May 1, 1945. H. D. BROWN ET AL 2,375,073

PLOW POINT

Filed Feb. 26, 1944 2 Sheets-Sheet 1

Fig. 1

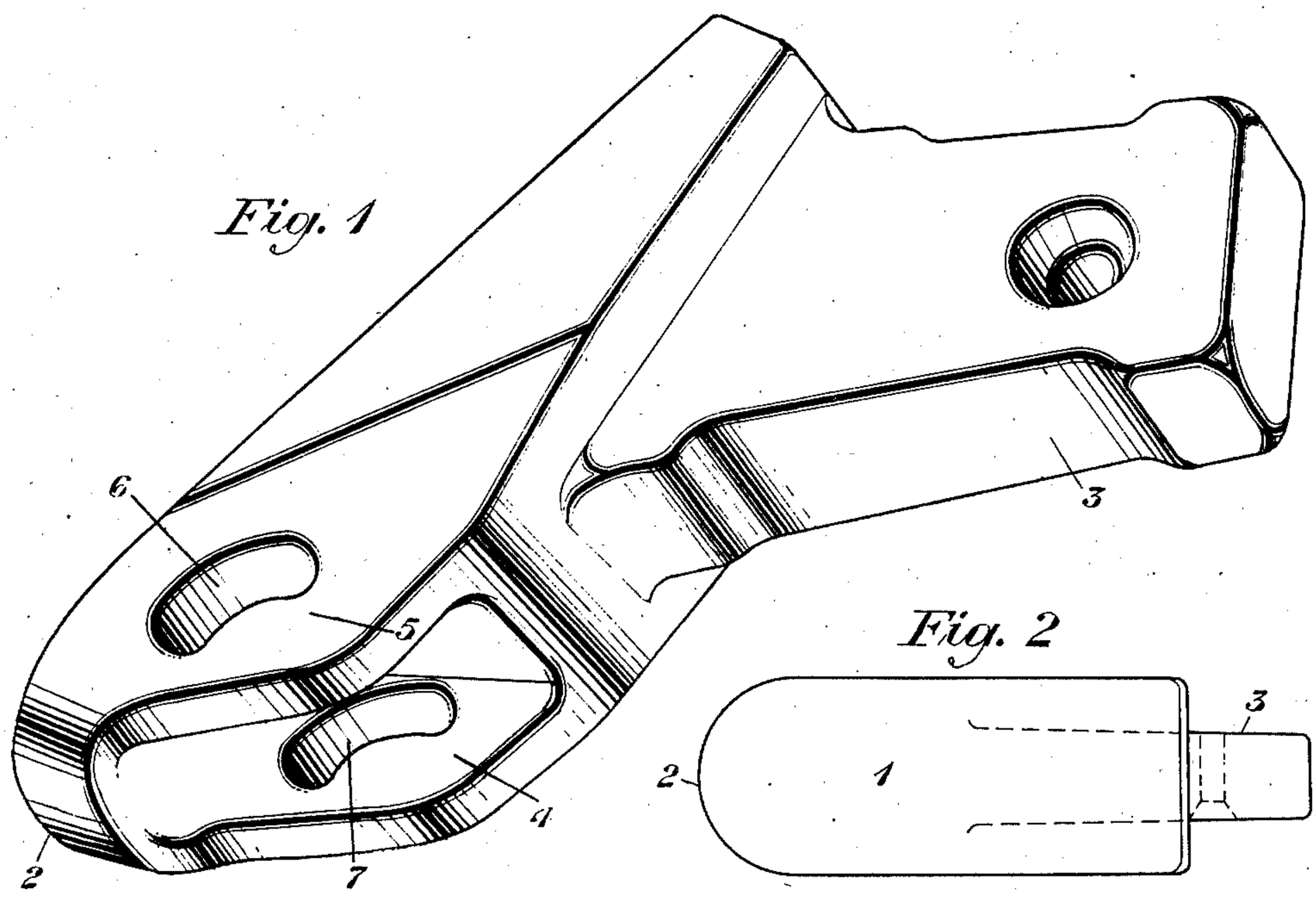
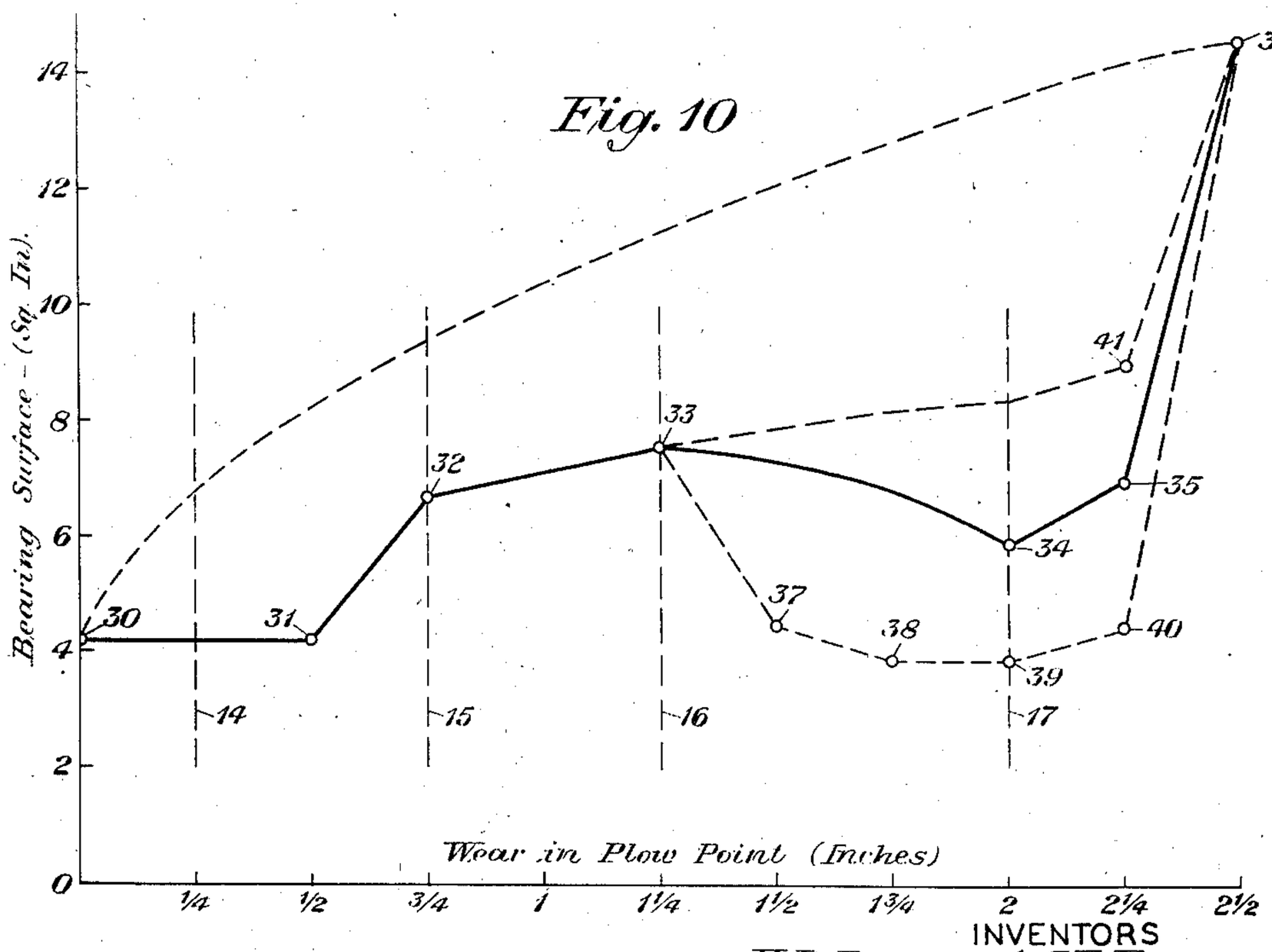


