Sept. 21, 1954 A. W. DANIELS ET AL 2,689,419

EXCAVATING BUCKET ADAPTER FOR REPLACEABLE TOOTH POINTS

Filed Jan. 12, 1950

3 Sheets-Sheet 1

Fig. 1

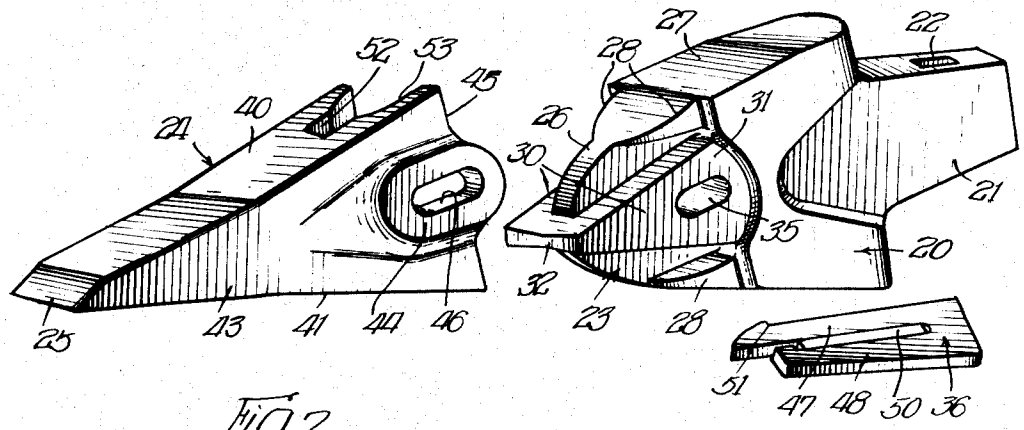


Fig. 7

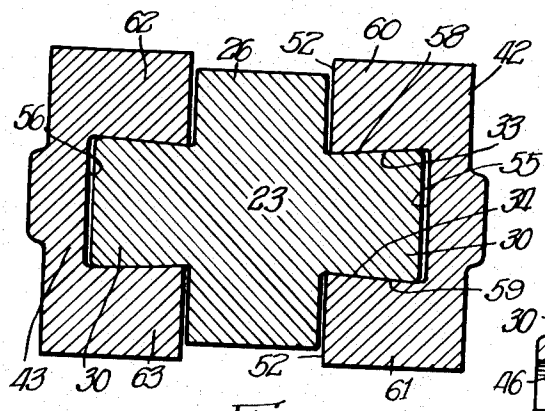


Fig. 9

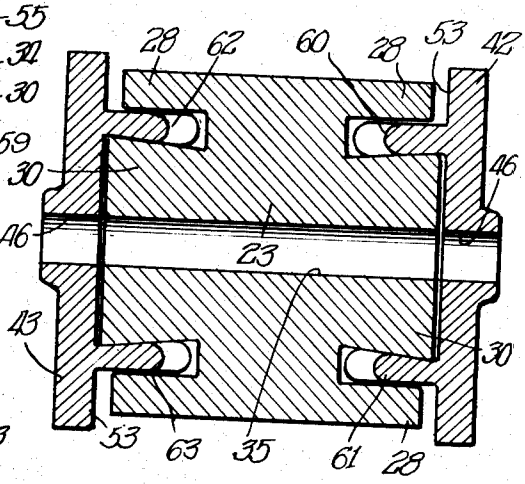
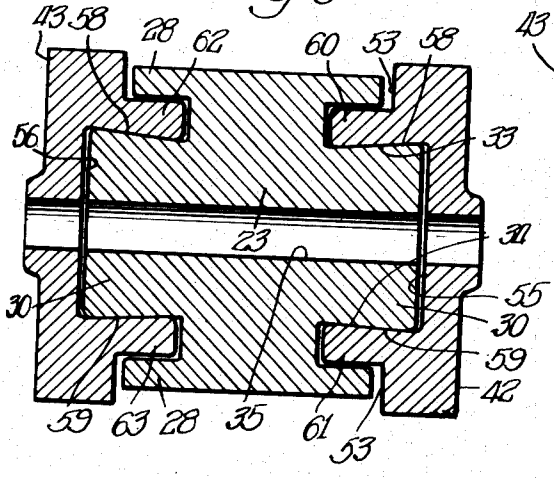


