

April 12, 1927.

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1,623,957

DIGGING MEMBER FOR DITCHING MACHINES

Filed May 14, 1924

2 Sheets-Sheet 1

Fig. 1.

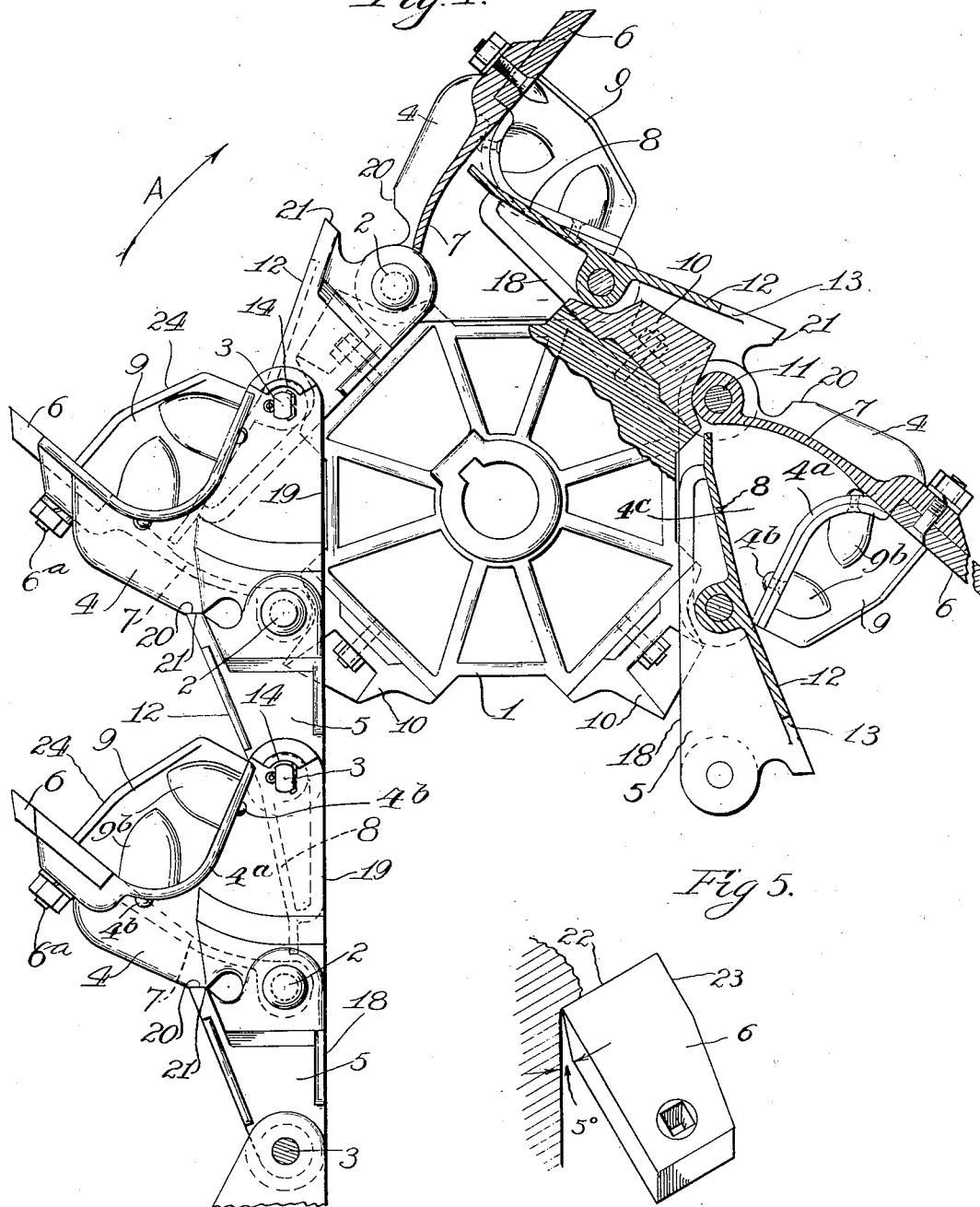
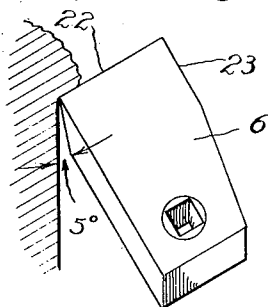


Fig. 5.



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Fig. 3.