Fig. 2

Fig. 10



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PLOW POINT

Filed Feb. 26, 1944 2 Sheets-Sheet 2

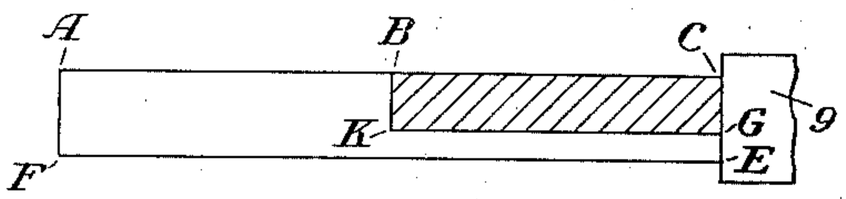
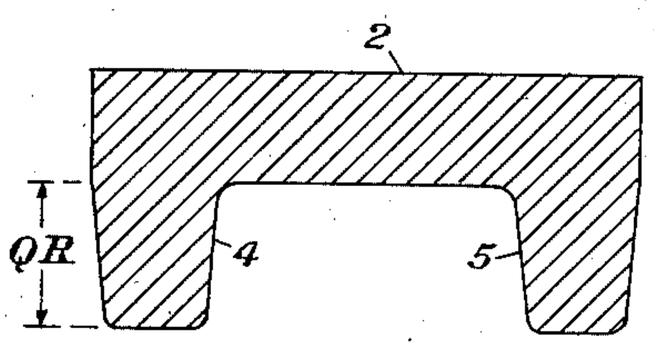


Fig. 3



Cross Section Line 15

Fig. 7

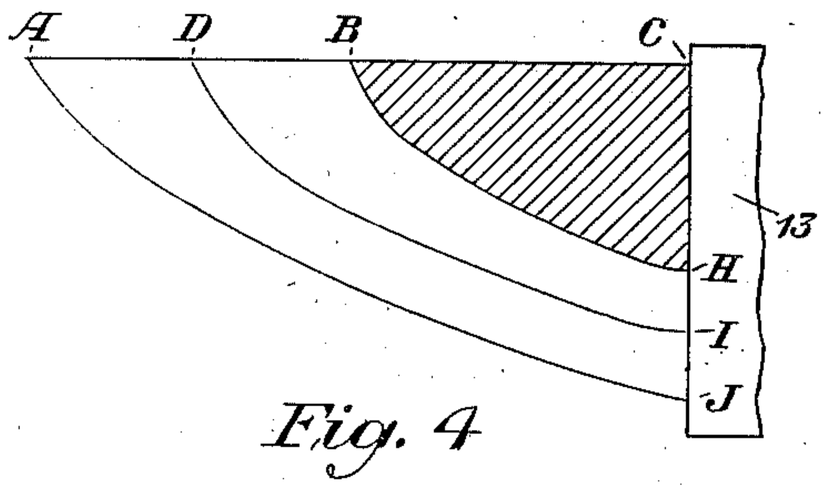
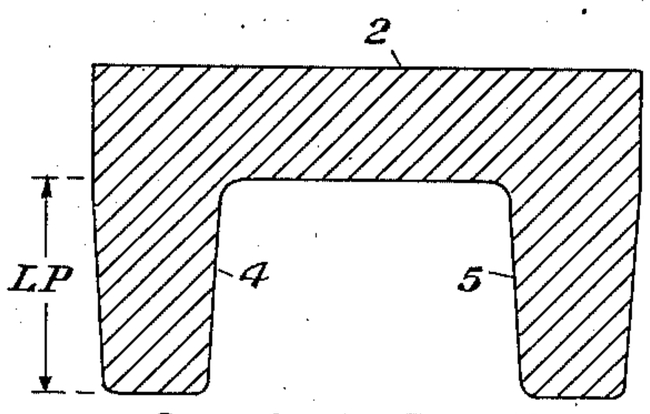