Fig. 8



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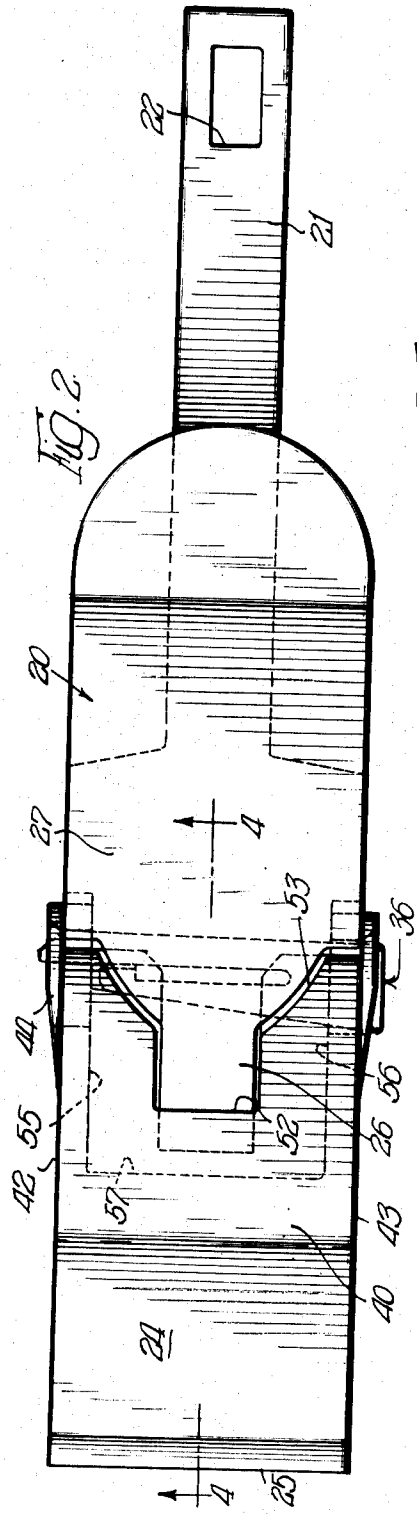


