E. C. MORGAN.

CUTTING CHAIN FOR MINING MACHINES.

APPLICATION FILED MAR. 8, 1915.

1,325,030. Patented Dec. 16, 1919.

Fig. 1.

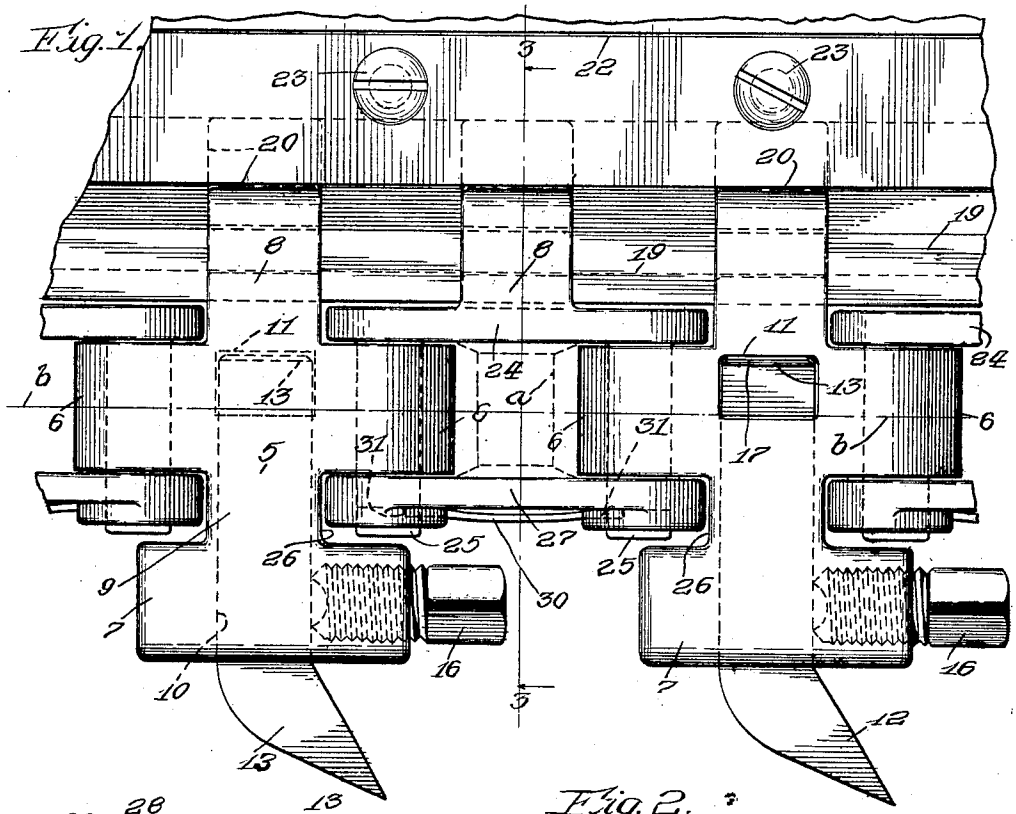


Fig. 2.

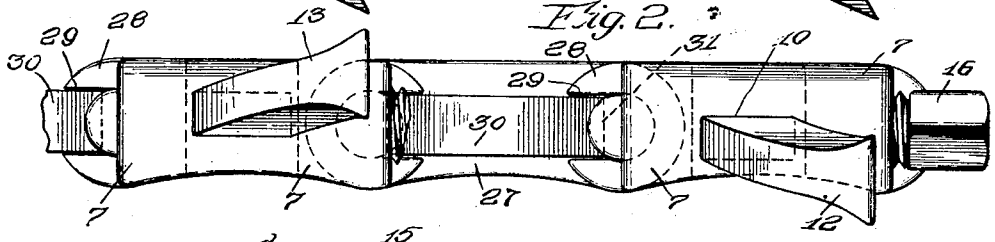


Fig. 3.

