July 28, 1931. D. H. YOUNG 1,816,710

REVERSIBLE EXCAVATOR TOOTH WITH SOCKETED TIP

Filed Aug. 24, 1927

Fig. 1.

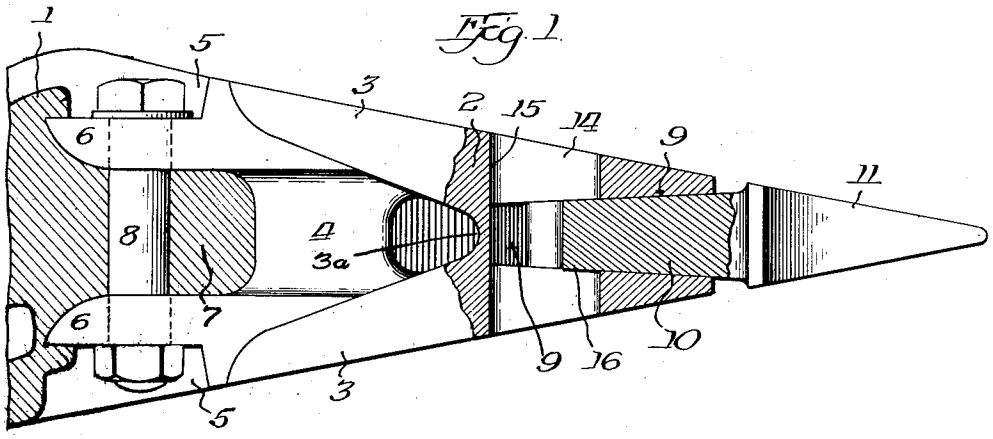
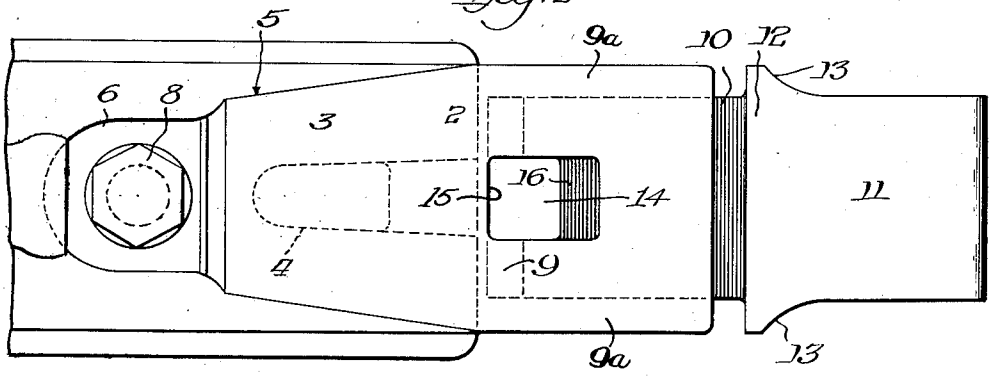


Fig. 2.



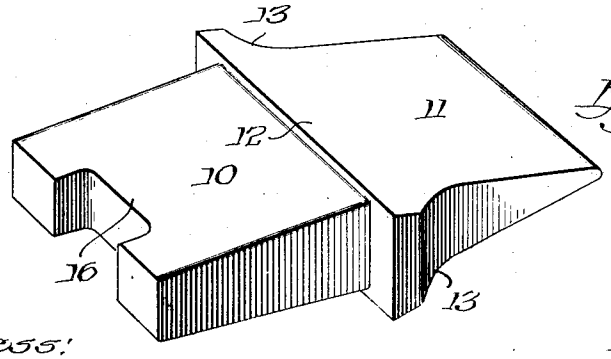


Fig. 3.

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Patented July 28, 1931

1,816,710

UNITED STATES PATENT OFFICE

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REVERSIBLE EXCAVATOR TOOTH WITH SOCKETED TIP

Application filed August 24, 1927. Serial No. 215,064.

This invention relates to teeth for excavating machines, such as dippers, and the like, and particularly to teeth which are subdivided into a plurality of parts in order that those parts, for instance, the tips of the teeth which encounter the more destructive forces in use, may be removed, and either reversed in position, or entirely replaced in order to permit the portion of the tooth involving the greater mass of metal to be continued in service for the full period of its usefulness.