Fig. 2

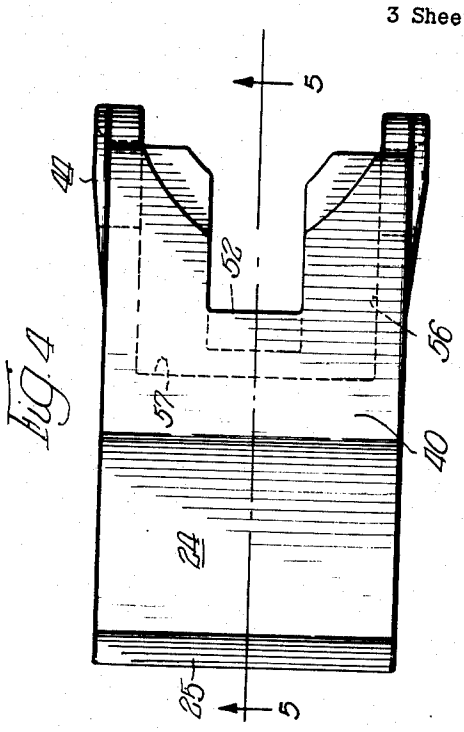


Fig. 4

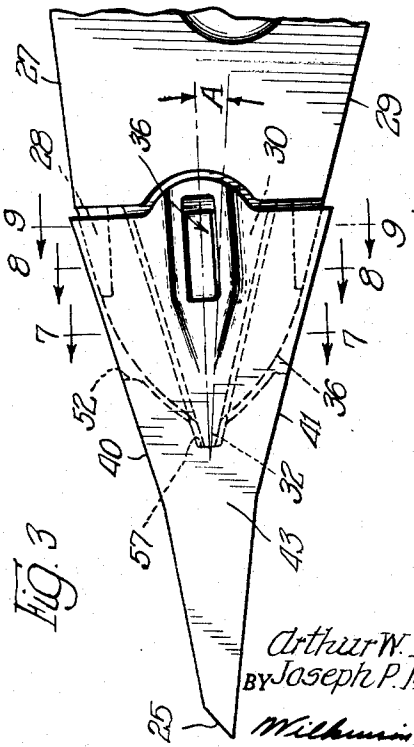


Fig. 3

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Fig. 10

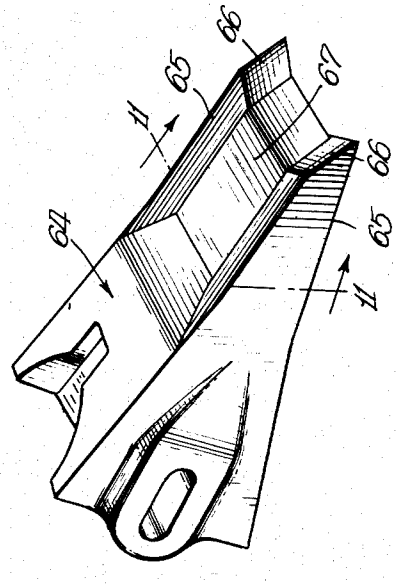


Fig. 11

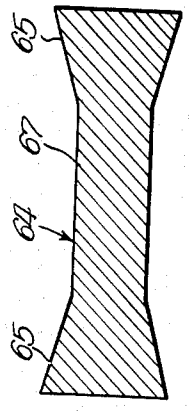


Fig. 5

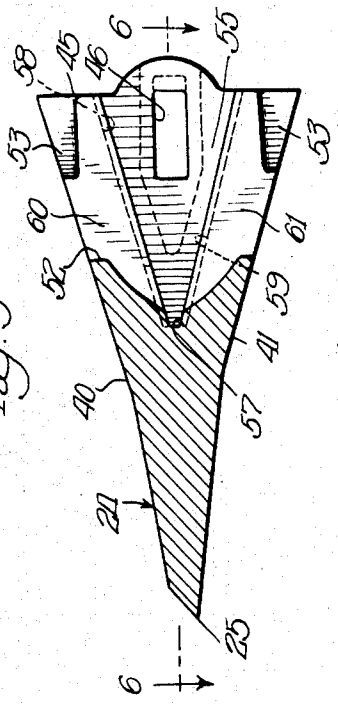
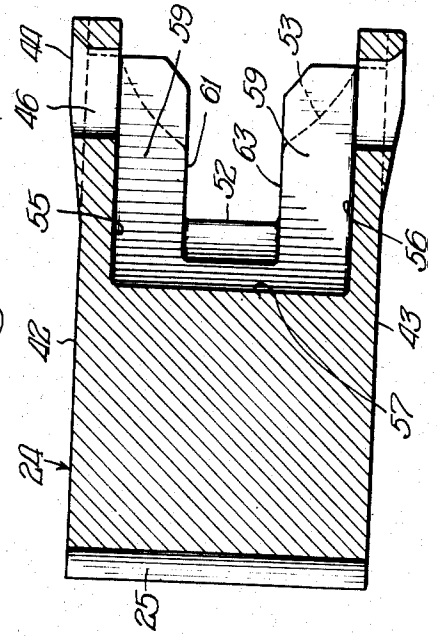


Fig. 6



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Patented Sept. 21, 1954

2,689,419

UNITED STATES PATENT OFFICE

2,689,419

EXCAVATING BUCKET ADAPTER FOR REPLACEABLE TOOTH POINTS

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Application January 12, 1950, Serial No. 138,238

4 Claims. (Cl. 37—142)

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The invention relates to excavating teeth such as are used on the forward digging lip of power shovels, loading buckets, dippers and the like, and has reference in particular to a replaceable point for such teeth of box-like formation for maximum strength and impact resistance and which is reversible on the nose of the adapter to thus extend the useful life of said point.

