J. L. HILLER.

CUTTER TIP.

APPLICATION FILED DEC. 15, 1919.

1,380,146.

Patented May 31, 1921.

4 SHEETS—SHEET 1.

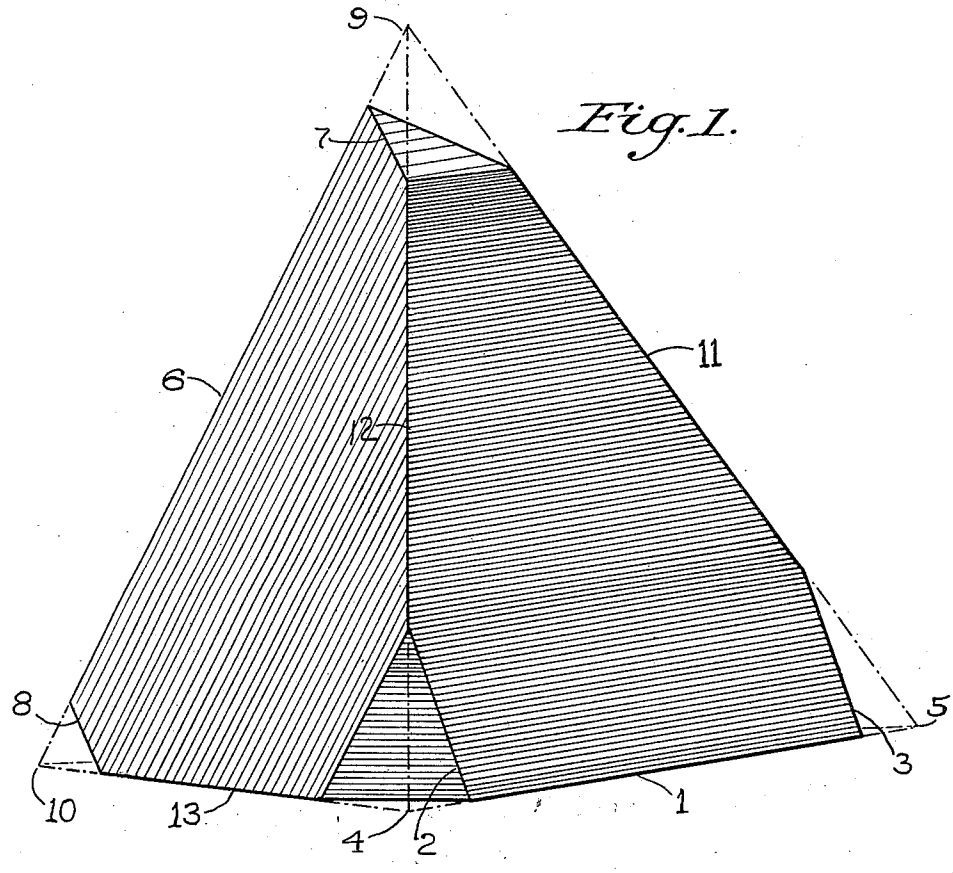


Fig. 1.

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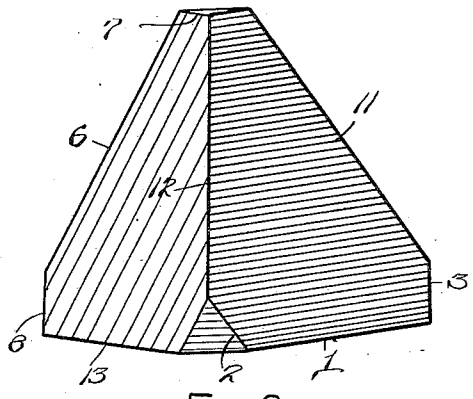


