct and mesne assignments, to The Jeffrey Manufacturing Company, a corporation of Ohio

Application May 22, 1930, Serial No. 454,561

55 Claims. (Cl. 262—33)

My invention relates to improvements in mining machine chains and more particularly to the bit carrying link of said chains, and to cutting bits for mining machine chains.

Heretofore in order to obtain the proper positioning of the bit in the bit carrying links for the purpose of cutting a kerf of the desired width and depth it has been necessary to provide links of different types in the chain. Furthermore, in the commercial type of chain used the adjustment and cutting point of the bit has been limited.

It is one of the objects of my invention to provide an improved form of bit carrying link, and bit therefor, which link will permit of a wide variation in the adjustment of the bit carried thereby, so that only one form of link need be provided.

It is a further object of my invention to provide a bit, which while being preferably applicable for use in connection with my particular form of link may also be applicable for use with the standard commercial form of link now in use and which may be cheaply manufactured.

It is another object of my invention to provide a bit having a plurality of cutting points each of which, by a simple adjustment of the bit holder may be presented in cutting position.

It is a further object of my invention to provide a cutter bit which has sharpened flaring cutting edges adjacent the points of the bit so that, in event the point of the bit does not remove the material to be cut, the edges will come into cutting operation.

It is a further object of my invention to provide a bit which geometrically renders itself to drop forging or stamping from sheets of material in multiple grouping without waste of material and to provide a bit with a minimum weight of material per point.

For the purpose of disclosing my invention I have illustrated certain embodiments thereof in the accompanying drawings in which—

Fig. 1 is a side elevation of a cutter chain embodying my improved form of bit link and showing my improved form of bit supported therein;

Fig. 2 is a front elevation of the chain, the chain guide being shown in section, and showing the bits of the successive links in various adjusted positions;

Fig. 3 is a detailed sectional view showing the bit clamping means of the bit link illustrated in Fig. 1;

Fig. 4 is a detailed sectional view showing the bit clamping positioning means;

Fig. 5 is a sectional view of the bit link showing the oiling means;

Fig. 6 is a front elevation of the front bit clamping member of the type illustrated in Fig. 1;

Fig. 7 is a front elevation of the rear bit clamping member;

Fig. 8 is a side elevation of one embodiment of my bit;

Fig. 9 is a front elevation thereof;

Fig. 10 is a rear elevation thereof;

Figs. 11 and 12 are respectively front and sectional views of a modified form of my bit;

Fig. 13 is still another modified form of my bit;

Fig. 14 is a front elevation of a further modified form of my bit;

Fig. 15 is a plan view of a layout on a metal sheet showing how my improved form of bit may be stamped and drop forged from sheet metal;

Fig. 16 is a side elevation partially in section of the ordinary commercial form of bit link showing means for clamping my improved bit in position;

Fig. 17 is a modified form of link and clamping means;

Fig. 18 is a detailed section on the line 18—18 of Fig. 16; and

Fig. 19 is a detailed section on the line 19—19 of Fig. 17.

In the embodiment illustrated in Figs. 1 to 7, the bit carrying link 1 is provided with a bit carrying head 2, which is preferably cylindrical in shape and is laterally offset as illustrated in Fig. 5. This head is arranged intermediate of the ends of the link 1, being formed integrally therewith, and the two faces are identical so that the position of the link may be reversed. Under such circumstances, however, of course, the head will be thrown on the opposite side of the line of travel. The links 1 are connected together by connecting links 3 which are of the usual formation and to provide for such connection each of the bit carrying links is provided with pivot pin openings 4 extending therethrough and into which the connecting pins are adapted to pass. These openings are lined with hardened bushings 5.

For insuring the lubrication of the pivoted connections I provide each link with a centrally disposed well 6, preferably formed in the link at the time the same is drop forged, and having its front closed by a closure plate 7. Recesses 8 are formed in the side walls of the well 6 which communicate with the pivot openings 4 so that the lubrication contained in the well will flow to the pivot points. For preventing the bushings 5 from

rotating, each bushing is provided with a slot 9 into which takes the end of a locking bar 10 arranged in the well 6 and extending through the recesses 8. Any suitable fitting as 11 may be provided in a countersunk recess 12 in the top of the link 1 whereby the lubrication may be fed to the well.

