Feb. 22, 1927. 1,618,826

J. L. HILLER

SHANK AND CUTTER TIPS FOR PULVERIZERS

Filed July 28, 1919 4 Sheets-Sheet 1

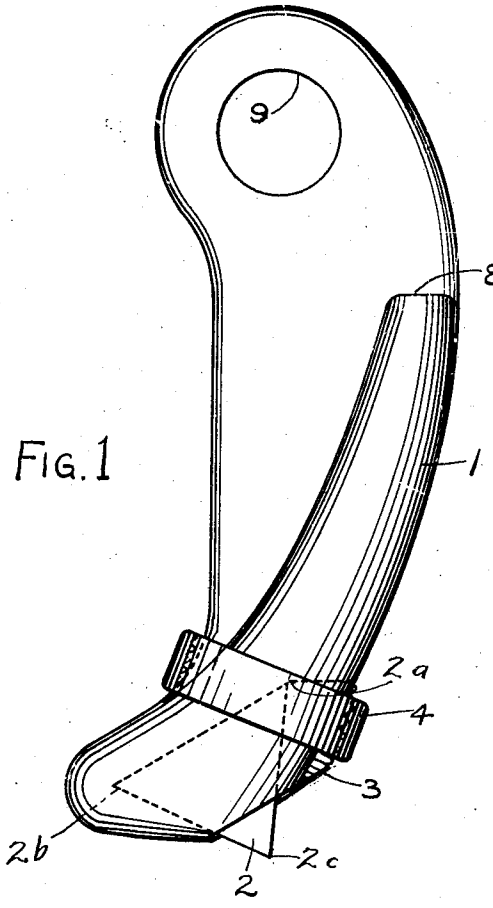


FIG. 1

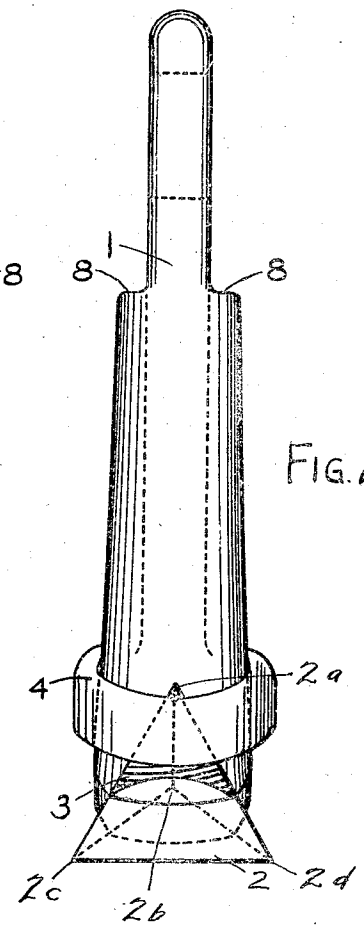


FIG. 2

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SHANK AND CUTTER TIPS FOR PULVERIZERS