Earlier conceptions of digging teeth for excavating scrapers, buckets, dippers, and the like, included the production of the teeth as separate members replaceably mounted upon the implements, in order that the teeth which wear much more rapidly than the bodies could be replaced and the ineconomy of scrapping the relatively large masses of metal involved in the bodies of the implements thereby avoided; such teeth being made with attaching bases of various designs through means of which to establish firm and substantial mounting of the teeth upon the body of the implement. Later, realizing that the forward or penetrating portions of such teeth were subjected to greater wear than the base portions thereof, the practice grew of making forward portions or points of the removable teeth, separate from the base portions thereof, and with various designs that would facilitate substantial but releasable mounting of such points upon their bases; and this practice likewise growing out of the circumstance of greater wear on one vertically presented face of the tooth point than on the other, resulted in the conception and development of tooth points that were reversible in position in order to prolong the life of the point and reduce the volume of waste metal to be scrapped at the time of replacement. Finally, the art has developed to the point of not only making the point of the tooth replaceable upon the base of the tooth, but making the tip or extreme forward digging portion of the point separate and replaceable, and even reversible, upon the point; but the method of reversibly assembling a reversible tip upon a reversible point corresponded generally with that followed in mounting such a point upon its base and the base did not include inclined upper and lower surfaces which cooperated with similarly inclined surfaces of the point and tip, but, instead, the wedge-shaped tooth included only the upper and lower wear surfaces of the point and tip and the base member only served as supporting means. It might further be premised, that the means employed for mounting the entire tooth upon its base or upon the front of the implement has varied from the principle which involves the use of divergent jaws on the replaceable tooth embracing a tapered lip or nose upon the implement, to the principle of providing a tang or shank upon the replaceable member entering a socket in the implement. But the replaceable tooth body and chisel tip have never been combined in one and the same structure.

The present invention proceeds upon the principle of making in a separately formed replaceably attached and reversibly applied piece, that portion of the tooth which is involved merely with the tip, where the greatest wear occurs and where the wear is in a plane at such an angle as would make it impracticable to allow the wear to extend up into the deeper portion of the point without impairing the function of the tooth, and leaving the remainder of the point to provide the main areas of the diverging or deflecting surface of the tooth where the abrasive forces are more in the direction of the surface and very much slower in developing than is the wear at the tip; the result of thus rendering the tip renewable and reversible being to greatly delay the time when it becomes necessary to scrap the more substantial portion of the upwardly inclined member or point of the tooth, also in making the intermediate portion of the tooth upon which the tip is reversibly mounted, reversible and replaceable in itself upon the body or base of the tooth, so that when a new tooth is supplied, or if several new teeth have been supplied, if it should be found that one of the deflecting surfaces of the

main portion of the point has become worn to such a degree as makes it operate inefficiently with the new tip surface that should align with it, said body or sub-base of the point can be reversed in position and thereby bring into cooperative relation with the deflecting surface of the new tip, a more efficient deflecting surface of the point to the position of less wear or permitting the substitution of a new sub-base portion of the point, or if finally found to be necessary, permitting the replacement of the base member itself.

One object of the present invention is to construct a tooth for excavating implements, which tooth, while as a whole constituting a wedge and comprising a body member constituting the major development of the wedge and a separately formed and replaceable tip member constituting the minor development or penetrating portion of the wedge, will involve a construction which, compared with replaceable tip teeth heretofore made, is simpler, cheaper to produce, particularly in the foundry work which it entails, and by reason of shielding and protecting the means through which the tip member and the body member are assembled one with the other is more durable; a construction which will admit of strong and durable assembly of the tip notwithstanding the bifurcation of the tooth body to adapt it for replaceable attachment to its base; and a construction which is more convenient than replaceable tip tooth points heretofore used, with respect to removal and replacement of the tip upon the body portion of the tooth. To these ends, the present invention proceeds upon the principle of constructing the body of the tooth with a forwardly presented socket to receive the attaching tang of the chisel point, and with spaced jaws through which it embraces and is attached to its own base; said jaws being made to diverge from the inner end of the chisel tip of the socket; said socket, with or without the transverse displacing opening hereinafter referred to, combined with the recess afforded by the crotch or forward end of the space between the divergent jaws opening up the portion of the tooth body which is of greatest mass in a manner to favor heat treatment; and the side walls of the chisel socket with their rearwardly enlarging vertical dimensions constituting essential staying and bracing members for said jaws notwithstanding the close approach of the inner end of the chisel socket to the forward end of the crotch.

Another object is to provide a tooth for excavating implements, which tooth, while having its wedging portion composed of a body member and a replaceable tip member, will have the means for mounting the tip member upon the body member housed wholly within one of the members (preferably the body member) so that no part of the connecting means constitutes an important portion of either of the wedging surfaces of the tooth or is exposed on either of said surfaces, and the portion of the wedge which is contributed by the replaceable tip is so related in transverse dimensions to the portion which is contributed by the body member of the tooth, that the tip will protect the forward end of the body in which the tip connecting means is received, and avoid premature impairment of the latter.