Many types and designs of two-part teeth for use on excavating implements have been developed over the last several years. More recently the trend has been toward a small, low cost, renewable point combining the features of economy with digging efficiency and which will provide a thin cutting edge for easy penetration into the material to be excavated. From an engineering and design standpoint there are two important features which have militated against arriving at the ultimate in perfection where a replaceable point is desired, the first being the inherent weakness of the nose portion of the adapter which necessarily has to be correspondingly small to accommodate the point, the second being the necessity of using high alloy steels differentially and specially heat treated to provide the hardness necessary and the stiffness required to avoid bending and deformation.

Accordingly, it is an object of the invention to provide a two-part excavating tooth which will be economical to manufacture although durable and rugged in service, and which will essentially consist of an adapter providing a nose portion of novel design and a replaceable point having a cavity of complementary shape for interfitting relation with the nose portion. In the excavating tooth of the invention the weight of the manganese steel employed in the parts is kept to a minimum although adequate metal section is provided of the proper contour and shape to take advantage of all the good qualities of the metal and at the same time strengthen the parts against bending or deformation of any kind.

Another object of the invention is to provide a replacable point for an excavating tooth which is reversible on the nose portion of its adapter and wherein the design of said point and nose portion is such as to locate the greater portion of the metal where it is available for wear and to employ the minimum amount of metal for holding purposes.

Another object resides in the provision of a box-like replaceable point for excavating teeth which will have slotted openings in the top and bottom walls thereof to permit interlocking of all four inside corners of the point with overlapping ribs on the adapter, and wherein an increasingly tight fit of the point on the adapter is obtained as pressure is applied in digging as a result of the tapering fit between the point and the adapter for the full length of the nose portion thereof.

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A further object is to provide a composite excavating tooth wherein the adapter or base member has a nose portion of novel and improved design with the metal being so distributed and proportioned that advantage is taken of the total depth and most of the width of the nose portion at the point of greatest stress and leverage whereby to effectively resist shock loads imposed from all directions.

A further object is to provide a replaceable point for an excavating tooth for interfitting relation with the nose portion of an adapter or base member and which is symmetrical about horizontal and vertical center lines, whereby the metal section at the top and bottom is equal for maximum strength of the point and for protection of the nose portion, and wherein the said point is so shaped and located on the nose portion as to automatically sharpen itself as a result of normal digging operations.

Another object of the invention is to provide a composite tooth characterized by the nose portion of the adapter being disposed at an angle in a downward direction with respect to the longitudinal center line of the composite tooth, whereby the practicability of the self-sharpening feature of the replaceable point is improved, and clearance is maintained at all times on the underside of the tooth to prevent any tendency of the adapter to force the digging point out of the work.

A further object resides in the provision of a replaceable digging point for a composite tooth which will have side edges of greater thickness than the center portion with no flat surfaces top or bottom, and wherein the outside corners are extended beyond the center portion to compensate for the increased wear on the metal at the outside corners. When said outside corners are worn as a result of initial digging operations to provide a straight cutting edge, the entire cutting edge of the replaceable point will be work-hardened under impact to approximately twice its original hardness and the cutting edge will continue to wear sharp for the entire life of the point.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be

more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the invention, and wherein like reference characters are used to designate like parts—

Figure 1 is an exploded view illustrating in perspective the parts of the present composite tooth comprising the adapter, the replaceable digging point and the locking key;

Figure 2 is a top plan view of the composite tooth with the parts in assembled relation;