Fig. 4



Cross Section Line 16

Fig. 8

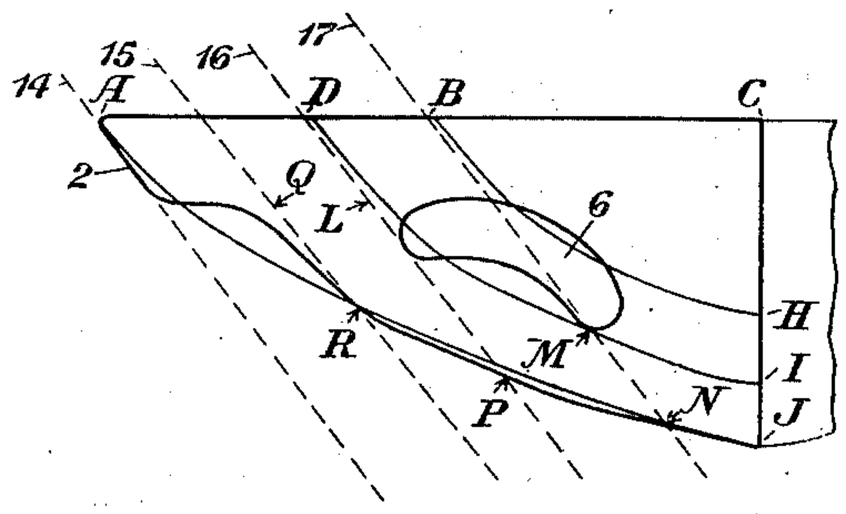
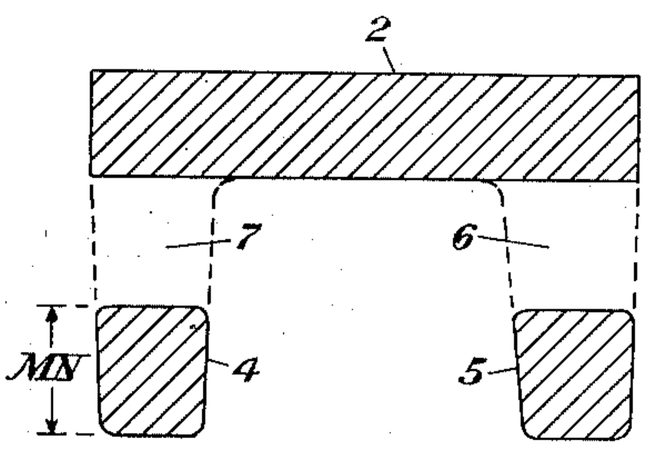


Fig. 5



Cross Section Line 17

Fig. 9

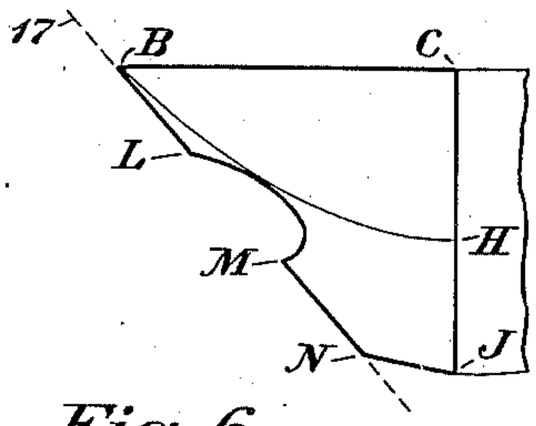


Fig. 6

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Patented May 1, 1945

2,375,073

UNITED STATES PATENT OFFICE

2,375,073

PLOW POINT

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Application February 26, 1944, Serial No. 523,992

6 Claims. (Cl. 262—33)

This invention relates to plows and more particularly to improvements in points to be used in the plowshare assembly of a rooter type plow.

A rooter type plow is one which is used for extremely rough or heavy work, such as tearing up a road bed or making a preliminary plow cut in front of the path of another plow such as one utilized to lay a cable in a communication system. The plow point of the rooter plowshare assembly to perform the rough work required of it must be of heavy strong metal but nevertheless it will be worn away due to the rugged nature of the work involved. The wearing away of the cutting edge of a plow point will ordinarily cause it to become progressively duller and hence require greater power to operate the plow. Accordingly, it would be desirable to maintain the cutting edge of the point as near as possible at its original degree of sharpness. In view of the foregoing, one of the features of the arrangements of the invention is that the point of the plowshare assembly is designed to be self-sharpening while it is being worn away. This is accomplished by making the shape of the point such that while the metal is worn away from the cutting edge the bearing area on the bottom of the point which has a direct relation to the sharpness of the point remains relatively constant throughout the designed service life of the point. Another feature of the invention is that the foregoing constancy of bearing area is achieved without materially reducing the effective strength of the point during the time its cutting edge is being worn away. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawings in the Figures 1 to 10 of which the invention is illustrated. Figure 1 is a view of the plow point of the invention looking at one side thereof and partially underneath it. Fig. 2 is a plan view of the top of the plow point. Figs. 3 and 4 are views of certain types of cantilever beams used in explanation of the theories involved. Figs. 5 and 6 are side views of portions of the plow point of the invention before and after it has been worn away. Figs. 7, 8 and 9 are sectional views of portions of Figs. 5 and 6. Fig. 10 is a curve illustrating the degree of sharpness of the plow point as it is worn away. Similar reference characters have been utilized to denote like parts in all of the figures.