Filed July 28, 1919 4 Sheets-Sheet 2

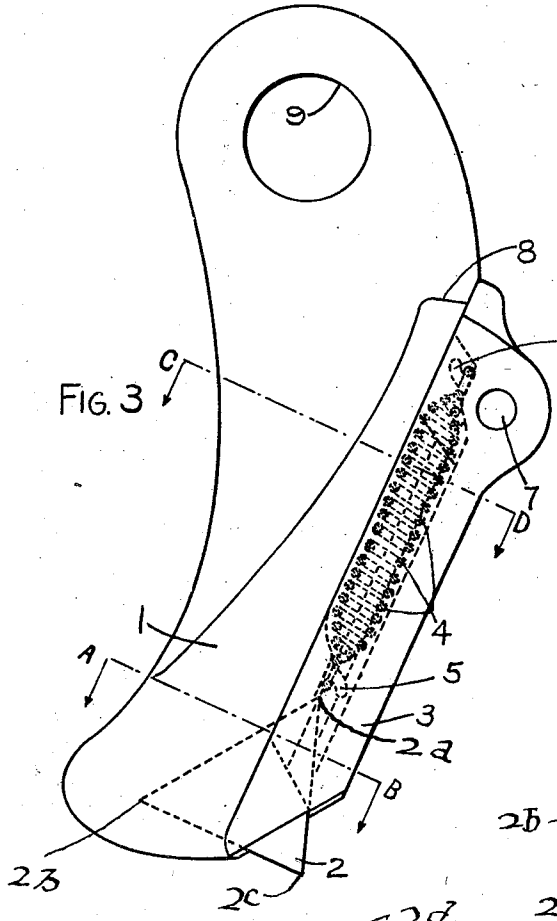


FIG. 3

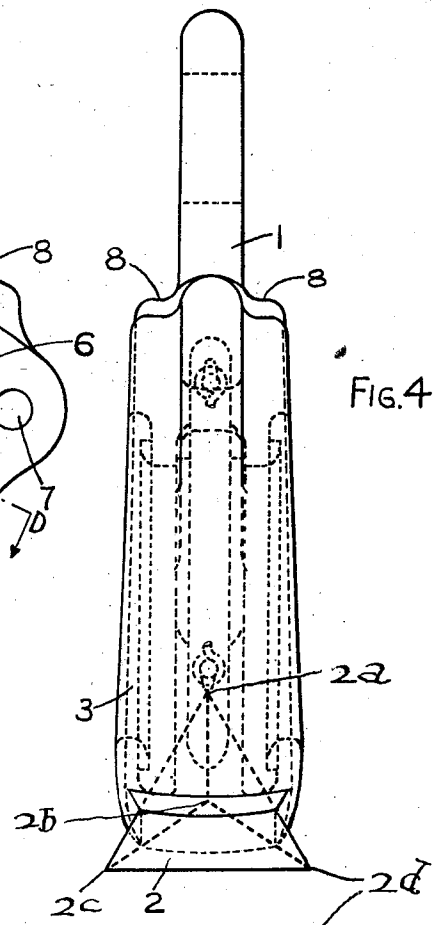


FIG. 4

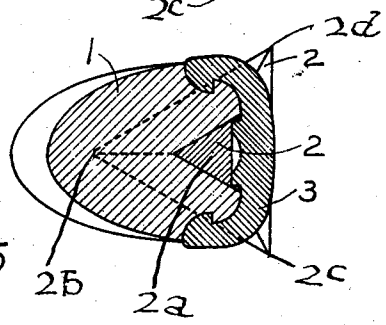


FIG. 5

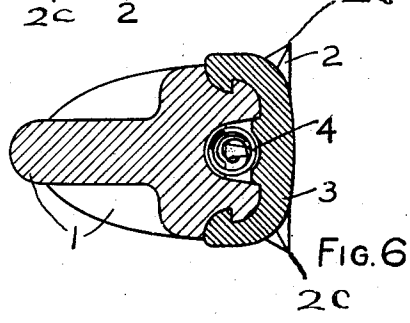


FIG. 6

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SHANK AND CUTTER TIPS FOR PULVERIZERS

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FIG. 7

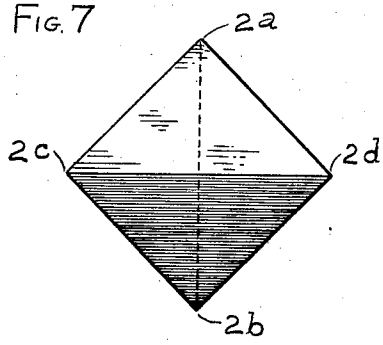
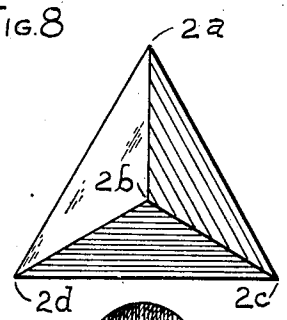