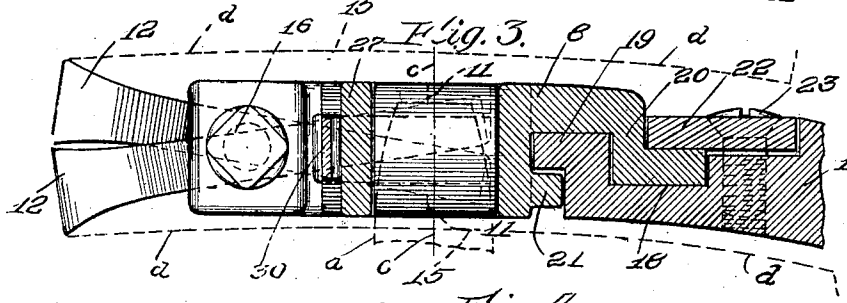
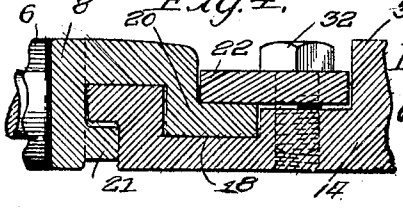


Fig. 4.



Witnesses:

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CUTTING-CHAIN FOR MINING-MACHINES.

1,325,030. Specification of Letters Patent. **Patented Dec. 16, 1919.**

Application filed March 8, 1915. Serial No. 12,760.

To all whom it may concern:

Be it known that I, EDMUND C. MORGAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Cutting-Chains for Mining-Machines, of which the following is a specification.

This invention relates to improvements in cutting chains, and more particularly to improvements in cutting chains for mining machines.

The principal object of the invention is to provide a simple strong construction which is effective and efficient in operation.

Other objects of the invention will appear hereinafter.

In the accompanying drawing, Figure 1 is a plan view of a portion of a cutting chain constructed in accordance with the principles of my invention; Fig. 2 is a side elevation of the same; Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1, and Fig. 4 is a sectional view illustrating the modified form of clamping construction.

In cutting chains for mining machines it is desirable that the chain parts should be strong and substantial in construction, and that they should be of such a construction that the parts may be assembled and taken apart with great facility because of the heavy duty which is imposed upon them. The cutting bits must also be easily accessible and removable.

In the present construction a cutting link designated generally by the reference numeral 5 is formed with perforated link projections 6, a laterally extending head 7 and an opposite laterally extending guide portion 8. The head portion 7 is separated from the main or body portion of this link by means of a neck 9, and the guiding projection 8 at the other side of the link is of substantially the same width as the neck 9. The head 7 is of substantially the same thickness as the main body portion of the link, and extending inwardly from the outer end of the head portion is a bit socket 10 which extends through the neck 9 to the main body portion of the link 5, and on one side of the link is an aperture 11 which communicates with the inner end of the bit socket. The bit sockets of adjacent lengths are oppositely inclined in the link so that the ends of adjacent sockets are nearest the opposite sides and the apertures 11 of adjacent lengths are on opposite sides of the links. A bit 12 having a shank 13 is inserted in each one of the sockets and as the bit sockets of adjacent lengths are oppositely inclined the bits will extend on opposite sides of the chain, as clearly shown in Figs. 2 and 3. By thus staggering the bits, they may be made to cut a kerf which is slightly wider than the chain itself and wider than a cutting head or frame 14 by which the chain is supported, thus permitting the chain to be inserted within the kerf, as illustrated by the dotted lines 15 in Fig. 3.

Each bit is securely held in place by means of a fastening device 16, and in order to remove a bit from the socket it is necessary only to loosen the fastening device and to draw the bit from the socket. If the bit tends to stick in the socket a suitable tool can be inserted in the aperture 11 on one side of the link and the bit wedged or driven from the socket. Usually the inner extremity of the bit shank is formed with beveled edges 17 to facilitate the insertion of a tool.

The cutter head 14 is formed with a groove 18 extending along the edge thereof and with a flanged edge 19 extending therefrom. The guide portion 8 of each link 5 is formed with an over-hanging projection 20 which extends over the flange and lies in the groove 18. The guiding portion of each link is also formed with an under-hanging projection 21 which extends below the flange 19 of the cutter head. The over-hanging and under-hanging parts of guide portion 8 fit the flange and groove of the cutter head closely but permit the link to be moved freely upon the cutter head. The construction described would prevent the movement of the cutter chain toward and from the cutter head and would prevent the upward movement of the chain with respect to the cutter head but in order to bind the chain against the downward movement with respect to the cutter head a clamping strip 22 is provided which is adjustably secured to the cutter head by means of a fastening screw 23 and projects over the groove 18 above the over-hanging projection 20 of the guide portion 8 of each link. This holds the cutter chain firmly in position in the guideway, preventing its dislodgment therefrom but permitting the cutting chain to slide freely along the guideway.

