May 31, 1938. R. S. WEIMER 2,118,872

REMOVABLE TEETH FOR EARTH WORKING MACHINES

Filed June 10, 1936 2 Sheets-Sheet 1

Fig. 2

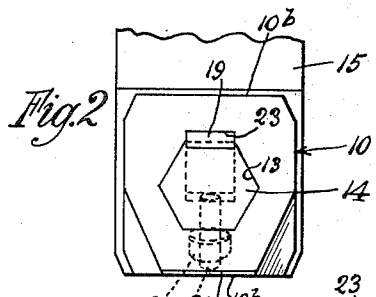


Fig. 1

Fig. 3

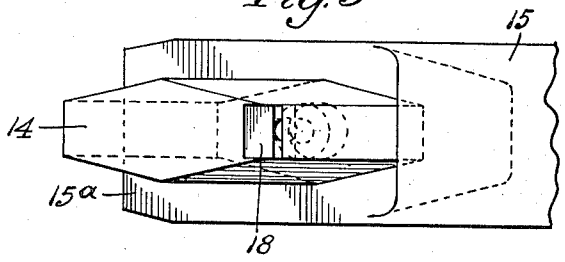


Fig. 6

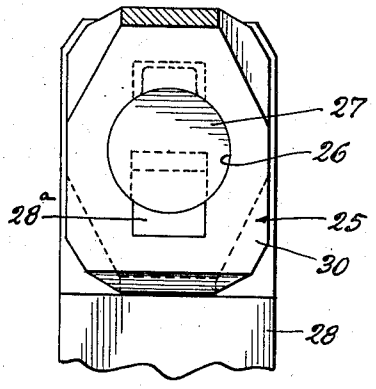


Fig. 4

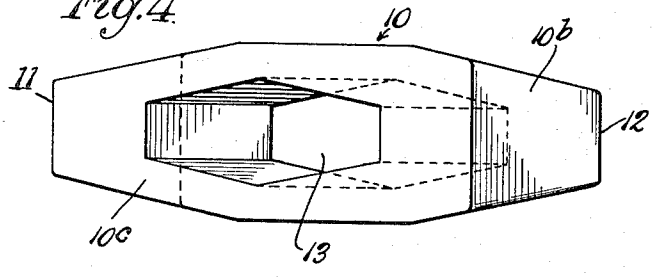
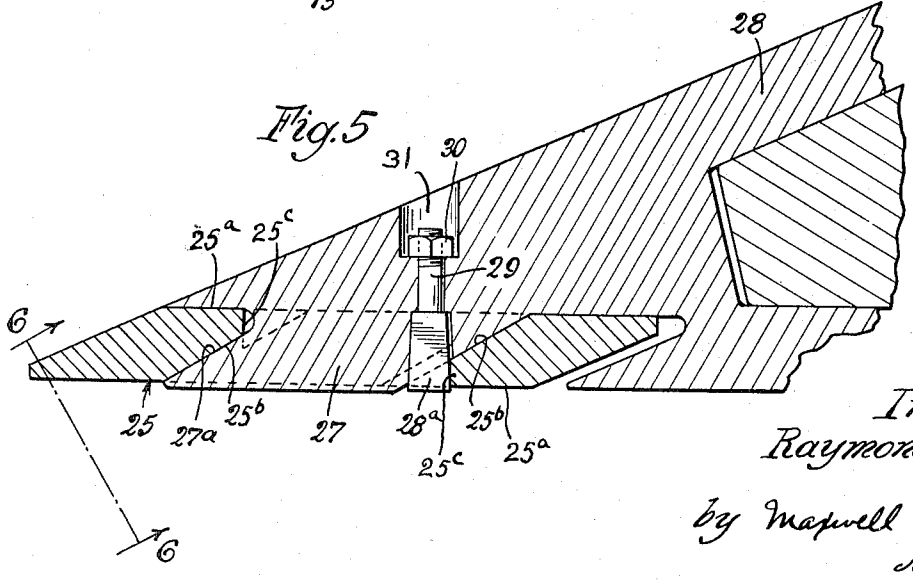