FIG. 8



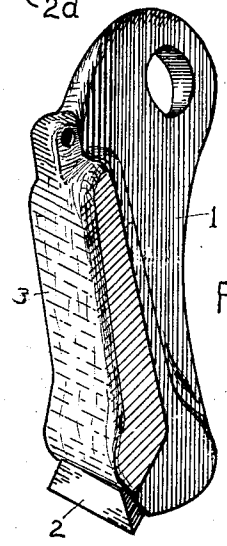


FIG. 10

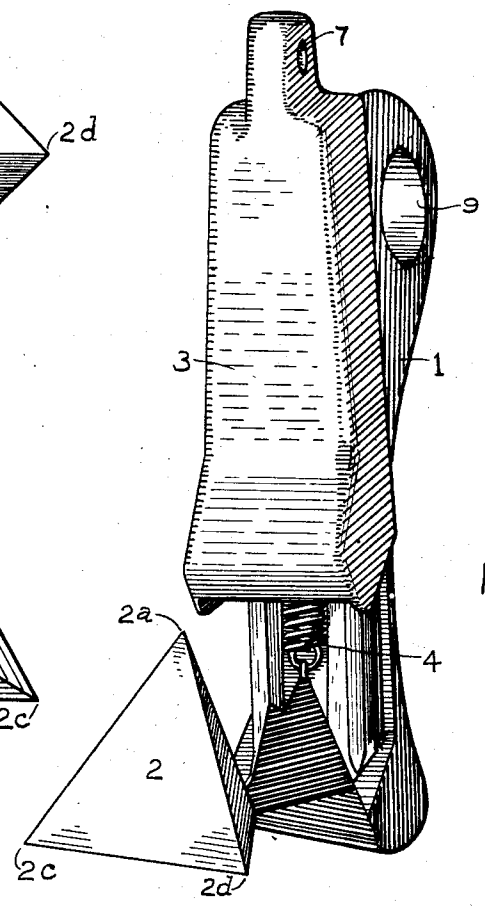


FIG. 9

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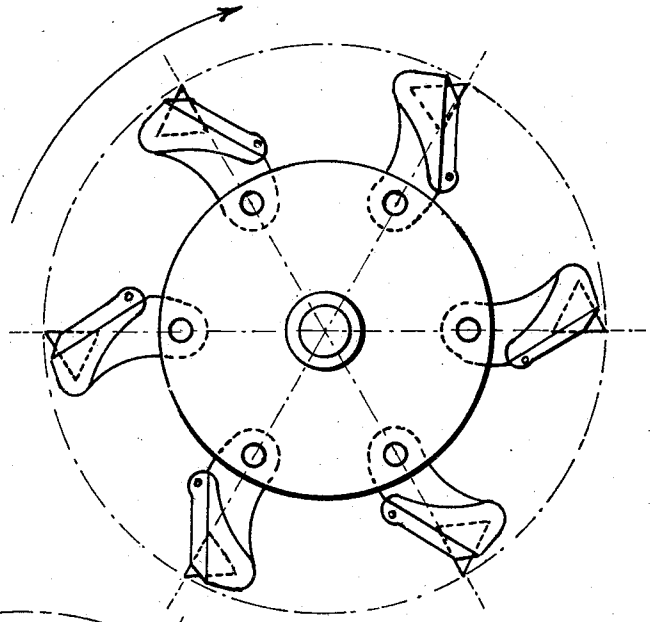
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J. L. HILLER

SHANK AND CUTTER TIPS FOR PULVERIZERS

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FIG. 11



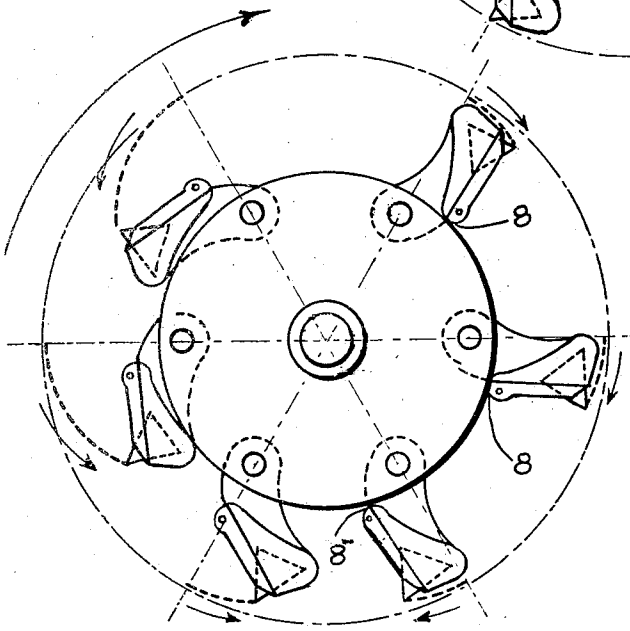


FIG. 12

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Patented Feb. 22, 1927. 1,618,826