The invention proceeds upon the principle of developing the tip of the point in the form of a chisel with an attaching shank or tang, and designing the forward end of the body of the point, with a socket that receives the tang; the meeting faces of the tang and socket being inclined to the axis of assembly at relativelv low angles in a manner to develop a highly efficient frictional fit that dispenses with the use of bolts and reduces the device to but two parts; the body of the point being preferably provided with a transverse opening which intersects the bore that receives the tang, and admits a drift pin into displacing relation to the tang, so that in addition to being positioned on the body of the pin by merely slipping the point into place, the tip can be just as readily removed by driving a drift pin into the transverse opening; the tip enlarges rearwardly, to-wit, vertically through means of its wedging faces and laterally, from a horizontal transverse dimension that is less than the corresponding dimension of the socketed end of the tooth body, through means of flaring side faces, to a degree which develops in that portion of the tip which is presented to the forward end of the socket, transverse dimensions sufficient to shield walls which define this socket, and thus avoid wearing away of the said walls in advance of the life of the body member as a whole; the vertical tapering of the tip being made to so correspond with the vertical tapering of the body of the point as to produce the effect of an essentially continuous tapering tooth; the lateral flaring of the tip and completion of horizontal transverse dimension into substantial conformity with that of the body of the tooth; protecting the forward end of the socket against impact of solid obstructions; and the body of the point being assembled with its base through means of spaced jaws which diverge from the inner end of the chisel socket or adjacent thereto where the forward end of the crotch of said jaws together with the chisel socket will open up the greater dimension of the tooth body to successful heat treatment, while the vertical lateral walls of the chisel socket exist as

rearwardly enlarging bracing webs for the said divergent jaws.

In the accompanying drawings, in which the preferred embodiment of the invention is shown by way of illustration—

Figure 1 is a side elevation, partly in section, showing a fragment of a tooth base, and a reversible tooth point mounted thereon, the point having socketed therein a chisel tip in accordance with the present invention.

Figure 2 is a plan view of the parts shown in Figure 1; and

Figure 3 is a perspective view of the chisel tip alone.

1 represents a tooth base which may be of any construction known and approved as a means for mounting a point upon an excavating implement. 2 represents a tooth point or sub-base which may follow generally known principles of construction, although having some novelty of design in those portions through means of which it is mounted upon the base 1, but consisting generally in a pair of jaws 3 joined by an anti-spreading web 4, said jaws tapering rearwardly, as shown in Figure 2, entering correspondingly designed recesses 5 in the base 1 and terminating in rearward extensions 6 which embrace the intermediate portion 7 of said base and are secured thereto by means of bolt 8. The forward end of the point 2 is provided with a socket 9 which receives the tang 10 of a chisel pointed tip 11; the socket 9, as well as the tang 10 being tapered vertically to cause the latter to enter the former with a wedging fit. Tip 11 is provided with an enlarged rear end 12 from which the tang 10 projects, enlargement 12 being developed by rearward vertical wedging of the tip and by the flares 13 at the sides of the tip; and this enlargement brings the vertical and horizontal transverse dimensions of the tip 11 into substantial conformity with those of the forward end of the body of the point and particularly the walls of the latter which define the socket 9, with the result that the forward end of the socket is protected against the striking of stones and other obstructions that would tend to deform and seriously attack the end of the socket. As shown in Figure 1, the jaws 3 diverge rearwardly from the crotch or forward end of their opening 3*a* at a point adjacent the inner end of the chisel socket 9, so that the portion of the body which is of greatest transverse dimensions is thoroughly opened up to heat treatment and the best possible development of Austenite depended on to render durable articles of this kind when made of alloy steel such as manganese steel; this opening up to heat treatment being also favored by the vertical opening 14 hereinafter referred to. Also the lateral walls 9*a* of the chisel socket 9 which constitute rearwardly enlarging webs, greatly strengthen and rigidify the jaws 3 in their divergent relation against the weakening effect of the near approach of the crotch 3*a* with the socket 9.

Tooth point 2 has a vertical transverse opening 14 which intersects the socket 9 and admits a drift pin or tapered piece into impingement against the rear end of the tang 10 while the pin is being sustained by the rear wall 15 of the transverse opening (the rear end of the tang being preferably recessed as at 16 to admit a substantial dimension of displacing pin without unduly shortening the length of the tang along its sides), so that the tip with its tang can be displaced from the body of the point, when desired. Opposite faces of the tip 11 and of the tang 10 are symmetrical, so that the tip can be inserted with either of its wedging faces downward. In other words, the tip is reversible so that if its under face wears off to a degree which renders the point inefficient as a substantial continuation to the under inclined face of the body of the tooth, the tip may be driven out in the manner already explained and re-introduced in reverse position, with the result that while the tip may be foreshortened by the wearing away of its face which was previously presented downwardly, it will still remain sharp and have a face which will substantially align with the under face of the body of the point, and the duration of usefulness of the tip will be correspondingly prolonged. If the underside of the body of the point 2 becomes worn to the limit of security of the socket 9, the body of the tooth may be reversed in position upon the base 1, and stresses which are largely vertically downward on the tip 11, will then be sustained by the remaining substantial wall of the socket 9 (now presented vertically downward), and a new tip 11 may be introduced and worn in its two different positions while the said remaining socket wall is running its duration of wear.