The offset head 2 is centrally bored at 13 to receive the bolt 14 by which the clamping members for the bit are secured in position. The rear clamping member 15 has its top front face rearwardly and upwardly inclined as at 16, being flat, and its outer edges surrounded by a lip 17. This face is substantially triangular in shape and by the projection of the flanges 17 a flat bottom triangular recess is provided. The remaining portion of the clamping member is preferably cylindrical to coincide with the cylindrical head 2.

The front clamping member 18 coincides in shape to the rear clamping member 15 and is provided with a forwardly and upwardly inclined clamping face 19 which coincides with and lies parallel to the face 16 of the rear clamping member. The bottom edge of this clamping member is provided with a lug 20 which rests against the front face of the clamping member 15 to compensate for the thickness of the bit to be clamped between the two members. Each of the clamping members is provided with a central opening to receive the bolt 14 and the opening of the front clamping member is internally screw threaded to receive the screw threads 21 of the bolt 14. The rear clamping member 15 is maintained against longitudinal displacement on the bolt 14 by means of a set screw 22, the end of which takes into an annular groove 23 in the bolt. This arrangement permits of the movement of the front clamping member by the rotation of the bolt relatively to the rear clamping member. Both clamping members are rotatable on the bolt 12, to adjust their clamping faces, and with them, the bit to various positions. And for maintaining the clamping members in their various adjusted positions, I provide a pin 24 which takes into apertures 25 and 26 in the front and rear clamping members and into recesses 27 in the face of the head 2. It will be noted that I provide a plurality of these recesses 27 whereby the bit may be adjusted on the head 2 to obtain the most beneficial cutting position for that particular link, and it will be noted from Fig. 2 that by adjusting the successive bits in the chain a proper kerf may be obtained. It will also be noted that by merely reversing the link, thereby throwing the head 2 to the opposite side of the line of travel the width of the kerf may be adjusted as desired.

The bit which I provide, used in connection with the above described link has a plurality of cutting points and in the structure illustrated, having particular reference to Figs. 8, 9 and 10 is provided with three cutting points 28 connected by sharp cutting edges 29 which outline an equilateral triangle. The face or cutting side of the bit is concaved and the back of the bit is convexed so that the bit forms a triangular concavo-convexed figure, the front faces 30 and the rear faces 31 of which form three isosceles triangles.

In clamping the bit in position it will be noted that the clamping face 19 engages in the front face of the bit and lies flat and against one of the triangles 30 while the clamping face 16 receives and backs up the rear face of the triangle.

If desired the bit may be of the structure shown in Figs. 11 and 12 wherein the front face is perfectly flat and is provided with a central opening 32 to receive a securing pin. The rear face has the same configuration as the rear face of the structure shown in Figs. 8 and 9 and is provided with a rearwardly extending lug 32' to take into a recess on a back clamp.

In the structure illustrated in Fig. 13 a central opening 33 is provided by which a clamping pin on the front clamp may be projected through the bit if desired. In the structure illustrated in Fig. 14 the bit is substantially the same configuration as that illustrated in Figs. 8 and 9 except that the points 34 are rounded.

In Fig. 15 I have illustrated a sheet of material from which the bits illustrated in Figs. 8 and 9 may be formed by drop forging, stamping, rolling or otherwise. And it will be noted from the layout of the stampings on the sheet that the bits may be formed with a minimum of waste of material.

In Fig. 16 I have illustrated a form of clamping member which may be used on the present commercial type of bit link. This bit link as illustrated is provided with a longitudinally extending opening 35 generally rectangular in cross-section as is the character of bit now in commercial use. The bit is secured in position by means of a set screw 36. My present type of clamping means comprises a rear clamping member having a shank 37 provided with a head 38 overhanging and resting upon the top of the link as at 39. This head has a rearwardly and upwardly inclined triangular face 40 surrounded by a rim 41. Cooperating with the rear clamping member is a front clamping member having a shank 42 provided with a lug 43 taking into a recess 44 on the front face of the shank 37 and provided with a head 45 overhanging and resting upon, as at 46, the top of the link. This head has a front face 47 slightly forwardly extending to cooperate with the face 40 for clamping the bit between the same.