Fig. 5



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REMOVABLE TEETH FOR EARTH WORKING MACHINES

Filed June 10, 1936 2 Sheets-Sheet 2

Fig. 7

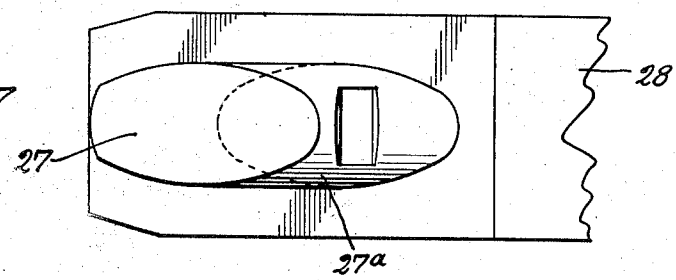


Fig. 8

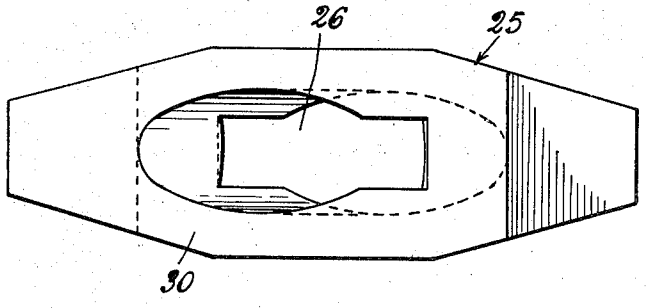


Fig. 9

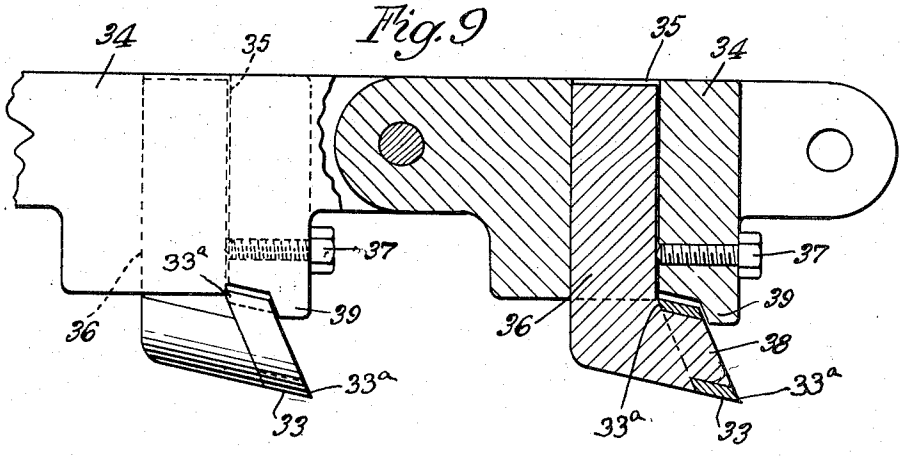


Fig. 10

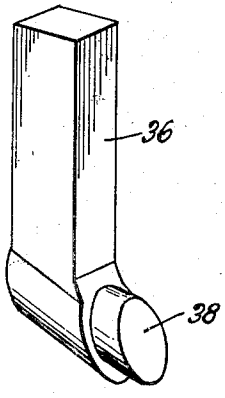


Fig. 11

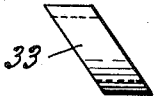


Fig. 12

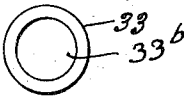
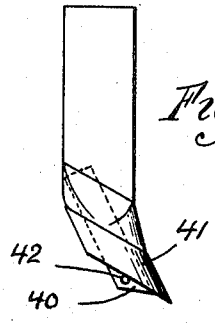


Fig. 13



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UNITED STATES PATENT OFFICE

2,118,872

REMOVABLE TEETH FOR EARTH WORKING MACHINES

Raymond S. Weimer, Wilmington, Ill.

Application June 10, 1936, Serial No. 84,439

14 Claims. (Cl. 37—142)

This invention relates to improvements in removable teeth for earth working machines.

The teeth of dipper buckets and other earth working or earth moving apparatus wear away relatively rapidly under the severe service generally encountered in excavation operations and it has been found advantageous to provide removable teeth for such apparatus which, as they wear away and lose their efficiency, can readily be replaced by new or re-sharpened teeth.

One object of the invention is to provide an improved tooth shaped at each end for excavating or digging, and having the front and rear halves symmetrically arranged with respect to a common mounting recess whereby the tooth can be reversed to place either end in operating position.

When teeth of this type are used in conjunction with a mounting or supporting member which is also reversible, the working surface of each end of each tooth can in turn be so disposed as to constitute the lower surface of the tooth, which generally is subjected to the greatest wear. Thus each tooth has four working surfaces which prolong its period of usefulness.