UNITED STATES PATENT OFFICE.

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SHANK AND CUTTER TIPS FOR PULVERIZERS.

Application filed July 28, 1919. Serial No. 313,782.

This invention relates to shanks and cutter tips combining to form cutters, beaters or hammers for shredders, pulverizers and crushing machines.

The construction according to the invention herein set forth is applicable to various types of swing hammer crushers, and especially to all pulverizers of the rotary beater type which are employed in fine crushing or pulverizing or in machines the product of which it is desired to maintain of uniform quality or, in operation, requiring sharp cutting or crushing members.

This invention is a distinct improvement in that branch of the art in which Patent No. 1,197,026 was granted to me on September 5, 1916. The relatively light weight of the renewable cutter and the ease of manufacture, within extremely close limits of weight, makes this invention especially favorable for use in connection with balanced rotors.

The object of the invention is to decrease the operating costs of the machines such as may use the shanks and cutter tips herein disclosed. This is done by providing a form of cutting member which is especially efficient because of the acute angle of the cutting edge, because the entire renewable cutting member is of light weight securely held, yet easily changed and because of the extensive effective cutting and crushing edges in proportion to the volume of the cutting member.

The cutter tips consist of the six sturdy edges of a tetrahedron and present twelve face edges each identical and, in a new cutter, any one is equally available for work. Each face edge as it becomes worn may be successively succeeded by one of the other twelve face edges which have not seen service, until all have been utilized.

The cutter tip herein shown is made the subject of a separate application and is specifically claimed in my application, Serial No. 344,904 filed Dec. 15, 1919, entitled Cutter tips.

Coupled with the efficient utilization of the renewable cutter tips is the holding arrangement which provides, for the cutter, a secure mounting which is at once rugged, simple, permits the self-adjustment of the cutter and is quick to operate.

The shape of the cutter is adapted for being perfectly supported and perfectly locked. The solid support of the holder on three sides of the cutting member provides the ideal three point bearing of reliability and the clamping against the fourth side makes a perfectly balanced clamping arrangement.

The cutting member is extremely simple and cheap to manufacture, is adapted to be readily made either as a drop forging as a casting or to be cut from rolled bars, thus combining the possibilities of low manufacturing costs with the utilization of the various metals having those qualities best adapted to make them particularly successful for each particular requirement.

In short, the tetrahedral form of cutter tip, because of the favorable angle of its edges, their great length in proportion to its volume, their universal utility, the perfect security of its seating and clamping, yet permitting its instant introduction to service, its instant change from one edge to another or its instant removal and because of the protection which it affords to the holding members and all coupled with its low cost of production, forces the conclusion that since it functions so ideally in each of so many offices, that it is well adapted to its use in a cutter tip.

An embodiment of the invention is disclosed in the drawings. Fig. 1 shows a view of the combined shank with cutter tips, wedge and clamping ring as it appears in a plane parallel with the rotation of the beater.

Fig. 2 is a front view of Fig. 1 and shows the surfaces which are presented to the work.

Fig. 3 is also a view of the invention shown in the plane of rotation. The cutter clamping wedge is here shown of a form to protect the beater shank from wear.

Fig. 4 is a front view of the working face of this beater.

Fig. 5 is a sectional view taken on line A—B shown in Fig. 3.

In Fig. 6, which is a sectional view taken on line C—D of Fig. 3, the holding member is shown in transverse section, it is attached to shank 1 by means of the hook 5 and is connected to the slide 3 by means of the hook 6, the looped ends of the spring passing over the hooks.