The lower ends of the two shanks at their adjacent faces are inclined away from one another as at 48 so that, when the clamp as a whole is lifted slightly out of its socket 35, the two clamping members may be separated, and to prevent their complete withdrawal I provide a shoulder 49 on the lower end of the front shank which will be engaged by the edge of the set screw unless the same is withdrawn to a greater extent, and prevent the complete removal of the clamping member. In order to force the clamping member upwardly for the purpose of renewing or changing the bit I provide a spring 50 in the bottom of the socket 35.

In the structure illustrated in Fig. 17 I show a modified form of link which may be reversed. In this form of link the socket is rounded and the head is screw threaded as at 51 and 51' to receive, from either end, the holding screw 52. The shanks of the front and rear clamping members 53 and 54 are rounded and the shank of the front clamping member 53 is provided with a conical recess 55 for reception of the conical end of the set screw 52, whereby when the screw is turned up it will not only force the two clamping members together but will tend to draw the member 53 down onto the member 54.

I claim the following:

1. The combination with a mining machine chain link having a laterally projecting extension provided with a longitudinally extending opening, of a pair of bit clamps adapted to be secured to said projection, a bit secured in position between said clamps, and a bolt extending through said opening and adapted to draw said clamps to-

gether at least one of said clamps being rotatably mounted on said bolt.

2. The combination with a mining machine link having a laterally projecting extension provided with a longitudinally extending opening, of a pair of bit clamps having clamping surfaces for engaging and clamping a bit therebetween, and a bolt extending through said projection for drawing said clamps together and alternatively against either face of said projection, said clamps being rotatably mounted on said bolt.

3. The combination with a mining machine chain link having a laterally projecting extension provided with a longitudinally extending opening, of a pair of bit clamps having coinciding clamping faces, a bolt extending through said opening and adapted to draw said clamps together and alternatively against either face of said projection, said clamps being rotatable on said bolt to position their clamping faces, and means for locking said clamps against said rotation.

4. The combination with a mining machine chain link having a laterally projecting extension provided with a longitudinally extending opening, of a pair of bit clamps having coinciding bit clamping faces, a bolt extending through said clamps for drawing the same together and alternatively against either face of said projection, said clamps being rotatably mounted on said bolt, and means for maintaining said clamps in any one of a number of predetermined positions and against rotation.

5. The combination with a mining machine chain link having a laterally projecting substantially cylindrical projection, the opposite ends of said projection being similar and the projection being equidistant between the ends of the link, of a pair of bit clamps adapted to be secured against either end of said projection, and a bolt extending through said projection and through said clamps for drawing the clamps together and securing the clamps against either end of the projection.

6. The combination with a mining machine chain link having a laterally projecting substantially cylindrical extension equidistant from the ends of the link, of a pair of bit clamps rotatably secured upon an end of said projection, and means for holding said clamps in any one of a series of predetermined positions.

7. The combination with a mining machine link having a laterally extending substantially cylindrical projection, of a pair of bit clamps adjustably mounted on the face of said projection, one of said clamps having a rearwardly and upwardly inclined flat face and the other of said clamps having a forwardly and upwardly inclined flat face coinciding with the flat face of said first mentioned clamp, and a concavo-convex bit secured between said clamps having a plurality of cutting points radially disposed and connected by straight cutting edges.

8. A bit for cutter chains having a plurality of cutting points radially disposed and provided with cutting edges extending between said points and outlining an equilateral triangle.

9. A bit for cutter chains having a plurality of cutting points radially disposed and provided with cutting edges extending between said points and substantially outlining an equilateral triangle, the back face of said bit being convexed.

10. A bit for cutter chains provided with a plurality of cutting points radially disposed and having cutting edges extending between said points and substantially outlining an equilateral triangle, the back of said bit being convexed and having three faces outlined by lines extending from each point towards the center.