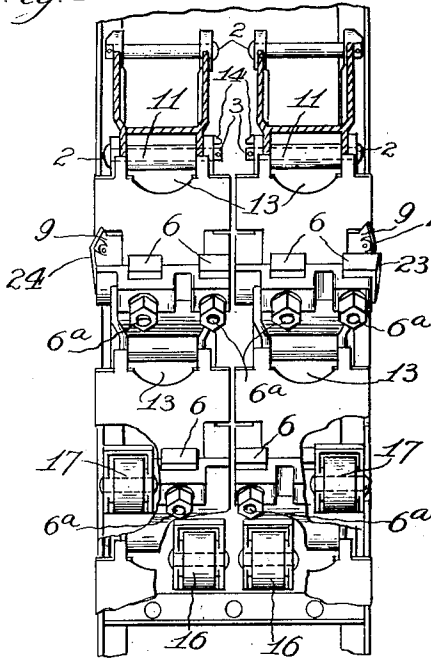


Fig. 2

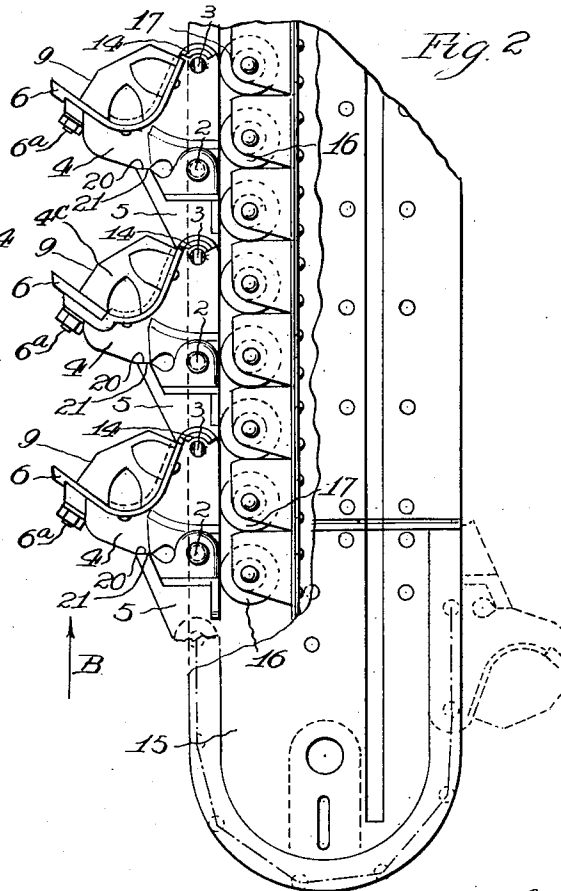


Fig. 4.

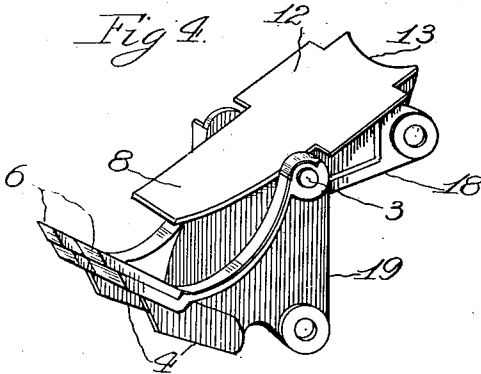
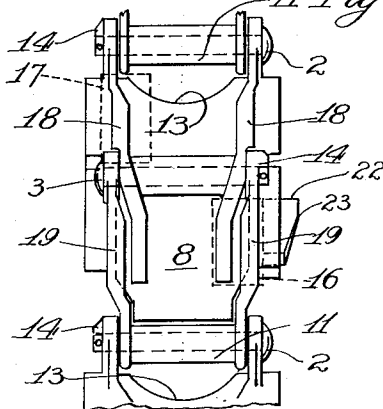


Fig. 6.



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UNITED STATES PATENT OFFICE.

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DIGGING MEMBER FOR DITCHING MACHINES.

Application filed May 14, 1924. Serial No. 713,242.

REISSUED

The purpose of this invention is to provide an improved form of digging member for ditching machines and the like and it consists in various features of construction herein shown and described as indicated by the claims.

In the drawings:—

Figure 1 is a side elevation partly in section showing a few links of a digging chain embodying this invention associated with a head wheel over which the chain runs.

Figure 2 is a side elevation on a smaller scale showing the lower end portion of a boom and a few links of the digging chain supported and guided thereon.

Figure 3 is a front elevation of the part of the digging chain shown in Figure 2.

Figure 4 is a perspective view of one link of the chain.

Figure 5 is a perspective view of one of the digging teeth showing diagrammatically its relation to the soil in working position.

Figure 6 is a rear elevation of a fragment of the chain showing the track ribs of the link sections.