FIG. 2

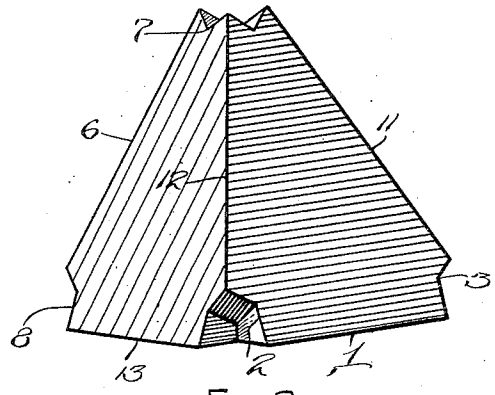


FIG. 3

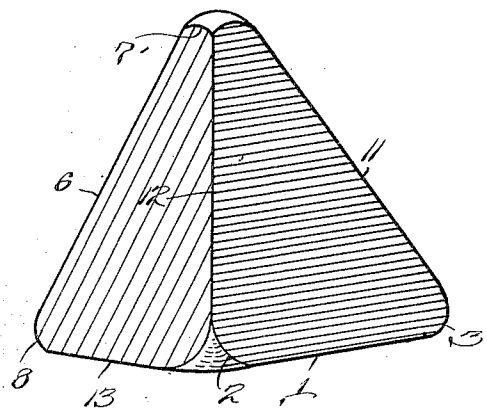


FIG. 4

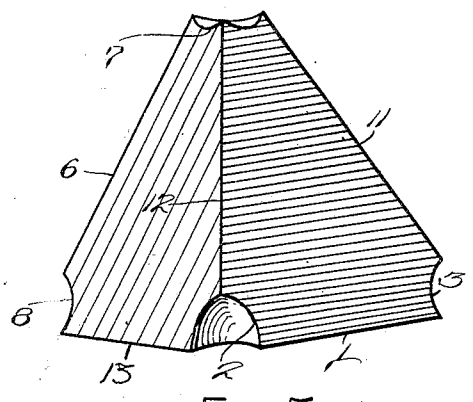


FIG. 5

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4 SHEETS—SHEET 3.

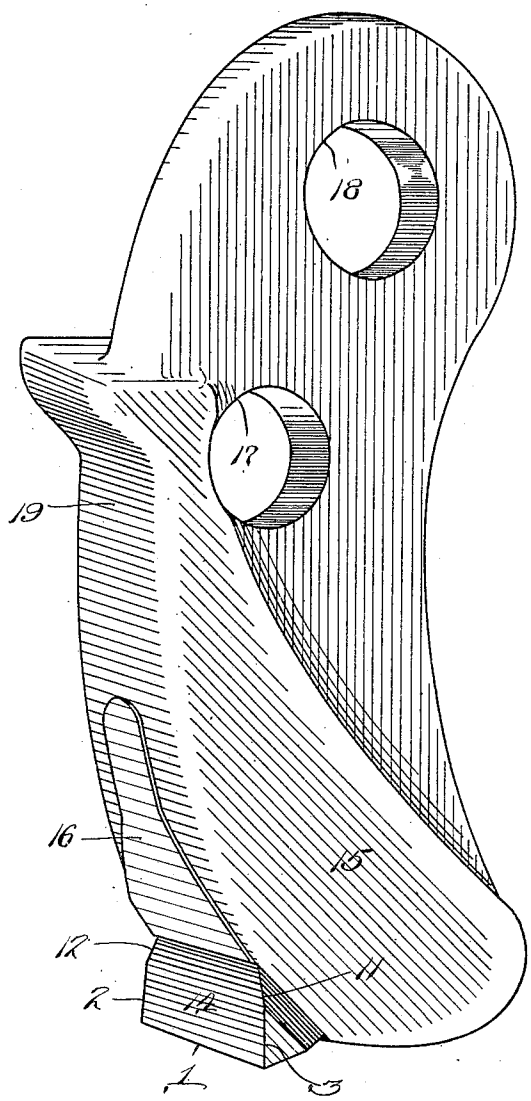


FIG. 6.

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4 SHEETS—SHEET 4.