11. A bit for cutter chains having a plurality of radially disposed cutting points connected together by cutting edges substantially outlining an equilateral triangle, the front face of said bit being concaved.

12. A bit for cutter chains having a plurality of radially disposed cutting points connected together by cutting edges substantially outlining an equilateral triangle, the front face of said bit being concaved and having three flat faces outlined by lines extending from each point towards the center.

13. A bit for cutter chains having a plurality of radially disposed cutter points connected together by cutting edges substantially outlining an equilateral triangle, said bit being concavo-convex.

14. A bit for cutter chains having a plurality of radially disposed cutting points connected by cutting edges substantially outlining an equilateral triangle, said bit being concavo-convex and having on its front and rear faces a plurality of flat surfaces outlined by lines extending from the cutting points to the center.

15. The combination with a mining machine chain link, of a bit secured to said link having a plurality of radially disposed cutting points connected by cutting edges substantially outlining an equilateral triangle, and a pair of clamps for engaging said bit, mounted on said link.

16. The combination with a mining machine chain link, of a bit therefor having a plurality of radially disposed cutting points connected by cutting edges substantially outlining an equilateral triangle, said bit being concavo-convex, and a pair of clamps mounted on said link having coinciding clamping faces between which said bit is adapted to be clamped.

17. The combination with a mining machine chain link, of a cutting bit having a plurality of radially disposed cutting points connected by cutting edges substantially outlining an equilateral triangle, said bit being concavo-convex and having on its front and rear faces flat portions outlined by lines extending from the points of the bit to the center, and clamping members mounted on said chain link and having coinciding inclined triangular flat faces between which any one of said flat faces of the bit may be clamped.

18. A bit for cutter chains having a substantially flat front face, with three cutting points equidistant from each other and the center of the bit, the back face of said bit being convexed.

19. The combination with a mining machine chain link, of a laterally projecting head on said link and formed with a longitudinal opening therethrough, means for supporting a bit for angular adjustment in a plane other than the plane of chain travel, said means comprising a pair of clamps adapted to hold a bit between their adjacent faces, and a bolt extending through said opening and cooperating with said clamps to lock a bit between said clamps and to lock said clamps to said head.

20. The combination with a mining machine chain link, of a head provided with means for supporting a bit for angular adjustment in a plane other than the plane of chain travel, said means comprising a pair of bit clamps holding a bit between their adjacent faces, a bolt extending

through the rear clamp and into a longitudinal opening in the link head and engaging the front clamp, and means whereby rotation of said bolt draws the clamps together to hold the bit and draws the rear face of the rear clamp firmly against the link head.

21. The combination with a mining machine chain link, of a projecting head thereon for mounting a bit, a longitudinally extending opening in said head, a rear bit clamp, a bolt in said opening projecting forwardly from said head and extending centrally through said read bit clamp, a front bit clamp and cooperative means on said bolt and on said front bit clamp whereby said bolt may be operated to draw said front clamp, toward said rear clamp to lock a bit therebetween, and to hold the rear face of said rear clamp firmly against the front face of said head.

22. A bit for cutter chains having a substantially triangular contour at its front face, and an intermediate portion of one face, of less area than the front face, laterally displaced from the area immediately bounding said displaced portion.

23. A bit for cutter chains having a substantially triangular contour at its front face and with a depression formed in one face.

24. A bit for cutter chains having a substantially triangular contour at its front face and with a protuberance formed on one face.

25. A cutter chain for mining machines comprising a plurality of bit holding links and connecting links, each of said bit holding links having a bit carrying head, means comprising a plurality of seats on the bit carrying head distributed along the chain at various angles relative to the median plane of the chain to confine the cutter bits each at a predetermined angle relative to its bit carrying head, there being at least three different angular positions for the cutter bits within a range of sixty degrees on a longitudinal axis parallel to said plane, and mechanism co-operating with said confining means for clamping the latter and said bit to secure the same to said heads at a predetermined angle dependent upon the seat on said bit carrying head.