In order to connect the cutting lengths a connecting member 24 is provided which has

a guide portion 8 which is preferably similar to the guide portion of the cutting length. It is also formed with two preferably integral pivot pins 25 extending in the opposite direction from the guide portion 8 and adapted to be inserted through the perforations of the link projections 6 of adjacent cutting lengths 5. The neck 9 of each link forms a space 26 between the link portions and the head 7 of each cutting length into which the extremities of the pivot pins 25 project but they do not project far enough to engage the inner side of the head 7. An outer link 27 is provided for each connector member which is of substantially the same length as the connector itself and is provided with perforations through which the pins 25 extend. In order to place the outer link in proper position, in assembling the chain, it must be inserted in the spaces 26 of adjacent cutting lengths 5 before the pins 25 are inserted into the spaces 26. After the outer link 27 is in place the extremities of the pins 25 are inserted through the perforations of the link 27 and the connection between the cutting lengths is complete. In order, however, to hold the outer link 27 in position it is formed with bosses 28 partially surrounding the apertures at the ends, the inner sides of the bosses being omitted to form seats 29 for the ends of a spring 30. The pins 25 are formed adjacent their extremities on the insides thereof with notches 31 in which the ends of the spring 30 are seated so that when the spring is in place with its extremities in the notches 31 the outer link 27 is held firmly in position. To remove the spring 30 it is necessary only to insert a tool between the spring and the outer link and to pry the center of the spring upwardly whereupon the extremities of the spring will become disengaged from the notches 31 and the spring can be removed. It will be seen, however, that even if the spring 30 is removed there is but little tendency for the chain to come apart, for the outer link 27 can be removed only when the connector member 24 is withdrawn to such an extent that the extremities of the pins 25 are clear of the spaces 26, and this is not likely to happen since the same guideway which holds the guide portions of the cutting lengths also holds the guide portions of the connector link. When desired, however, it is a simple matter to disconnect the connector link, and the construction is simple and strong and not likely to become damaged. It will be seen that the ends of the pivot pins 25 are protected by the heads 7 of the cutting lengths so that there is no danger that the ends of the pins will become battered or bent to such an extent that the connector link cannot be easily removed.

Instead of a fastening screw 23, as shown in Fig. 3, a headed bolt 32 may be employed to secure the clamping strip 22 in place, in which case it is desirable that the cutter head 14 be formed with an upstanding shoulder 33 slightly above the head of the bolt 32 to protect it from contact with the sides of the kerf and thereby to prevent it from becoming damaged.

In Figs. 1 and 3 a driving tooth for the chain is represented by the broken outline *a* and a horizontal center line *b* in Fig. 1 is referred to as the drive line of the tooth, and the line *c* in Fig. 3 is the transverse center line of the tooth. The tooth may be connected to a gear or any other suitable driving element (not shown). It is evident that the drive line is intermediate the cutting bits 12 and the cutter head 14 and between the bits and the guideway of the cutter head. With this construction the guideway of the cutter head and the center line of the cutting bits are substantially in the same plane or are in the same straight line when viewed from the side as in Fig. 3, and therefore the maximum and the most direct driving effect is produced by the teeth of the driving element. The cutter head is preferably mounted to swing into the material to be cut and the broken lines *d* in Fig. 3 represent the path of a kerf cut by the chain. Since the cutter head is substantially the same width as the cutting chain a very thin deep kerf can be cut.

It should be noted that the invention hereinbefore described is particularly adapted for loop chain core-cutting machines in which the frame 14 is an open frame having an unobstructed core-opening therethrough, the direction of feed being along the path indicated by the broken lines *d* in Fig. 3. The line of drive indicated by the line *c* in Fig. 3 is in a transverse plane relatively to the feeding path of travel of the chain cutter. The cutters are located at one edge of the chain and the guiding mechanism at the opposite edge of the chain, the guiding path of travel being parallel to the path of travel of the cutters and the cutter head, interlocking guiding mechanism, the chain, and the cutters being arranged in series in the direction of the feed, as shown in Fig. 3, so as to effect the cutting of a narrow kerf in a loop chain core-cutting machine.

In my copending application, Ser. No. 848,726, filed July 3, 1914, for cutter chains for mining machines, I have covered broadly cutting mechanism of the same general type as that herein disclosed and also particularly adapted for use in core-cutting mining machines comprising cutting mechanism having an unobstructed core-opening therethrough.