It may be understood that the digging member constituting this invention is in the form of an endless chain supported on upper and lower pulleys or sprockets.

Figure 1 includes an upper sprocket wheel, 1, by which the chain is both supported and driven. The chain consists of a series of links connected by pivots, 2, and each consisting of two parts hingedly connected by pivots, 3. The lower part, 4, of each link includes a bucket portion for carrying the material removed in forming the ditch and this bucket is connected to the next succeeding bucket and chain by the upper link section, 5. The bucket member, 4, is provided with digging teeth, 6, of chisel form, two teeth being set in each link bucket and spaced apart as indicated in Figure 3 while the two teeth of the next succeeding bucket are spaced to register vertically with the interspaces of the bucket teeth just above them. This provides teeth for covering the full width of the ditch while distributing the working strain and insuring a better digging action than if the teeth were continuous clear across the entire width of the chain. The digging member shown in Figure 3 consists really of two chains arranged to travel side by side so that four teeth, 6, are distributed in a row across this width. Each tooth is

secured to the cast portion, 4, of the chain link by an attaching bolt, 6^a, which renders the teeth individually removable for renewal or repair.

The link member, 4, is cast with a web, 7, which forms the bottom of the bucket trending downwardly toward a horizontal direction from the surface of the digging teeth, 6, and a back wall is formed by the web, 8, carried by the lower end of the upper section, 5, of the link and extending nearly into contact with the bottom web, 7. Supplemental side walls, 9, are applied to the casting, 4, and the bucket thus formed is left upwardly open so as to discharge its load in passing over the head wheel, 1. To facilitate the discharge and to insure delivery of the entire load the bottom web, 7, is curved concentrically about the axis of the hinge pivot, 3, so that as the two part link passes around the head wheel, 1, the resultant folding of the link about its hinge, 3, will swing the back wall, 8, forwardly causing it to sweep across the curved bottom, 7, of the bucket to the extent indicated in the sectional portion of Figure 1, this being found sufficient for completely loosening the material so that it will fall out as the bucket is inverted in passing over the head wheel, 1. The web, 8, continues upwardly past the pivot, 3, in a portion, 12, which also serves to some extent as a back wall for the bucket and then acts as a chute or slideway over which the material is discharged as the bucket is inverted.

The driving sprocket, 1, is preferably of polygonal form so as to provide flat surfaces for seating of the link sections as they traverse the wheel and alternate faces of the latter are provided with applied driving teeth, 10, which engage the cylindrical parts, 11, at the lower end of each bucket section, 4, for driving the chain. As seen in Figure 1 the web, 12, of each chain section, 5, is inclined forwardly to provide space for the tooth, 10. And to prevent the dirt or clay from packing in the rear face of the chain and causing it to run tight on the sprocket wheel, 1, the webs, 12, are each formed with a clearance notch, 13, through which the teeth, 10, can force any accumulated material as it registers with this part of the chain link.

To simplify the assembly and repair of the machine the pivot members are preferably secured by cotter pins which are indi-

cated in connection with the pivots, 3, in Figure 1. To prevent the cotter pins from being bent or broken off at the ends by striking material at the sides of the ditch the link sections, 4, are formed with hoods, 14, disposed directly above the ends of the pivots, 3, for guarding them.

Figure 2 shows the lower end of a fabricated steel boom, 15, the guide pulleys for the chains being removed and a part of the side wall of the boom being broken away to reveal the rollers, 16 and 17, over which the chain links track as they travel upward at the working ply of the chain. The rear faces of the link sections are formed with straight ribs, 18 and 19, which lie in a common vertical plane when the links are straightened out for vertical travel along the boom. These track ribs, 18 and 19, are formed in pairs arranged at the sides of the link sections and the rollers, 16 and 17, are made only wide enough to support one rib of each pair, but to insure lateral stability of the links the rollers, 16, are positioned to register with one rib of each pair and the next succeeding rollers, 17, are laterally offset from the rollers, 16, so as to register with the other ribs of the link sections. Thus at any particular position the link section is supported at opposite corners by one roller, 16, and one roller, 17.

For further stabilizing the chain at its working ply the pivotal connections, 2, are prevented from folding backward toward the supporting rollers, 16 and 17, by the provision of abutments, 20 and 21, on adjacent link sections, 4 and 5, respectively. These abutments engage when the track portions, 18 and 19, lie in vertical alignment; thus the stress imposed upon the links by the digging action of the teeth, 6, in the soil in which the ditch is being formed will not buckle the chain as it travels upward over the rollers.