26. A mining machine cutter chain comprising a plurality of bit holding links and connecting links, each bit holding link having an offset bit carrying head with a longitudinal bore, means for mounting the cutter bits one on each head at either end thereof by being confined to a predetermined angle relative thereto to secure successive positions of the cutter bits for closely adjacent lines of cutting travel at various distances from the median plane of the chain, and mechanism extending through said bores from either ends thereof for clamping said confining means and said bits rigidly to said bit holding links.

27. A mining machine chain cutter comprising a plurality of bit holding links and connecting links, said bit holding links having offset bit carrying heads rigidly connected thereto to move bodily therewith, means comprising seats on said heads arranged successively at different angles to confine the bits for closely adjacent lines of cutting travel, and mechanism for clamping the bits and said confining means rigidly to said heads.

28. A mining machine chain cutter comprising a plurality of bit holding links, and connecting links, each bit holding link having a bit carrying head provided with angularly spaced seats, bit clamping mechanism for rigidly connecting the bits to said heads, and means connecting said bit clamping mechanism to anyone of said seats to lock the bits on successive bit holding links in positions for closely adjacent lines of cutting travel.

29. A mining machine chain cutter comprising a bit holding link having a laterally projecting extension provided with a longitudinally extending opening, bit clamping mechanism, a bolt extending through said opening for securing said bit clamping mechanism to said laterally projecting extension, and means for maintaining said bit clamping mechanism in any one of a plurality of predetermined positions relative to said laterally projecting extension and against rotation relative thereto.

30. A mining machine chain cutter comprising a plurality of similar bit holding links and connecting links, the bit holding links having laterally projecting extensions with longitudinal bores therethrough, bit clamping mechanism adapted to be located at either end of each of said extensions, seats for said clamping mechanism, and bolts extending through said bores to secure said bit clamping mechanism to their seats at either end of each extension, whereby in assembling the chain cutter some of the similar bit holding links may have their extensions offset from one side of the median plane of the chain and others may have their extensions offset from the other side of the median plane of the chain.

31. A mining machine chain cutter comprising a cylindrical extension, a cutting bit, clamping mechanism rotatably associated with one end of said extension, and means for holding said clamping mechanism and said cutting bit in any one of a series of predetermined positions.

32. A mining machine chain cutter comprising a bit holding link having a bit carrying extension with a longitudinal bore extending therethrough, a cutting bit, a pair of clamping members for said cutting bit and rotatably associated with one end of said extension, a bolt extending through said bore and screw-threaded through one of said clamping members, and means comprising a pin between the other clamping member and said extension for locking said last-named clamping member against rotation relative to said extension.

33. A mining machine chain cutter comprising a bit carrying extension having a longitudinal bore extending therethrough, a cutting bit, two clamping members for said cutting bit and rotatably associated with said extension, a bolt extending through said bore and screw-threaded into one of said clamping members, and means comprising a set screw in the other clamping member in position to extend into an annular groove in said bolt to lock said last-named clamping member against withdrawal from said bolt longitudinally of the latter while permitting rotation of said last-named clamping member relatively to said extension.

34. In a chain cutter for mining machines, the combination with a bit holding link having spaced-apart abutment blocks each provided with a longitudinal screw-threaded bore, of a set screw adapted to be screw-threaded through said bores in either of opposite directions, bit holding mechanism comprising two clamping members adapted to be seated between said abutment blocks, one of said members having a conical recess, and a conical extension on said set screw for entering said conical recess, said bit holding mechanism

being adapted to occupy reversed positions between said blocks.

35. In a chain cutter for mining machines, the combination with a chain comprising a plurality of bit holding links some having right-handed heads and others having left-handed heads, of seats on said heads successively at different angles in predetermined formation from one side of the chain to the other, a plurality of multiple pointed cutter bits one for each head and each having at least three spaced cutting points, and means for securing said multiple pointed bits to said seats to hold the same rigidly connected in adjusted positions to said links in the aforesaid formation from one side of the chain to the other.