Figure 3 is a fragmentary side elevational view of the nose portion of the adapter in assembled relation with the replaceable point as shown in Figure 2;

Figure 4 is a top plan view of the replaceable point;

Figure 5 is a vertical sectional view of the replaceable point taken longitudinally along line 5—5 of Figure 4;

Figure 6 is a horizontal sectional view of the replaceable point taken along line 6—6 of Figure 5;

Figure 7 is a vertical, transverse sectional view along line 7—7 of Figure 3 illustrating the interfitting relation of the replaceable point with the nose portion of the adapter;

Figure 8 is a vertical, transverse sectional view taken along line 8—8 of Figure 3;

Figure 9 is a vertical, transverse sectional view taken along line 9—9 of Figure 3;

Figure 10 is a perspective view showing a modified form of replaceable point characterized by edge portions of increased thickness with the outside corners being extended beyond the center portion; and

Figure 11 is a transverse sectional view, somewhat enlarged, taken along line 11—11 of Figure 10.

In the illustrated embodiment of the composite tooth selected for illustrating the present invention the adapter or base portion indicated by numeral 20 is provided with a rearwardly extending tang 21 having a vertical keyway slot or opening 22 of conventional design and construction whereby the adapter may be detachably mounted on the forward digging lip of excavating buckets, shovels, dippers and the like as will be well understood by those skilled in the art. In accordance with the invention the adapter 20 has a nose portion 23 of special shape and which nose portion has interfitting relation with the replaceable digging point 24, it being understood that the parts are assembled by relative longitudinal movement, the nose portion 23 fitting into a cavity located in the rear of the replaceable point. The cavity in said replaceable point is also of special design, having inwardly protruding lugs and recesses whereby the cavity is complementary in shape to that of the nose portion.

As illustrated in Figures 1 and 3, the nose portion is disposed on the adapter 20 at a slight angle in a downward direction with respect to the longitudinal center line of the composite tooth, the angle being indicated by A in Figure 3. The purpose of this construction is to provide clearance on the underside of the cutting point. This is an important feature of the present design of composite tooth since it results in a greatly improved digging point and at the same time it enhances the practicability of the self-sharpening feature of the point. Also the box-like construction of the replaceable point makes it possible to reverse the position of the same on the nose portion so that the cutting edge 25 becomes self-sharpening. With the replaceable point set at the proper angle on the adapter, the edge 25 becomes self-sharpening because a new cutting edge is being established on the top as the lower surface is being worn away. The self-sharpening feature of the cutting point, together with the clearance which is maintained on the underside of the point eliminates any tendency of the base member or adapter to force the digging tip out of the work digging operations.

Referring more particularly to Figures 1, 2 and 3, the nose portion 23 of the adapter is characterized by a web 26 which extends forwardly of the adapter, being nose-shaped in side elevation and disposed centrally on the vertical center line. The web 26 gradually merges into the top and bottom surfaces 27 and 29 of the adapter. However, at these points the web widens out to provide overlapping ribs 28 of arcuate shape as regards their periphery and which taper at their base where they join the adapter to a substantially thin edge at the forward extremity where the ribs merge with the web. Four overlapping ribs 28 are provided, two on each side of the web, one at the top and one at the bottom. It will be understood as the description proceeds that these ribs have overlapping relation with inwardly projecting lugs within the cavity of the replaceable point. The nose portion 23 is further characterized by laterally projecting lugs 30, having location on each side of the web 26, and being centrally positioned with respect to the longitudinal center line of the nose portion. At their base 31, where the lugs join the adapter, they have considerable width and it will be observed that the lugs 30 on each side of the web are similar in shape and that they taper rather abruptly in a direction forwardly of the nose portion. In fact, the lugs extend beyond the forward edge of the nose portion where they join to form the tongue 32. The top and bottom surfaces 33 and 34, respectively, of each lug 30 slope in a direction inwardly toward the web 26. Each lug therefore has its greatest thickness along its outer extremity. In other words, the thickness of the lug at its outer extremity is greater than the thickness of the lug at a comparative point adjacent the web. This constructional feature is perhaps best shown in Figures 7, 8 and 9, and an important advantage thereof is to improve the interfitting relation which the replaceable point has on the nose portion, which becomes increasingly tight as greater digging pressure is applied to the point. The transverse opening 35 provides a keyway for receiving the key 36 by means of which the replaceable point is releasably locked in assembled relation on the nose portion of the adapter.