Another object of the invention is to provide a reversible tooth of the type mentioned provided with an obliquely disposed mounting aperture therein by means of which the tooth can be held with either end in operative position against displacement on a supporting member.

Another object of the invention is to provide removable excavating or like teeth and mounting means therefor which so cooperate that the greater the stresses imposed on the teeth in use the greater is the coaction of the same with the mounting means tending to hold the teeth against displacement or looseness with respect to the mounting means.

Other objects relate to various features of construction and arrangement of parts which will be apparent from a consideration of the following specification and accompanying drawings, wherein:

Figure 1 is a longitudinal vertical section through a tooth embodying the present improvement and illustrating a tooth supporting means and portion of a dipper bucket lip or excavating edge also in section.

Figure 2 is a broken end elevation looking to the right of the structure shown in Figure 1.

Figure 3 is a broken top plan view of the tooth support shown in Figure 1, the tooth being removed.

Figure 4 is a top plan view of a detached tooth of the form shown in Figure 1.

Figure 5 is a vertical longitudinal broken sectional view of a modified form of tooth and support therefor.

Figure 6 is a view taken on line 6—6 of Figure 5 and looking in the direction of the arrows.

Figure 7 is a broken bottom plan view of the structure shown in Figure 5 with the tooth removed.

Figure 8 is a top view of the tooth shown in Figure 5.

Figure 9 is a broken vertical section of another form of earth working device embodying a further modified form of the improved teeth.

Figure 10 is a perspective view of a detached support for a tooth of the type shown in Figure 9.

Figure 11 is a side elevation of a detached tooth adapted to be carried by the support shown in Figure 10.

Figure 12 is an end elevation of the tooth shown in Figure 11.

Figure 13 is a side elevation of modified tooth mounting member similar to that shown in Figure 10.

In Figures 1 to 4 of the drawings, the improved tooth is indicated generally by the numeral 10, and as illustrated in Figure 1 is parallelogrammatic in vertical longitudinal section. The tooth has upper and lower parallel plane surfaces and parallel but oblique end surfaces. In plan view (see Figure 4) the end portions of the tooth illustrated converge toward the working ends 11 and 12. An aperture 13 is provided for mounting the tooth in an inclined position on a stud or projection 14 shown as being integral with a tooth supporting member 15 which is secured by suitable means, as bolts 16, to the forward edge or lip 17 of a dipper bucket or other earth working or moving equipment. The aperture 13 extends obliquely through the tooth and is of a shape corresponding to the cross sectional shape of the mounting stud 14.

In Figures 1 to 4 the aperture 13 is hexagonal and the stud or boss 14 is likewise hexagonal. A slot 18 is provided in the stud 14 which extends through said member and through member 15 for receiving a wedge 19 and a threaded extension 20 having a nut 21 which is located in the enlargement or socket 22 of the recess 18.

The wedge 19 is inserted after the tooth 10 is placed in position on the stud 14 and in being drawn down to the position shown in Figure 1, the wedge abuts one of the transverse edges 23 to force the tooth rearwardly or to the right, as viewed in Figure 1, and restrain movement in the opposite direction and thus hold the tooth firmly in position. As the bucket or excavating member is moved into the earth the resistance offered to the tooth 10 tends to move the same to the right, as viewed in Figure 1, with reference to the member 15, thus tightening the tooth more firmly on the stud 14 by wedging the acute angular portion 10a more firmly between the

surface 14a of the stud and the adjacent surface 15a of the member 15.

The tooth can be removed by first removing the nut 21 by means of a socket wrench, for example, tapping out the wedge 19 and then tapping or sliding the tooth to the left in a direction parallel with the axis of the stud 14.

When the working edge of the tooth has become worn so that its operating efficiency is reduced, the tooth can be removed, inverted, and reversed with reference to the ends and replaced upon the stud 14, thus disposing the opposite end of the tooth in operative position. The change can be made simply, easily and readily, as will be seen. Since the lower surfaces of the working ends of the teeth generally are most subject to wear, the mounting members 15 preferably are reversible or invertible as from the position shown in Figure 1 to the position illustrated in Figure 5. Thus after the teeth have been used until the two surfaces 10b have become worn, the members 15 can be reversed and the teeth positioned so as to place the two surfaces 10c in lowermost position. The provision of reversible supports with the improved reversible teeth, thus makes available the four wear or working surfaces of the latter.

As will be noted, the end portions of the tooth are symmetrical and corresponding parts of each end bear the same angular relation to the aperture 13, and hence ends of the teeth, when positioned in operative relation, are disposed in the same angular position, with reference to the member 15.