What I claim is:

1. A chain cutter adapted for loop chain core cutting mining machines, said chain

cutter comprising a chain having a plane of drive extending transversely of the direction of feed and spaced from the guiding path of movement of said chain, said chain comprising links, and an overhanging part and an underhanging projection extending from said links back of the chain relative to the feeding direction thereof.

2. In a chain cutter for mining machines, the combination with links adapted for a line of drive in a plane extending transversely of the direction of feed, of cutters extending from the forward edge of said chain, an overhanging portion and an underhanging projection extending rearwardly from the rear edge of said chain, a cutter-head having a flange extending between said overhanging portion and said underhanging projection, said cutter-head also having a groove for receiving the overhanging portion, and an adjustable device for confining said overhanging portion to movement along said groove.

3. The combination with a cutting chain having links arranged for a plane of drive substantially at right angles to the direction of feed, of cutters extending from the forward edge of said chain, an overhanging portion and an underhanging projection extending rearwardly from the rear edge of said frame, a cutter-head having a flange and a groove to engage the underhanging projection and the overhanging portion respectively, and a clamping strip to prevent the dislocation of said flange from said underhanging projection and to prevent the dislocation of said overhanging portion from said groove.

4. The combination with a cutter-head having a groove and a projecting flange, of a cutter chain adapted for a line of drive in a plane substantially at right angles to the direction of feed, an overhanging portion extending rearwardly from the rear edge of said chain and seated in said groove, an underhanging projection extending rearwardly from the rear edge of said chain and disposed beneath said flange in a position spaced from said overhanging projection, and a clamping strip secured to said cutter-head and adpted to project over a portion of said groove to hold said overhanging portion therein and hold said chain in sliding relation to said cutter-head and in alinement therewith in feeding direction.

5. In a chain cutter for mining machines, the combination with a chain, of cutters extending from the forward edge of said chain, guiding devices extending from the rear edge of said chain and each having an intermediate longitudinal groove and an extension with angular bends, a supporting frame having a groove for receiving said extension and itself having an extension with angular bends and fitting into said longitudinal grooves and a plate removably secured to said frame for confining said extensions from said chain in the groove in said frame to support said chain and said cutters in alinement with said frame in the direction of feed for a line of drive of said chain in a plane approximately at right angles to the direction of feed.

6. In cutting mechanism for producing curved kerfs in a mine wall, the combination with a plurality of cutting links, of a plurality of connecting links, a plurality of guiding devices one connected to each of said cutting links to move therewith and one connected to each of said connecting links to move therewith, and projecting rearwardly from the chain formed by said links, cutting bits connected to the front side of said cutting links, and a guide frame connected to the said guiding devices to support said chain for a cutting path of travel spaced from said guiding devices and substantially at right angles to the feeding path of travel of said chain.

7. In a chain cutter for mining machines, the combination with a plurality of cutter holders each having perforated link portions and a head separated from the line of drive, and each also having a projection opposite said head, of a plurality of connecting links, and pins adapted to be inserted through the perforations of said link portions to hold said connecting links between said perforated link portions, said heads having extensions to protect the adjacent extremities of said pins.

8. In a chain cutter for mining machines, the combination with a chain having a line of drive in a plane substantially at right angles to the direction of feed, of cutter holders on the forward side of said chain, a guiding device on the rear side of said chain said guiding device comprising a longitudinal intermediate groove and an extension having angular bends, and a supporting frame for said chain comprising an extension into said groove and means for receiving the extension of said guiding device.

9. In a cutter chain of the class described, the combination with cutting links each formed with perforated link engaging portions and with a head separated therefrom but having portions opposite the perforations, of a plurality of connecting links having pins adapted to be inserted through the perforated portions of the other link from the side opposite the head thereof, and an outer connecting link with perforations through which the pins pass, less in width than the distance between the head and perforated link portion whereby the link must be placed in the said spaces before the extremities of the pins are inserted through the outer link member.

10. In a cutting chain of the class de-

scribed, the combination with a plurality of cutting links each formed with perforated link engaging portions and a head separated therefrom on one side by a neck forming a space with portions of the head opposite the perforations, a plurality of connector links each having pins adapted to be inserted through the perforations of the cutting lengths and with notches at their ends on the inside, an outer connecting link adapted to be placed in spaces formed by the necks of adjacent cutting lengths before the pins of the connector member are inserted through the perforations of the cutting length and having a guide in the outer face thereof, and a resilient spring adapted to be inserted in the notches at the ends of the pins and seated and held in place by the guide of the outer connector length for preventing the dislocation of the link.