As shown in Figs. 1 and 2, the plow point of the invention comprises a section with a flat top 1 rounded to a point which forms the cutting edge 2. The flat top section is integral with a second section 3 which might be bolted to a plowshare assembly. The underneath portion of the front of the flat top section near the cutting edge is hollowed out as shown. This would result in two side walls 4 and 5. In these side walls are provided two crescent-shaped holes 6 and 7. When the section 3 is bolted to a plowshare assembly the portion of the flat top section near the cutting edge will form a type of cantilever beam.

In Figs. 3 and 4 are shown two types of cantilever beams. The bending or breaking moment on such beams is the load times distance. The resistance moment of the beam depends upon its depth at the fixed support. This resistance moment must be greater than the bending moment in order to prevent failure of the beam. In Fig. 3 the cantilever beam ACEF which is firmly affixed to the member 9 is of uniform depth throughout. If the load on the beam ACEF is moved from point A to point B nearer the fixed support 9, the bending moment on beam ACEF will decrease. Accordingly, a beam such as BCGK shown by a shaded area would support the same load at point B that the beam ACEF would support at point A. In other words, with the load at point B a beam the size of BCGK would have the equivalent strength of the beam ACEF with the load at point A. In Fig. 4 is shown another type of cantilever beam ACJ attached to a fixed support 13. This type of beam is known as a uniform strength beam and its depth increases toward the fixed support. This type of beam will not necessarily break at point C, as is the case with beam ACEF, but will probably shear at the point of load or break at any other point along the beam. In this type of beam the bending or breaking moment decreases as the load is moved toward the fixed support 13. Accordingly, a beam such as BCH shown by a shaded area would support the same load at point B that a beam ACJ would support at point A. In other words, with the load at point B a beam the size of BCH would have the equivalent strength of the beam ACJ with the load at point A. In a like manner with the load at point D a beam the size of DCI would have the equivalent strength of a beam ACJ with the load at point A.

As heretofore pointed out, it is desirable to maintain the cutting edge of the plow point of the invention as near as possible at its original

degree of sharpness. Sharpness may be defined as thinness of edge. As the plow point of the invention is a relatively blunt instrument compared with a knife or razor blade its sharpness may be considered from the standpoint of the area of its cutting edge. As shown in Fig. 1 a portion of the front part of the plow point is hollowed out leaving a cutting edge 2 and two side or supporting walls 4 and 5. The purpose of hollowing out this portion is that the area of a part of the cutting edge 2, namely, that portion between side walls 4 and 5, will remain almost constant or at its original sharpness as the plow point wears away. The purpose of leaving the two side walls 4 and 5 is to provide support for the cutting edge against load and to cause the point to resemble to a certain degree a cantilever beam of the uniform strength type such as is shown in Fig. 4. Accordingly, portions of the front areas of the two side walls must, as the plow point is being worn away, be added to the area of the cutting edge in determining the overall area or sharpness of the plow point at a given time. As the plow point wears away it will be seen that as the side walls increase in depth toward the fixed support the area of portions of the side walls contacting undisturbed earth will slowly increase and cause the plow point to become slightly duller. When the point is sufficiently worn away so that the supporting feature of the side walls is no longer needed the arrangements of the invention provide for a decrease in that area of portions of the side walls which must be added to the area of the cutting edge and hence will cause the plow point to become sharper again. This will appear more fully from the following discussion of Figs. 5 to 9.