In Figures 5, 6, 7 and 8, the tooth 25 is similar to the tooth above described except that the aperture 26 therethrough is shown as cylindrical rather than hexagonal. The aperture may be any desired shape, such as oval, elliptical, etc., thus permitting a selection of shape that will allow the most economical use of metal.

The mounting stud or boss 27 carried by member 28 is also cylindrical in right cross section to correspond with the shape of the aperture 26. Where apertures of other shapes are used, the mounting studs will be shaped to correspond therewith. In this form of the invention the stud 27 is shown disposed on the lower surface of the mounting member 28 rather than on the upper surface, as illustrated in Figure 1. The working ends of the tooth 25 are similar and arranged symmetrically with respect to the aperture 26 as described above with reference to the tooth 10.

As shown in Figure 5, the tooth 25 is held in position by means of a wedge 28a having a threaded extension 29 for nut 30, located in socket 31 formed in member 28. Upon removing the wedge the tooth 25 can be slid in a direction parallel to the axis of the stud 27. The tooth can then be inverted and reversed end to end as above described, and replaced in position with the other end in operative position. Both forms of the tooth thus provide double working surfaces when used with a non-reversible mounting or four working surfaces when employed with reversible mountings such as are shown at 15 and 28 in Figures 1 and 5 respectively, which arrangement prolongs the serviceability of the teeth and which, when of no greater usefulness, can be discarded.

The use of the removable teeth, which take the major portion of the wear of excavating operations, thus saves substantial renewal costs as compared with teeth integral with their mounting means. As illustrated in Figures 5 and 8, the metal at the apex of the angle formed by the convergence of surfaces 25a and 25b is removed to form substantial wedge abutting areas 25c corresponding to the area 23 of the above described modification.

It will also be seen that as the tooth meets resistance in entering the earth or material being excavated, the tendency is for the tooth to move to the right as viewed in Figure 5, and thus wedge the same more firmly against the forward face 27a of the stud 27. This result prevents teeth from loosening on the stud under the heavy stresses to which they are subjected in use and damaging either the teeth or the studs.

In the modification of the invention illustrated in Figures 9 to 12, the teeth 33 are each provided with two similar working points 33a arranged symmetrically with reference to the central cylindrical aperture 33b, the aperture being formed at an angle oblique to the front and rear or top and bottom surfaces of the tooth as in the above described modifications.

The structure shown fragmentarily in Figure 9 may be a portion of a coal cutting mechanism comprising an endless chain formed of connected links 34 having apertures 35 therethrough in which are tooth mounting members 36 which may be held in position by set screws 37. Mounting studs 38 are shown as being integral with the member 36 and are shaped to fit the apertures 33b, in this case cylindrical in cross section. The teeth 33 are held in position against forward displacement by extensions 39 integral with the links 34. By releasing the set screws, the members 36 can be removed from the links and the teeth removed from the studs 38 and reversed and inverted, thus bringing the opposite working edge 33a into operative position. This arrangement also provides for greater serviceability with respect to the teeth which, when no longer serviceable, can be replaced by similar teeth. The teeth of this modification of the invention also to large extent protect the mounting members against wear during the cutting or excavating operations, thus making it necesary to replace the mounting members 36 or members 15 and 28 of the form shown in Figures 1 and 5 respectively, less frequently.

One advantage of the cylindrical form of the teeth shown in Figures 9 to 12 is that they can be made by cutting off sections of tubular or hollow stock, the plane of severance of the tubular material being at the desired angle to the axis of the stock. It is a well known fact that the drawing of metal in hollow shapes with relatively thin walls greatly increases the tensile strength and toughness of the metal. Thus a tooth having a parallelogrammatic shape that can be cut from hollow stock with a single operation is an advantage both as to cost and superior strength and durability of metal.

In each of the modifications of the invention described above it will be seen that the working ends of the teeth are similar and are disposed symmetrically with respect to the mounting apertures, which arrangement enables the teeth to be reversed to place either end in operative position.

The modification shown in Figure 13 differs from that shown in Figures 9 and 10 only in that the mounting stud or boss 40 of Figure 13 projects through the aperture of the tooth 41 sufficiently to accommodate a suitable retainer pin or member 42.

The resistance encountered by the teeth in the excavating operations in the form shown in Figures 1 and 5 is not transmitted to the wedges 19

and 28a respectively but to the mounting members 14 and 27, and the tendency of the imposed stresses is, as above stated, to force the teeth more firmly into seating position on the mounting members.