11. A chain cutter for mining machines, comprising a link structure for driving engagement, the plane of drive being at right angles to the direction of feed, cutting means at the forward side of said chain having a cutting path of travel parallel to the plane of drive, and guiding means at the rear side of the chain spaced rearwardly from the plane of drive, the cutting and guiding means being in substantially the same plane as the center line of the link structure and in alinement with each other in the direction of feed transversely to the plane of drive, said guiding means being no greater in thickness than the thickness of the chain and located entirely rearwardly of the chain.

12. A chain cutter for mining machines having a central drive line in a plane transverse of the direction of feed, cutting means extending forwardly from said chain and having a cutting path of travel parallel to said central drive line, and guiding means wholly on the rear side of said chain and spaced in its entirety from such plane of drive by being confined to a space no greater in thickness than the thickness of said chain and thereby leaving the lateral surfaces of said chain exposed, free and unobstructed.

13. A mining machine chain cutter for producing cylindrically curved kerfs in a mine wall, comprising flat links capable of free feeding movement in a curved kerf, additional links in planes at right angles to said first-named links, cutting tools connected to one edge of said flat links and capable of cutting cylindrically curved kerfs for the passage of said flat links and said additional links in feeding direction, a cylindrically curved supporting frame capable of free movement along said cylindrically curved kerf following said cutting tools and said flat links and additional links, and interlocking guiding connections between said vertical links and said supporting frame at that side of the chain opposite the cutting tools.

14. A mining machine chain cutter adapted for producing narrow curved kerfs in a mine wall, said chain cutter comprising a link structure provided with a line of drive in a plane transverse to the feeding direction, cutting tools mounted on the forward side of said link structure, a guide frame at the rear side of said link structure spaced from said line of drive, and confined to a space no greater in thickness than the thickness of said link structure, and interlocking connections between said link structure and said guide frame and extending all along the latter within the space no greater in thickness than the thickness of said chain for preventing the link structure from moving away from said frame while being guided along the latter for a cutting path of travel parallel to the said line of drive.

15. In mechanism for producing narrow curved kerfs in a mine wall, the combination with a guide frame curved in cross-section in the direction of feed, of a kerf chain cutter in arcuate alinement with said guide frame in the direction of arcuate feed, and interlocking guiding connections between said guide frame and the chain of said chain cutter opposite the cutting edge of the latter and confined to a space directly back of said chain of a thickness determined by the lateral surfaces of said chain.

16. In a chain cutter for mining machines, the combination with a plurality of links, of a guide frame, and interlocking guiding connections between the links and said guide frame confined to a space limited by the extended opposite surfaces of said links, said links having a line of drive in a plane transverse to the direction of the feed of said chain cutter together with said guide frame and interlocking guiding connections.

17. A chain cutter having a cutting side and a guiding side in alinement with each other in feeding direction and comprising a plurality of cutter links and intermediate connecting links, and guiding mechanism extending from the guiding side of the chain and comprising extensions each having a plurality of bends, said guiding mechanism being confined to a space between planes extended from opposite surfaces of said chain, leaving the lateral surfaces of the chain exposed and unobstructed for free passage along the kerf.

18. In cutting mechanism for core cutting mining machines, the combination with a chain having cutting tools extending from the advance edge thereof, of a guide frame spaced back from the rear edge of said chain, interlocking connections comprising grooves extending along the forward edge of said frame and also comprising extensions from the rear edge of said chain to fit into said

grooves for confining said chain cutter to a predetermined path of cutting travel parallel to the plane of drive located intermediate the cutting path of travel and said interlocking connections, said interlocking connections preventing said chain cutter from being moved away from any portion of said frame in feeding direction transversely of the plane of drive.

19. A chain cutter for mining machines comprising a plurality of alternate cutter links, of a plurality of pairs of intermediate links pivoted to said cutter links, T-shaped heads extending from said cutter links and forming recesses to receive the ends of the outer intermediate links, and guiding mechanism for that side of the chain opposite the said heads, said guiding mechanism confining the inner intermediate links to its position relatively to said cutter links.