36. In a chain cutter for mining machines, the combination with a chain comprising a plurality of connected bit holding links some having right-handed heads and others having left-handed heads, of longitudinal cylindrical seats on said heads successively at different angles in predetermined formation from one side of the chain to the other, a plurality of cutter bits one for each head, clamping means for said bits and means comprising pins fitting into said cylindrical seats and connected to said clamping means to hold said cutter bits rigidly connected to said links in the aforesaid formation to secure parallel spaced-apart lines of travel of the cutter bits at various distances from opposite sides of the median plane of the chain.

37. In a chain cutter for mining machines, the combination with a chain comprising a plurality of connected bit holding links some having right-handed heads and others having left-handed heads, of a plurality of longitudinal seats on each head at different angles for selection for a predetermined formation of spaced parallel lines of cutting travel, a plurality of cutter bits one for each head, and means for securing the cutter bits to selected seats to obtain such predetermined formation on both sides of the median plane of the chain for the cutting of a kerf by parallel cutting paths of travel spread over the entire width of the kerf.

38. In a chain cutter for mining machines, the combination with a chain comprising a plurality of connected bit holding links some having right-handed heads and others having left-handed heads, of a plurality of longitudinal cylindrical recesses on each head spaced at different angles for selection of a predetermined formation of spaced parallel lines of cutting travel, a plurality of cutter bits one for each head, clamping means for said bits, and means comprising pins fitting in said recesses and connected to said clamping means for securing the latter and said bits for such predetermined formation on both sides of the median plane of the chain for the cutting of a kerf by parallel cutting paths of travel spread over the entire width of the kerf.

39. A cutter chain having a plurality of identical cutter bit carrying links and identical connecting links, the utter bit carrying links having offset bit carrying heads assembled in the chain some as right-hand heads and others as left-hand heads, bit locating means associated with each of said heads for confining the cutter bit on its respective head to any one of at least three different positions through a range of sixty degrees variation relative to the median plane of the cutter chain, and mechanism for clamping the cutter bit to its head while said bit locating means lock the cutter bit at its adjusted angle.

40. A cutter chain link having a longitudinally extending bore, means for supporting and positioning a cutter bit including an imperforate member insertable in said bore, and means for clamping said imperforate member and bit in position including an adjustable clamping element carried by said imperforate member and engaging said bit to hold the same in adjusted position separately from said imperforate member.

41. 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 an imperforate member insertable in said bore, said imperforate member being insertable within said bore from either end of the link to obtain two predetermined positions of the bit one at one end of said bore and the other at the other end thereof, and associate means co-operating with the link body for definitely locating the bit in the aforesaid predetermined positions at the ends of said bore with respect to its link.

42. In a chain cutter for mining machines, the combination with a plurality of connected bit holding links, of right-handed heads on some of the bit holding links and left-handed heads on other bit holding links, seats on said heads successively at different angles in predetermined formation along the chain with respect to the right-handed heads and successively at different angles in predetermined formation along the chain with respect to the left-handed heads, and bit holding mechanism on said heads and adjustable on longitudinal axes spaced laterally from the medial plane extending from the path of travel of the chain.

43. A mining machine chain cutter comprising a cutter-carrying link having a projecting extension provided with a longitudinally extending opening, a pair of bit clamps adapted to be secured to said projection, a bit secured in position between said clamps, and a bolt extending through said opening and adapted to tighten said clamps together, at least one of said clamps being rotatably mounted on said bolt.

44. A mining machine chain cutter comprising a cutter-carrying link having a projecting extension provided with a longitudinally extending opening, of a pair of bit clamps having clamping surfaces for engaging and clamping a bit therebetween, a bolt extending through said projection for tightening said clamps together and alternatively against either face of said projection, said clamps being rotatably mounted on said bolt.

45. The combination with a mining machine cutter chain link, of a bit having a plurality of radially disposed cutting points arranged in equilateral triangular relation, and clamping mechanism mounted on said link to secure said bit thereto with any one of said cutting points in cutting position.