While I have shown and described certain embodiments of my improvements for the purpose of illustration, I do not wish to be restricted specifically thereto except as so limited by the appended claims.

I claim:

1. An earth working member for excavators comprising a reversible tooth having parallel front and rear surfaces and provided with a centrally obliquely disposed mounting aperture of a size to receive a thrust resisting mounting member, and earth working formation at the ends symmetrically arranged with respect to the axis of said aperture.

2. An earth working member for excavators comprising a reversible tooth having symmetrical earth working formations at opposite ends and provided with an obliquely disposed mounting aperture therebetween of a size to receive a thrust resisting mounting member.

3. An earth working member for excavators comprising a reversible tooth having symmetrical front and rear halves each provided with an earth working formation at the terminal end and an intermediate portion having an obliquely disposed mounting aperture common to the two halves of a size to receive a thrust resisting mounting member.

4. An earth working member for excavators comprising a reversible tooth having symmetrical ends defining earth working terminal portions and provided with an oblique mounting aperture intermediate said ends of a size to receive a thrust resisting mounting member.

5. An earth working member for excavators comprising a reversible tooth having a central oblique mounting recess therethrough and earth working formations reversely disposed at opposite ends of said tooth and symmetrically arranged with respect to the axis of the opening.

6. An earth working member for excavators comprising a reversible tooth parallelogrammatic in vertical longitudinal section and having a central obliquely disposed mounting aperture, and ends constituting similar earth working members symmetrically arranged with respect to the axis of said aperture.

7. An earth working member for excavators comprising a reversible tooth having a central oblique mounting aperture and being parallelogrammatic in central vertical longitudinal section to provide similar diagonally disposed earth working ends arranged symmetrically with respect to said aperture.

8. A structure of the class described comprising a tooth supporting member having a tooth abutting surface provided with a mounting stud projecting angularly from the same, a tooth having a central oblique mounting aperture therethrough for accommodating said stud when in abutting contact with said surface, and a wedge carried by said member and arranged to engage a marginal wall of said aperture for retaining the same against displacement from said stud.

9. A supporting member having a tooth abutting surface, a mounting stud projecting from said surface at an angle thereto, a reversible tooth having symmetrical working ends and opposite plane faces and a central oblique mounting aperture for accommodating said stud when either face of the tooth is in contact with said supporting surface, and means for securing said tooth against displacement from said stud.

10. A structure of the class described comprising a tooth support having forwardly convergent upper and lower surfaces, a tooth carrying stud projecting forwardly from one of said surfaces, a reversible tooth having a central oblique aperture therethrough for accommodating said stud when the tooth is in contact with said surface, said tooth having parallel opposite faces and working ends arranged symmetrically with respect to said aperture, and means for releasably securing said tooth in position on said stud with one face or the other thereof in contact with said surface and one or the other of said working ends disposed in operative position.

11. A structure of the class described comprising a tooth support having forwardly convergent upper and lower surfaces, a tooth carrying stud projecting forwardly from one of said surfaces, a reversible tooth having a central oblique aperture therethrough for accommodating said stud when the tooth is in contact with said surface, said tooth having parallel opposite faces and working ends arranged symmetrically with respect to said aperture, and wedge means for releasably securing said tooth in position on said stud with one face or the other thereof in contact with said surface and one or the other of said working ends disposed in operative position.

12. A structure of the class described comprising a tooth support having forwardly convergent upper and lower surfaces, a tooth carrying stud projecting forwardly from one of said surfaces, an apertured reversible tooth having a central oblique aperture therethrough for accommodating said stud when the tooth is in contact with said surface, said tooth having parallel opposite faces and working ends arranged symmetrically with respect to said aperture, and wedge means operable within the aperture of said stud and the aperture of said tooth for releasably securing said tooth in position on said stud with one face or the other thereof in contact with said surface and one or the other of said working ends disposed in operative position.

13. An earth working member for excavators comprising a reversible tooth having two opposite parallel faces and two parallel end walls each disposed at an angle acute to one of said faces and defining therewith diagonally disposed earth working ends, said tooth having a diagonal mounting aperture intermediate and common to said ends.

14. A structure comprising a tooth supporting member having a tooth abutting surface and a forwardly inclined tooth mounting stud projecting from said surface, a tooth having a face adapted to contact said surface and an oblique aperture for accommodating said stud whereby operating stresses exerted rearwardly of said tooth tend to force the same axially of said stud toward said surface, and releasable means for preventing displacement of said tooth from said stud.

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