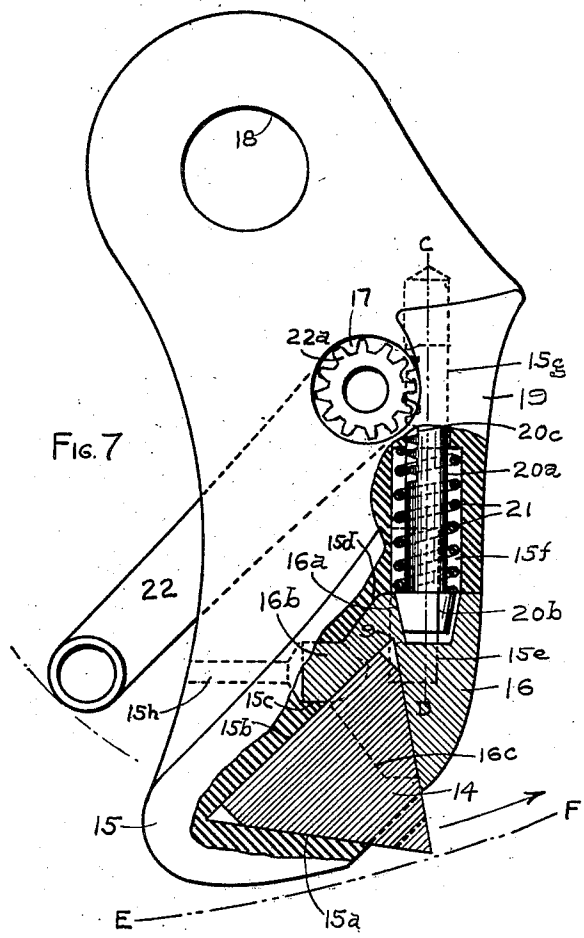


FIG. 7

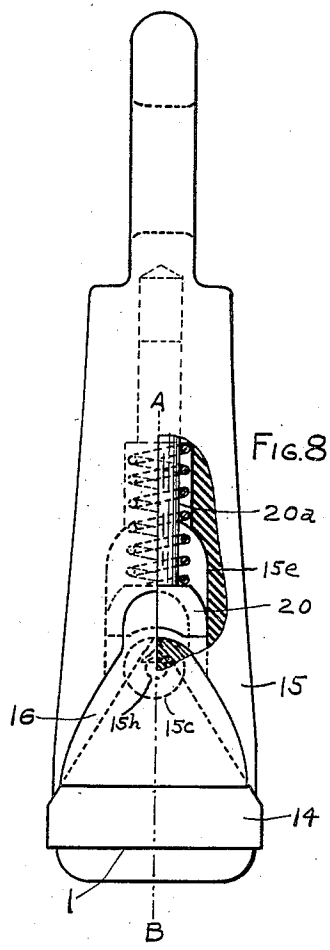


FIG. 8

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UNITED STATES PATENT OFFICE.

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CUTTER-TIP.

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Application filed December 15, 1919. Serial No. 344,904.

To all whom it may concern:

Be it known that I, JOSEPH L. HILLER, a citizen of the United States, residing at Mattapoisett, in the county of Plymouth and State of Massachusetts, have invented certain new and useful Improvements in Cutter-tips, of which the following is a specification.

This invention relates to the tetrahedral form of body adapted for use as detachable cutter tips used with beaters in hammer mills for shredding, crushing, pulverizing and general reduction purposes. These cutter tips are adapted for nicking, shearing, cutting, and modifying matter in general by the various processes known to the mechanical arts, and in their various uses their general tetrahedral form may be modified, locally, to adapt them to any special use in such arts where they may usually be combined with holders adapted to facilitate their peculiar functioning.

The tetrahedral form has properties which render it of value when employed with a cutter tip as it permits of its adjustment in many positions in the holder, each position having the same relative location.

One object of this invention is to provide a cutter tip which shall have a nearly uniform capacity throughout its life by which means the capacity of the machines utilizing this device may be maintained at nearly full capacity and efficiency at all times. Another important object is to facilitate the manufacturing operation in the production of the cutter tips.

Figure 1 is a perspective view of a beater tip according to my invention.

Figs. 2, 3, 4 and 5 are views of modifications of the device, and

Fig. 6 is a perspective view of the beater arm with a tip in position.

Fig. 7 is a side elevation, with an irregular portion removed to show a partial section along line A—B of Fig. 8, of a complete beater with cutter tip in position, with locking means illustrated and showing attached, a releasing key or wrench which is normally not a part of the beater, and is used only at such times as the cutter tip is changed.

Fig. 8 is a front elevation of the complete beater shown in Fig. 7, a small portion on the right of the center line being shown in section as on line C—D of Fig. 7.

The three last described figures show an application of a cutter tip to a beater arm which is adapted to hold the cutter tip in any one of its twelve positions and to facilitate the quick change from one position to another position and to permit the easy removal of one cutter tip and the introduction of another cutter tip.

This invention of cutter tips makes practical the utilization of the great advantages of the efficient regular tetrahedron form of cutter with its extensive cutting edges and affords a convenient shape to facilitate the economical manufacture of such cutter tips.

Reference to Fig. 1 of the drawings will show a cutter tip formed in accordance with my invention as shown in outline by the full lines. Broken lines are used for the purpose of extending the several principal edges of the cutter to the points 4, 5, 9 and 10 of a regular tetrahedron which is the basis of the construction which I claim as new and useful.

In Fig. 1, also in the variations of form shown in Figs. 2, 3, 4 and 5, edges 1, 6, 11, 12 and 13 are examples of what I have termed the principal edges, which are each available for use in the position in which edge 1 is shown in the assembled beater views as illustrated in Figs. 6 and 8.