As appears above, conventional forms of excavating teeth which have been heretofore developed comprised either a single tooth member which is mounted upon the digging lip of the excavator or a construction in which the tooth is formed of two parts, both of which are replaceable, and either or both of which are reversible; thus the two parts may comprise a base member secured to the digging lip and a sub-base member which forms substantially the major portion of the point of the tooth. In another form of the two-part tooth, the construction has comprised a base member secured to the digging lip which includes a forwardly extending tapered portion forming the major portion of the excavator point, but having secured to its forward end as the second

part, a renewable and reversible tip. However, none of the prior constructions embodied a three-part tooth which has all the advantages of both of the heretofore used forms of a two-part tooth, and in addition is more economical and efficient than any of the previous forms. Thus the provision of a relatively small replaceable and reversible tip portion is an advantage, but it must be associated with a reversible base member or the wedge of the major portion of the tooth would become so worn as to make it impracticable to substitute a new tip without substituting or reversing the base member. In the formerly used two-part constructions of excavating teeth the base member had to be rigidly secured to the digging lip of the dipper and could not be readily and easily removed and reversed. In my construction the main base portion may be rigidly secured to the digging lip and only renewed after long periods of service. The sub-base member is renewable and reversible upon the base member, and the connection is such that changes may be readily made in the field. The tip portion is so associated with the sub-base member that substitution of the tip or the reversing of its position may be readily carried out by merely inserting a drift pin in the opening provided. The use of the tang and socket connection between the tip and the sub-base is more economical than the formation of the tip with diverging jaws corresponding to the connection of the sub-base to the base member.

I claim:

1. A replaceable excavating tooth having a renewable tip; said tooth, as a whole, constituting an approximately uninterrupted wedge comprising a vertically tapered body portion and a correspondingly tapered tip portion; said body portion having a forwardly opening socket, and said tip portion having a rearwardly presented tang fitted in said socket; said body portion also having rearwardly extending spaced jaws through which the tooth is adapted to be mounted upon a base, said jaws diverging from a crotch adjacent the inner end of said socket, said socket and said crotch opening up said body portion to heat treatment, and said socket having vertical lateral walls constituting rearwardly enlarging bracing webs strengthening the divergent jaws at their crotch.

2. A replaceable three part excavating tooth comprising a replaceable base member adapted to be secured to a digging lip and including upper and lower inclined surfaces, a replaceable and reversible sub-base member secured to said base member and including upper and lower inclined surfaces forming extensions of the inclined surfaces of said base member, a replaceable and reversible tip portion secured to said sub-base member and including tapered upper and lower surfaces forming extensions of the inclined surfaces of said sub-base and said base member, said base, sub-base and tip portion constituting an approximately uninterrupted wedge.

3. A replaceable excavating tooth comprising three parts, consisting of a replaceable base member, a replaceable and reversible sub-base member and a replaceable and reversible tip portion, the whole constituting an approximately uninterrupted wedge and comprising a vertically tapered base member and a correspondingly tapered sub-base member and tip portion, said sub-base member having a forwardly opening socket and said tip portion having a rearwardly presented tang fitting in said socket, said sub-base member also having rearwardly extending spaced jaws through which said sub-base is adapted to be mounted upon the replaceable base member.

4. A replaceable excavating tooth having a renewable tip, said tooth as a whole constituting an approximately uninterrupted wedge comprising a vertically tapered body portion and a correspondingly tapered tip portion, said body portion having a forwardly opening socket, and said tip portion having a rearwardly extending tang fitted in said socket, said body portion also having rearwardly extending spaced jaws through which the tooth is adapted to be mounted upon the base, said jaws diverging from a crotch adjacent the inner end of said socket, said socket and said crotch opening up said body portion, said socket having vertical lateral walls constituting rearwardly enlarging bracing webs strengthening the diverging jaws at their crotch, and in which the rearwardly enlarging vertical dimension of the tip reaches its maximum development in substantial conformity to the vertical dimension of the forward end of the body portion and the horizontal transverse dimension of said tip is less than the corresponding dimension of the forward end of the body but has laterally enlarging shoulders adjacent said forward end of the body portion which brings the maximum lateral dimension of the tip in substantial correspondence with said body portion.

Signed at Oakland, Calif., this 12th day of August, 1927.

DONALD H. YOUNG.