The replaceable point 24 is of box-like formation, having top and bottom walls 40 and 41 and side walls 42 and 43. Each side wall is provided with a central boss portion 44 projecting laterally on the outside surface thereof and having location so as to extend slightly beyond the rear edge 45 of the replaceable point. The boss-like portion has the effect of thickening each wall at its location and the same is apertured to provide the keyway slot 46. The keyway slots in the side walls 42 and 43 are of course aligned and said slots are likewise located in alignment with the transverse keyway 35 when the parts are assembled. The replaceable point 24 is locked on the nose portion 23 by the tapering key 36. The key is slotted longitudinally to

provide the spaced prongs 47 and 48, there being located between the prongs a resilient insert 50 of rubber or other suitable material to apply tension to the prongs when compressed. Prong 47 at its terminal end is notched as at 51 so that the key 36 upon being inserted through the aligned keyways to its full extent will have locking relation with a side wall of the nose portion as a result of the resilient tension exerted by the prongs of the key. The full taper of the key 36 is applied to prong 48 and the transverse keyway 35 is similarly tapered so that it is impossible for the operator to insert the key in an improper manner.

The cavity in the rear wall of the replaceable point is best illustrated by Figures 1, 5 and 6. As previously explained, said cavity has a shape which is complementary to that of the nose portion. The cavity is characterized by longitudinal slots 52 in the top and bottom walls 40 and 41, the slotted openings receiving the web 26. It will be observed that the entrance to each slotted opening is formed by spaced walls 53, which diverge in a direction toward the rear, each wall being slightly dished to provide an arcuate contour for receiving an overlapping rib 28. This structual feature permits interlocking of all four inside corners of the replaceable point with the overlapping ribs on the adapter. Each side wall within the cavity is recessed as at 55 and 56, each recess extending from the rear wall 45 in a forward direction and terminating in the transverse groove 57. The recesses 55 and 56 taper in a forward direction from the rear wall 45 toward the cutting edge of the point, each recess terminating in the groove 57, which in effect connects the recesses in a manner similar to the connection of the lugs 30 by tongue 32. In fact, the recesses are designed to receive the lugs 30 and accordingly they have a shape complementary to the lugs with the groove 57 receiving the tongue 32. The top and bottom surfaces 58 and 59 of each recess slope in a direction outwardly toward their side walls, and it will be seen from Figures 7, 8 and 9 that the slope is such as to accommodate the lugs 30 to provide a close and tight fit between the coacting surfaces of the respective parts.

The recess formed in each side wall of the replaceable point in combination with the slotted opening in the top and bottom walls produce lugs that protrude inwardly of the cavity. Said lugs extend on each side wall from the rear wall 45 to adjacent the groove 57. The lugs protruding inwardly from the side wall 42 and which form the recess 55 are indicated by numerals 60 and 61, constituting the top and bottom lugs respectively. In a similar manner the lugs protruding inwardly from the side wall 43 and which form the recess 56 have been indicated by numerals 62 and 63, comprising the top and bottom lugs, respectively. In Figures 8 and 9 it will be seen that each lug for a part of its length has a substantially flat and horizontal outer surface although the inside surface of each lug slopes in a direction outwardly toward its side wall. The flat surface of each lug is provided for receiving an overlapping rib 28, the coacting surface of each overlapping rib likewise being flat and substantially horizontal for the purpose.