20. In a chain cutter for mining machines, the combination with a chain having a line of drive in a plane extending transversely of the direction of feed, of cutter holders on the forward side of said chain, guiding devices connected to the other side of said chain within a space between the planes of the opposite surfaces of said chain having such surfaces exposed and free to pass along a narrow kerf, which surfaces are parallel to the direction of feed, and a frame also within the surfaces of such planes for receiving said guiding devices within the forward edge of said frame and locking the chain against movement away from said frame and confining said guiding devices to a traveling movement along the edge of said chain parallel to said plane of drive.

21. In a chain cutter for mining machines, the combination with a chain having a line of drive in a plane extending transversely of the direction of feed, of means for holding cutters extending from the forward edge of said chain, a supporting frame, guiding devices extending from the rear edge of said chain and fitting into the forward edge of said frame approximately within planes extending through opposite surfaces of said chain parallel to the direction of feed leaving such surfaces unobstructed for freedom of passage along a narrow kerf, and means on said frame for locking said guiding devices to said frame against movement away therefrom while permitting guiding movement along the same.

22. In a chain cutter for mining machines, the combination with a chain having a line of drive in a plane substantially at right angles to the direction of feed, of means for receiving cutting tools at the forward edge of said chain, guiding devices extending from the rear edge of said chain, a frame for receiving said guiding devices within a space between planes extending through opposite surfaces of said chain and parallel to the direction of feed leaving such opposite surfaces of said chain free and unobstructed, and a removable plate adapted to be secured to said frame to hold said guiding devices in interlocking engagement with said frame.

23. In a chain cutter for mining machines, the combination with a chain having a line of drive in a plane extending substantially at right angles to the direction of feed, of cutters carried by said chain to extend from the forward edge thereof, guiding mechanism comprising extensions secured to said chain and confined to a space between planes of the opposite surfaces of said chain leaving the lateral surfaces of said chain free and unobstructed, and a guide frame of a thickness no greater than the thickness of said chain between such opposite surfaces, and having an interlocking groove for receiving said guiding mechanism and confining movement thereof along said guide frame but preventing movement of said chain away from said frame in the direction of feed or in the reverse direction.

24. In a chain cutter for mining machines, the combination with a chain having a plane of drive extending transversely of the direction of feed, of cutters extending from the forward edge of said chain, and guiding mechanism for said chain comprising extensions from the rear edge of said chain and a guide frame having a groove extending along the same at the forward edge thereof and opening toward the feeding path of travel of the chain to confine the chain to a predetermined path of travel along said guide frame and prevent movement of said chain away from said guide frame in the direction of feed or in the reverse direction, said guiding mechanism including said frame occupying a space no greater in thickness than the thickness of said chain measured along a line parallel to said plane of drive.

25. The combination with a traveling cutter chain, of cutting devices carried by the forward edge of said chain, a support along which said chain is adapted to travel transversely of its direction of feed, means at the forward edge of said support for guiding the chain along such path of travel, and mechanism connected between said chain and said guiding means to lock the chain against movement thereof from said support in the direction of feed or in the reverse direction, said guiding means and said locking mechanism being located at the rear of the chain and spaced from the plane of drive which extends transversely of the direction of feed.

26. In chain cutting mechanism for mining machines, the combination with a plurality of alternate cutter links, of a plurality

of pairs of intermediate links pivotally connected to said cutter links to constitute a chain having a plane of drive substantially at right angles to the direction of feed, T-shaped heads extending from the forward edge of said cutter links to form recesses for receiving the ends of the forward links of the pairs of intermediate links, spring clips extending longitudinally of said forward links to hold them in predetermined pivotal connection with said cutter links, cutters mounted in sockets extending through said heads into said cutter links transversely to the plane of drive, means for holding said cutters rigidly connected to said heads, a supporting frame in position to follow said chain and said cutters in the direction of feed, and interlocking guiding mechanism between said cutter links and said frame, and also between the rear links of the pairs of intermediate links, and said frame for guiding said chain transversely to the direction of feed to cause the cutters to follow the path of travel parallel to the contour of the forward edge of said frame, said frame and inter-locking mechanism being in alinement with a transverse section of said chain in the direction of feed and between opposite surfaces of said chain.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 4th day of March, A. D. 1915.

EDMUND C. MORGAN.

Witnesses:
CHAS. M. NISSEN,
CHAS. H. SEEM.