In Fig. 5 is shown a side view of the plow point of the invention. The dotted line 14 and the line A—C show the angle of the plow point as it enters the earth. The dotted lines 15, 16 and 17, together with the line A—C, show the shape of the plow point as it progresses through the earth and after its cutting edge has been partially worn away. It will be seen that the bearing area of the plow point at line 14 will only be the length times the width of the cutting edge 2 and hence, at this point the plow point will have the maximum desired degree of sharpness. When the plow point is at the dotted line 14 the cantilever arm formed by the plow point may be compared to the cantilever arm shown by the figure ACJ of Fig. 4. As the plow point progresses through the earth and is worn away, as indicated by dotted line 15, it will become slightly less sharp because to the area of the cutting edge 2 must be added the area of portions of the front of the side walls 4 and 5. Fig. 7 is a cross-section of the plow point as worn away to the dotted line 15. It will be seen that the total area to be considered in determining the sharpness of the plow point at the time it has been worn down to a degree indicated by the dotted line 15 will be the shaded area of the edge 2 plus the shaded area of a part of the front portions of side walls 4 and 5 shown in Fig. 7. This area of portions of the side walls 4 and 5 to be added to the area of the cutting edge 2 would be determined by their width times the length QR on dotted line 15 of Fig. 5. When the plow point has been worn away to a degree indicated by the dotted line 16, the support afforded to the plow point by that portion of the side wall 5 to the left of line 16 will, because of the crescent-shaped hole 6, be gone. However, at this point the remainder of the plow point may now be compared to the cantilever arm shown by the figure DCI of Fig. 4. As heretofore pointed out with respect to Fig. 4, a beam such as DCI will support at point D a load equal to the load which could be supported at point A by the beam ACJ. Accordingly, no need will exist for the extra support afforded by that portion of the side wall 5 to the left of the dotted line 16. At this point, namely, in the condition shown by the dotted line 16, the plow will be somewhat duller than before due to the fact that the area of portions of the side walls to be added to the area of the cutting edge is increased. This condition is shown in Fig. 8 which is a cross-section of the plow point worn away to the dotted line 16. The area of portions of the side walls 4 and 5 now to be added to the area of the cutting edge 2 would be determined by their width times the length LP on dotted line 16 of Fig. 5. However, from this point on, the cutting edge of the plow point will commence to grow sharper. For example, when the plow point has worn away to a degree indicated by the dotted line 17, it will have the shape indicated in Fig. 6. At this point the remainder of the plow point may be compared to the cantilever arm shown by the figure BCH of Fig. 4. Due to the presence of the crescent-shaped holes 6 and 7 the bearing area of certain portions of the front of side walls 4 and 5 will now be eliminated and the area now to be added to the cutting edge diminished. This is because the bearing area of the portions of the side walls 5 and 6 which must be added to the area of the cutting edge is now represented by their width times the distance MN on dotted line 17 of Fig. 5. This area would be less than the area of the side arms 4 and 5 when their length was as indicated as LP on line 16. This condition is illustrated in Fig. 9 which is a cross-section of the plow point at line 17. This will cause the plow point to become sharper again without causing any sacrifice in its strength with respect to its load because as heretofore pointed out a beam such as BCH will support at point B a load equal to the load which may be supported at point A by the beam ACJ.

In Fig. 10 is shown a curve illustrating variations in the sharpness of the plow point of the invention as it is worn away and also the degree to which it is self sharpening. In Fig. 10 the ordinates represent the bearing surface (or sharpness) of the plow point in square inches and the abscissae represent the wearing away of the plow point in inches. The curve represented by the line joining points 30, 31, 32, 33, 34, 35 and 36 represents how the sharpness of the plow point of the invention varies as it is worn away. That portion of the curve between points 30 and 31 shows the degree of sharpness of the plow point at the dotted line 14 of Fig. 5 or when it enters the earth. This is the maximum degree of sharpness of the plow point. When the plow point is worn away to the degree illustrated by dotted line 15 of Fig. 5 its sharpness will be represented by point 32 of the curve. In other words the plow point as heretofore pointed out has become somewhat duller. As the plow point is further worn away it becomes still duller until it is worn down to the degree illustrated by the dotted line 16 of Fig. 5. At this point its sharpness is illustrated by point 33 of the curve. From now on the plow point as it is worn away will become progressively sharper. When it is worn down to the degree shown by dotted line 17 of Figs. 5 and 6 its sharpness will be illustrated by point 34 on the curve. From this

point on the plow point becomes only slightly duller until the end of its designed service life is approached, at which point the curve rapidly rises as shown by that portion of the curve from points **35** to **36**. Because of the shape and positioning of the crescent-shaped holes **6** and **7** it often happens that when the plow point becomes worn away to a degree between the dotted lines **16** to **17** of Fig. 5, or as above shown in Fig. 6, the lower portion of the side walls **4** and **5** below the crescent-shaped openings **6** and **7** will be sheared off by hitting extremely hard ground, a rock or other obstruction. When this happens the sharpness of the plow point will, because of this decrease in the bearing area of the side walls **4** and **5**, be illustrated by the dotted line curve connecting points **33**, **37**, **38**, **39** and **40**. Under such conditions the plow point will be restored practically to its original degree of sharpness.