46. The combination with a mining machine cutter chain link, of a head provided with means for supporting a bit for angular adjustment in a plane other than the plane of chain travel, said means comprising a pair of bit clamps adapted to hold a bit between their adjacent faces, and means comprising a bolt in said longitudinal opening and extending through said bit clamps for forcing the clamps together to hold the bit and forcing the rear face of the rear clamp firmly against the link head.

47. A mining machine chain cutter comprising a bit holding link having a projecting extension provided with a longitudinally extending

opening, a pair of clamping members rotatable relatively to said extension on the axis of said opening, and means comprising a bolt associated with said clamping members for operating the latter to secure a bit between the same and to rigidly secure the clamping members and the bit in predetermined position relative to said projecting extension.

48. The combination wtih a mining machine cutter chain link, of a head provided with means for supporting a bit for angular adjustment in a plane other than the plane of chain travel, said means comprising a pair of bit clamps adapted to hold a bit between their adjacent faces, and means comprising a bolt in said longitudinal opening and screw-threaded through the front bit clamp for drawing the clamps together to hold the bit and drawing the rear face of the rear clamp firmly against the link head.

49. A mining machine chain cutter comprising a bit holding link having a projecting extension provided with a longitudinally extending opening, a pair of clamping members rotatable relatively to said extension on the axis of said opening, and means comprising a bolt associated with said clamping members for operating the latter to secure a bit between the same and rigidly secure the clamping members and the bit in predetermined position relative to said projecting extension.

50. A mining machine chain cutter comprising a cutter-carrying link having a projecting head, means on said head to afford a flat inclined seat having a V-shaped retaining wall at its outer end portion, a three-pointed bit having a flat rear wall adapted to engage said seat and to rest against said V-shaped retaining wall, and means comprising a flat faced clamping member adapted to engage an inner flat face of said three-pointed bit to secure the same against said seat while resting against said V-shaped retaining wall.

51. In a mining machine chain cutter comprising a cutter-carrying link having a projecting head, of a pair of clamping members, a multiple pointed bit, means for seating said multiple pointed bit between said clamping members, and a set screw screw-threaded through an opening in said projecting head to an opening extending transversely of the latter and against one of the clamping members inserted into such transverse opening.

52. A mining machine chain cutter comprising a cutter-carrying link having a projection extending therefrom, a cutter bit having a pair of laterally projecting extensions at its rear side rearwardly of the cutting point of the bit, means affording a seat for the rear side of said cutter bit including the rear lateral extensions thereon, and means in position on said projection for engaging the front side of said cutter bit to secure the rear side thereof including said lateral extensions to said seat and thereby secure the cutter bit rigidly to said cutter-carrying link.

53. A cutter chain having a plurality of bit carrying links and connecting links, said bit carrying links being castings similar in shape and size, a multiple bit, clamping mechanism therefor, bit locating means between said clamping mechanism and said bit carrying links and comprising seats successively in different angular positions relative to the median cutting plane of the chain, and means comprising a bolt on which said clamping mechanism is rotatable to its seat for securing the bit to said bit carrying link successively at various distances from the median plane of the chain to secure closely adjacent cutting paths of travel, the only change in structure in successive bit carrying links being the location of said seats.

54. A chain cutter for mining machines, comprising a plurality of cutter carrying links consisting of castings of similar shape and size but provided successively with seats in different angular relation with the median plane of the chain, cutter bits one for each cutter carrying link, means comprising a pair of clamping jaws between which a bit is gripped, and means comprising a bolt for operating said clamping jaws to grip a bit between the same and for securing said clamping jaws to its seat on said bit carrying link, the clamping jaws and said operating means as well as said bit carrying link being the same in construction throughout the series of the plurality of cutter carrying links.

55. In a mining machine chain cutter, the combination with cutter carrying links and connecting links, of laterally projecting heads on said cutter carrying links, a cutter bit for each head, clamping mechanism for each bit, and means for operating said clamping mechanism to grip its bit and secure the same to its head successively at different angles along the chain dependent upon seats on said heads distributed along the chain at different angles, the structures mounted on the successive bit carrying links being similar in shape and size as to its parts, only the seats on the heads being different on successive cutter carrying links.

FRANK L. FULKE.