The modified form of replaceable point generally indicated by numeral 64, as shown in Figures 10 and 11, is characterized by side edges 65 of increased thickness which extend from approximately the center of the point forwardly to the cutting edge. Also the outside corners 66 of the cutting edge have been extended beyond the center section 67. It must be remembered that manganese steel work-hardens under impact and also that the outside corners of the cutting edge wear faster than the central section. This is due to the breakdown of the metal at the outside edges where there is no support and the condition is particularly true as regards manganese steel due to the ductility and surface softness of the metal. It is well known in actual practice that when the outside corners of the cutting edge wear away during initial stages of operation, a tooth results having a blunt, rounded cutting edge that exists for the entire life of the tooth. The purpose of the modified design of point is to provide more wear metal at the points of greatest wear and additionally to make the outside edges of the point, both top and bottom, as well as the forward cutting edge take the initial wear and impact and work-harden to the extent that when the cutting edge is approximately straight across the same will be work-hardened under impact. From there on the point will have a sharp cutting edge which will be straight for its entire width with no rounded corners and which cutting edge will have about twice the hardness of a new point and which will continue to wear sharp for the entire life of the same.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings as various other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. A tooth for excavating implements or the like including an adapter consisting of the conventional base portion and a nose portion of special shape and design for receiving a replaceable point, said nose portion including a forwardly projecting nose-shaped web disposed vertically on the center line of the base portion, an integral lug on each side of the web protruding laterally of the web and tapering in a forward direction from the base portion to beyond the web where the lugs join to form a tongue, said tongue being disposed substantially normal to the web, each lug being disposed centrally of the web and being symmetrical with respect to the longitudinal center line of the nose portion, the top and bottom surfaces of the lugs sloping laterally inward in a direction toward the web whereby said lugs have their greatest vertical dimensions along the outer surface thereof, an integral rib on each side of the web above and below the lugs adapted to have overlapping relation with a portion of said replaceable point when the parts are assembled, said overlapping ribs each having location at the junction of the web with the base portion, each rib projecting laterally to one side of the web and forwardly of the base portion, and said replaceable point having a rear cavity of complementary shape for interfitting with the nose portion, said cavity including a forward recess for receiving the tongue of the nose portion.

2. A tooth for excavating implements and the like as defined by claim 1, wherein said overlapping ribs have a periphery substantially arcuate in contour, and wherein each said rib has its greatest thickness adjacent its connection with the base portion and tapers in a forward direc-

tion to a relatively thin edge at its extreme forward end where the rib merges with the web.

3. A tooth for excavating implements and the like as defined by claim 1, wherein said overlapping ribs have a periphery substantially arcuate in contour, wherein each rib has its greatest thickness adjacent its connection with the base portion and tapers in a forward direction to a relatively thin edge at its extreme forward end where the rib merges with the web, and additionally including a transverse keyway for receiving a key whereby to lock the replaceable point in assembled relation on the nose portion, said transverse keyway including a passage extending through the lugs and the web on the longitudinal center line of the nose portion.

4. A tooth for excavating implements and the like including an adapter consisting of the conventional base portion and a nose portion of special shape and design for receiving a replaceable point, said nose portion including a forwardly projecting nose-shaped web disposed vertically on the center line of the base portion, an integral lug on each side of the web protruding laterally of the same and tapering in a forward direction from the base portion beyond the web where the lugs join to form a tongue, said tongue being disposed substantially normal to the web, each lug having a shape in side elevation simulating a triangle with the base of the same being located adjacent the

base portion and the tongue forming the apex, the top and bottom surfaces of the lugs sloping laterally inward in a direction toward the web whereby the lugs have their greatest vertical dimensions along their outer surface, an integral rib on each side of the web above and below the lug on that side and adapted to have overlapping relation with a portion of said replaceable point when the parts are assembled, said overlapping ribs each occupying the angular space formed by the junction of the web with the base portion, and said ribs each tapering in a forward direction whereby to provide a relatively thin edge at the extreme forward end of the rib where the rib merges with the web.

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