Adjacent to each of the six principal cutting edges are two marginal cutting edge faces, one on either side of such edge, either of which may be so disposed as to face the front for active work.

When in service the major portion of ten of these marginal cutting edge faces are covered, one is exposed to the work, while the twelfth marginal cutting edge face is behind and protected by the working marginal edge face.

It thus appears that the cutter tip is adapted to be set in the beater arm, or shank, in twelve different positions.

The minor surfaces which determine the minor edges 2, 3, 7 and 8, may serve for clamping the cutter tip in its making, and the loss of the four sharp corners from the basic tetrahedron does not impair its usefulness, for the sharp corners of the full tetrahedron are of relatively small volume and would, therefore, in use, be of short life and of limited value, and their elimination permits the sturdier, wear resisting remaining portions of the cutter tips to be placed nearer one another as arranged in series in a hammer mill and so prove capable of fully sustained service throughout their life,

rather than a service of diminishing capacity which would obtain if full tetrahedral bodies, with their sharp corners, were used.

The corners of a regular tetrahedron may be eliminated by cutting in four planes each being parallel with the side opposite the corner it eliminates, as shown by Fig. 2, by cutting each corner in three planes, each perpendicular to each of the three edges which go to form each of the apexes, as shown by Fig. 3, and in other ways, two of which are shown in Figs. 4 and 5.

The truncated tetrahedral forms shown in Figs. 2, 3, 4 and 5 are perfectly symmetrical so that cutter tips manufactured in accordance with any of these four designs would have the same appearance when inserted in the holder in every one of its twelve different positions. Such an arrangement would be suitable for cutter tips when used in coke crushers hereinafter referred to. The design shown in Fig. 2 is adapted to be machined by cutters designed for producing flat surfaces, while the triangular surfaces on Figs. 4 and 5 would be more readily produced with equipment adapted for making convex and concave surfaces respectively. Again Fig. 4 might be produced in the course of wearing down the sharp corners of a regular tetrahedron in one of the uses hereinafter mentioned. The particular advantage in the design of the cutter tip illustrated as Fig. 3 lies in the uniform length of the edges 1, 6, 11, 12 and 13 which is maintained as these edges are worn back.

The preferred method of securing a form which meets all of the requirements and which possesses attributes superior to other forms resides in constructing the member with two apexes adjacent to one of the edges eliminated in planes perpendicular to said edge, as in Fig. 1 the tetrahedron corners 4 and 5 are eliminated by making the figure bounded by planes perpendicular to edge 1 and forming lines 2 and 3, and again by eliminating the regular tetrahedron corners 9 and 10 by planes perpendicular to edge 6 and thereby determining lines 7 and 8.

In service, those corners of the small triangular surfaces adjacent to the ends of edges 1 and 6 will wear the fastest, and in practical operation the edges 1 and 6 will first be successively utilized and after being worn and the corners adjacent to these edges being most worn, the overall length of the cutter as exposed from the arm, or beater shank, when edges such as 11, 12 and 13 are presented to the work will have been shortened, by the said corner wear, sufficiently to prevent their interference with one another when arranged in series in the mill.

Cutter tips may be made of any suitable material. For ordinary use, in mills, manganese steel, chromium-nickel steel, carbon steel and other alloy steels are well adapted and may be cast, forged, or formed in any suitable manner. Proper heat treatment of steels used is essential to insure the most efficient results.

One of many practical methods of using cutter tips, made in accordance with this invention, is in combination with the shank or arm 15 shown in Figs. 6, 7 and 8 wherein one form of clamping mechanism is illustrated for the purpose of giving a clear and specific mode of use.

Referring to Figs. 7 and 8 it will be observed that the shank 15 is provided, at one end, with an eye 18 adapted for attaching the shank to a hammer mill rotor. The opposite end of the shank is thickened to provide, among other things, for a recess shown by lines 15^a, 15^b, 15^c, 15^d, 15^e, 15^f, and 15^g. The primary function of the recess is for the reception of the cutter tip 14 with a secondary function of providing for clamping means, which consists of the cutter cap 16, the locking plunger 20, and the retaining spring 21.