I have found that certain proportions in the design of the digging teeth, 6, will render them practically self-sharpening in most soil and have illustrated such proportions in the drawings. In actual construction these teeth are made about $\frac{5}{8}$ " thick and 2" or $2\frac{1}{2}$ " in width. Each tooth is supported upon the casting, 4, through about $\frac{2}{3}$ of its length. Its cutting edge indicated at 22 in Figure 5 is sharpened at an angle of about 45° but the tooth is supported in the casting, 4, at an angle of 40° from the horizontal leaving a clearance angle of about 5° between the direction of working travel and the beveled end of the tooth. I have found that upon making the tooth considerably thicker than this the frictional wear upon this beveled end is not sufficient to maintain a sharp cutting edge at 22, while if the tooth is more sharply beveled or made thinner its cutting edge

lacks the necessary stability; but with the proportions shown the frictional wear on the beveled end of the tooth is found to be just about sufficient to maintain a fairly sharp edge without repeated regrinding.

The particular tooth shown in Figure 5 is one of the outside teeth of the chain having a lateral cutting edge, 23, which extends slightly beyond any part of the supporting bucket casting, 4, to insure cleaning up the side walls of the trench as it is formed while avoiding any undue friction between the side walls and the non-cutting portion of the bucket. As indicated in Figure 1 the side walls, 9, of the buckets are also formed with sharpened upper edges, 24, which act to some extent as cutters for smoothing up the sides of the trench. These ends—or sides, 9, of the buckets are preferably made of the same grade of manganese steel as that used for the teeth, 6. The digging teeth, 6, and the applied side walls, 9, thus take most of the wear which occurs in the use of the machine and may be readily replaced at will. The parts, 9, are attached by bolts to curved seat flanges, 4^a , formed on the bucket links, 4, and the attaching bolts, 4^b , are protected from wear by their location in hoods or pockets, 9^b , which open at the inner sides of the walls, 9, and are seen as rounded embossments on their outer faces.

In the perspective detail view of Figure 4 the walls, 9, are omitted to reveal the construction of the sweep-out lip, 8, more clearly and the folding of the link about its hinge pivot, 3, is considerably exaggerated as compared with the actual angular movement which takes place as the link traverses the head sprocket, 1, as shown in Figure 1. It may be noted, however, that the distance upward from the pivot, 3, to the adjacent coupling pivot, 2, is considerably less than the distance downward from the same hinge pivot, 3, to the lower coupling pivot, 2. This makes the sweep-out arm, 8, somewhat longer than it would be if the hinge, 3, were placed exactly midway of the coupling pivots, 2, and increases the sweep-out stroke for a given angle of folding of the link.

I claim:—

1. In a ditching machine a chain link comprising two parts hinged together, one part carrying the bottom and side walls of an upwardly and rearwardly open bucket extending from its outer face, the hinge axis being disposed at a distance above the bottom of the bucket and the other part of the link including a back wall for the bucket extending above and below said hinge and between said side walls to close the rear opening of the bucket, the bottom of the bucket being curved concentrically about the hinge axis to permit the lower edge of the back wall to sweep across said curved bottom

when the link folds at the hinge as in traversing a pulley.

2. In the combination defined in claim 1, said link having coupling pivots at its upper and lower ends for attachment to adjacent links of the chain and the hinge of the link being nearer to the upper coupling pivot.

3. In a ditching machine, an endless digging chain arranged with its working ply extending in a straight line and composed of two-part hinged links pivotally coupled together at their ends for folding in passing over a sprocket wheel, the ends of adjacent links having co-operating abutments which engage to oppose folding of the parts out of alignment in the opposite direction.

4. In a ditching machine, an endless digging chain composed of two-part links pivotally coupled at their ends for folding in passing over a sprocket wheel, said chain being mounted for travel of its working ply in substantially vertical direction upwardly; each link having digging means extending from its front face, and supporting means for the chain including rollers over which the working ply travels, the rear faces of the link parts having straight portions

adapted to track over said rollers and co-operating means on the adjacent parts of connected links limiting the unfolding movement thereof at the position at which said straight portions lie in alignment with each other.

5. In a ditching machine, a digging belt comprising chain links pivotally connected, each link having a web which extends in the direction of travel of the chain and a digging bucket projecting transversely from said web, a sprocket wheel for supporting and driving the chain having teeth which engage the pivotal connections of the links and the web of each link having an opening adjacent its pivotal connection to release impacted material adjacent the teeth of the sprocket.

6. In the combination defined in claim 4, the machine including a boom on which said rollers are mounted and the rollers being arranged in staggered relation thereon in transverse rows, the rollers of adjacent rows supporting opposite sides of the chain links respectively.

In testimony whereof, I have hereunto set my hand this 12th day of May, 1924.

HARRY H. BARBER.