As pointed out heretofore a portion of the front part of the plow point is hollowed out leaving two side or supporting walls **4** and **5**. This is an important feature of the invention. If this were not done and the point was solid in width with respect to its constantly increasing depth, its sharpness variation as it was being worn away would be represented by the dotted curve at the top of Fig. 10 connecting point **30** directly with point **36**. If the plow point of the invention was hollowed out as shown and the crescent-shaped holes **6** and **7** were omitted, its sharpness variation as it was worn away would be represented by the curve joining points **30**, **31**, **32**, **33** and **41**.

From the foregoing it will be seen that the hollowing out of the plow point of the invention to form a cutting edge and two side or supporting walls has certain advantages. That portion of the cutting edge of the plow point between the two side walls will remain at its original degree of sharpness as the plow point is worn away and hence the point will remain sharper than if it was solid in width with a constantly increasing depth. The two side walls afford strength to the point and cause it to resemble a cantilever beam of the uniform strength type which will not be materially weakened with respect to load as it is worn away. Furthermore by providing the two side walls with the described crescent-shaped holes the plow point of the invention is self sharpening as it is worn away. While the device of the invention has been described as embodied in a certain specific form which is deemed desirable it is understood that it is capable of embodiment in many and other forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A plow point so formed that it resembles a cantilever beam of the uniform strength type with its free end hollowed out to leave a cutting edge and two side or supporting walls which gradually increase in depth in the direction of the beam's fixed support, each of said side walls having an aperture therein.

2. A plow point so formed that it resembles a cantilever beam of the uniform strength type with its free end hollowed out to leave a cutting edge and two side or supporting walls which gradually increase in depth in the direction of the beam's fixed support, each of said side walls having an aperture therein, opposite sides of said apertures being concave and convex, the concave sides being nearer the load side of the beam.

3. A plow point so formed that it resembles a cantilever beam of the uniform strength type with its free end hollowed out to leave a cutting edge and two side or supporting walls which gradually increase in depth in the direction of the beam's fixed support, each of said side walls having an aperture therein, said aperture being so shaped and positioned that after the plow point is worn away so that its bearing area reaches said apertures said bearing area will be gradually reduced and the plow point will become sharper.

4. A plow point so formed that it resembles a cantilever beam of the uniform strength type with its free end hollowed out to leave a cutting edge and two side or supporting walls which gradually increase in depth in the direction of the beam's fixed support whereby as the plow point is first worn away that area of portions of the front of the side walls to be added to the area of the cutting edge of the beam to determine its sharpness will be increased and the beam or plow point will become duller, each of said side walls having an aperture therein, said apertures being so shaped and positioned that after the side walls are worn away to the point where the apertures are positioned the area of portions of the front of the side walls to be added to the area of the cutting edge of the beam will, as the beam is further worn away, be decreased and the beam or plow point will become sharper.

5. A plow point so formed that it resembles a cantilever beam of the uniform strength type with its free end hollowed out to leave a cutting edge and two side or supporting walls which gradually increase in depth in the direction of the beam's fixed support, crescent-shaped apertures in each of said side walls, said apertures being so positioned that when said cutting edge and side walls are worn away to the point where said apertures are positioned and the remaining part of said side walls sheared off by the operation of the plow point the cutting edge will be restored approximately to its original degree of sharpness.

6. A plow point so formed that it resembles a cantilever beam of the uniform strength type with its free end hollowed out to leave a cutting edge and two side or supporting walls which gradually increase in depth in the direction of the beam's fixed support, crescent-shaped apertures in each of said side walls, said apertures being so positioned that the convex sides thereof will be close to the lower part of the cutting edge and the ends thereof will be close to the fixed support of the beam.

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ALBERT EDWARD FREEMAN.