In the example shown, the cutter cap 16 is provided with a recess which substantially fits over any one of the four apexes of the tetrahedral cutter tips and is provided with a stem, which though not essential, is useful in positioning the cutter cap within the recess of the shank and furnishes a convenient surface on its end against which a drift pin may be applied for disengaging the cutter cap from the shank in case the cutter cap is not easily disengaged. The cutter cap is provided with a notch, one wall of which is marked 16^a against which the plunger 20 may engage for the purpose of clamping the cutter cap and with it the cutter tip in position in the recess provided in the shank 15. The shape of the cutter cap is therefore such as to inclose portions of three sides of the cutter tip and exteriorly to conform substantially to the outline of that portion of the recess in the shank which it engages.

A second hole 17 through the shank affords access to the toothed portion 20^c of the plunger stem 20^a which may be retracted by means of the releasing key, or wrench, 22 which is provided with a toothed end 22^a which may engage the toothed plunger stem 20^a.

When the plunger 20 has been withdrawn from engagement with the cutter cap notch, one wall of which is marked 16^a, the cutter cap 16 together with the cutter tip 14 may be withdrawn from the open side of the recess in the shank 15, whereupon the cutter cap may be lifted from the cutter tip.

The cutter tip may be rotated to present any one of its four apexes uppermost, and the cutter cap may be placed in any one of three positions on such uppermost apex, the

cutter tip and cutter cap may then be replaced in the shank recess. The retaining spring 21 will force the locking plunger head 20 into the cutter cap notch and will, on one side, engage the cutter cap wall 16^a, while the opposite side of the plunger head 20^b engages one side of the slot 15^e of the shank and securely locks the several parts in operating position.

Having described my invention and its utilization in one way which makes use of novel structure as shown in Figs. 6, 7, and 8 I may point out that this application is intended, primarily, to cover the cutter tip and that I reserve for the subject matter of other applications certain disclosures of novel construction herein shown but not claimed, specifically.

The advantages of the regular tetrahedral form for cutter tips in permitting a multiple number, up to twelve, different exposures of like character adapt it to those requirements demanding relatively frequent renewals of faces or edges as experienced in modifying matter, as in coke crushing rolls, metal cutting apparatus and in other departments of the useful arts.

Variations in the contour of the edges of the tetrahedral body, or in the shape of the body near its edges, as to adapt it for producing a formed surface on the matter operated on, or such variations in form as do not make it depart from its general tetrahedral form, or such variations in form as do not prevent interchangeability of position, as in the tetrahedral form, are within the scope of my claims.

What I claim is:

1. A cutter tip, for use with rotary beater shanks, said cutter tip consisting of a suitable piece of material of truncated regular tetrahedral form having two triangular surfaces perpendicular to each of two opposite edges.

2. A cutter tip of suitable material and of truncated tetrahedral form for use with beater shanks in hammer mills.

3. A cutter tip of suitable material for use with a shank to form a rotary beater, said cutter tip being of truncated tetrahedral form having certain of its principal edges longer than certain other principal edges.

4. A removable cutter tip of suitable material adapted to be secured to a holding member to form a rotary beater, said removable cutter tip being of truncated tetrahedral form with one or more triangular surfaces bounded by edges of unequal length.

5. A cutter tip for use with a beater arm, consisting of a suitable piece of material of mainly tetrahedron form having its corners cut away forming plane surfaces thereof perpendicular to an adjacent edge of the main body thereof.

6. A cutter tip adapted for use with rotary beater arms, said cutter tip being of truncated tetrahedral form with its four principal surfaces of similar shape.

7. A rotary beater consisting of a tetrahedral cutter tip, in combination with a shank provided with an eye at one end and a recess adapted for the reception of said cutter tip near the other end thereof, a cutter cap adapted to seat over one apex of said cutter tip, a plunger, adapted to engage a portion of said cutter cap and a surface of said shank, and a spring arranged to normally hold said plunger in engagement with said cutter cap.

8. A rotary beater consisting of a shank, a cutter, and a cutter cap adapted to inclose a portion of said cutter, interchangeably with its inclosure of other portions of said cutter, the said shank being provided with a recess adapted to substantially fit the said cutter and the said cutter cap when in engagement one with the other, and to inclose the major portion of said cutter, and means adapted to retain said cutter cap within said shank recess.

9. A rotary beater consisting of a shank, provided with a recess adapted to the reception of the major portion of a tetrahedral cutter tip a tetrahedral cutter tip of suitable material, and means for normally retaining said cutter tip in coöperation with said shank, with an edge of said cutter tip projecting outside of said shank.

10. A cutter tip of suitable metal said cutter tip being of tetrahedral form.

In testimony whereof I have affixed signature in the presence of two witnesses.

JOSEPH L. HILLER.

Witnesses:
FLORENCE L. HILLER,
HANNAH MARKOWITZ.