Fig. 7 illustrates a view of the cutter tip

looking perpendicular to two of its equal edges.

Fig. 8 illustrates another view of the cutter tip, looking at same in a line perpendicular to one of its four equilateral triangular faces, said face being obscured by the three oblique faces in the foreground.

Fig. 9 illustrates in perspective a shank 1, a clamping member 3 and a spring 4 all being assembled and a cutter tip 2 disengaged from the shank recess where normally it is seated.

Fig. 10 illustrates a completely assembled beater, in perspective.

Fig. 11 represents the application of the invention to a crushing machine rotor with the several shanks and cutter tips arranged in their normal operating position.

Fig. 12 is an end view of the rotor shown in Fig. 11, except that the rotor is assumed to be at rest, and is intended to illustrate the effect of the shoulders 8 upon the axial rotation of the shank permitting greater deflection, from its normal radial operating position, in one direction than in the other. This construction allows the device when in service to yield freely to pass uncrushable material while, by restraining axial rotation in the other direction, a more nearly balanced condition of the rotor is attained, while the rotor is at rest. This condition is an advantage in starting the rotor from its position of rest.

In clamping the cutting member 2 into the recess of the holder or shank 1, a very simple wedge 3 shown in Figs. 1 and 2, is used which is held in position by the screw clamping ring 4. It will be noted that centrifugal force in acting upon the wedge 3 which bears against the cutter 2 in the plane 2^a—2^c—2^d and the clamping ring 4 will tend to tighten the grip upon the cutting member 2.

It will be understood by those conversant with the operation of fine crushing, swing hammer pulverizers that practically all the wear of the beater takes place close to the edge which is radially farthest distant from the pivot point of the beater, from which it will be clear that the exposed edges of the cutter are sufficient for the work but that in time there may be an appreciable reduction in size of the lower end of the forward side of the shank or beater, shown as wedge 3, and especially along the edge which touches the exposed surface 2^a—2^c—2^d of cutting tip 2.

The wedge block 3 of Figs. 3, 4, 5 and 6 is wide enough to protect from wear the shank 1 and may be cheaply renewed if required. Centrifugal force will normally hold the wedge block in position to clamp the cutter and will automatically take up any looseness which may develop during operation. As an additional precaution however, there is provided a spring, shown in Figs. 3, 4 and 6, and marked 4, (in Fig. 3 it is shown in dotted section, in Fig. 4 the ends, only, are shown, the body portion being omitted to avoid confusion.

To remove the renewable cutter either for a change to a new cutting edge or to replace with a new member it is only necessary to slide the wedge block 3 free of the cutter when the latter may be easily removed.

The hole 7, in wedge block 3, is provided for receiving a hook, which is temporarily used in connection with changing the cutter, and which is secured at its other end in such relation to the hole 9 that when the shank is swung by hand on its pivot in said hole 9 the slide retracts and exposes the cutter for withdrawal.

Having described the invention as to its construction affecting its use in the operation of crushing and other reduction, I will set forth a novel functioning of this particular beater as affecting the general efficiency of the machine with which it is employed. This further novel construction resides in the shoulders 8 which are so disposed in relation to the pivot eye 9 that when the beater is mounted between the rotor supporting discs the beater is permitted to swing in one direction between the said discs, much as the blade of a jack knife closes between the sides of its handle, but which shoulders prevent the beater from swinging in the other direction by contacting with the rotor discs on either side of the beater, and thus holding the beater in an approximately radial position, with reference to the rotor. This simple arrangement overcomes an annoying difficulty experienced in starting swing hammer reducing machines, especially those which are driven by alternating current motors which have a low starting torque. The difficulty in starting the normal rotor is occasioned by the seriously unbalanced condition of the rotor employing the usual style of beater which hangs downward, on both sides of the shaft, until sufficient speed is attained to hold the beater radial by centrifugal action. In machines using the beaters made in accordance with this invention certain of the beaters on the down running side of the rotor will be held, by the shoulders, in approximately radial position and thereby will make the rotor easier to start than if they hung downward causing a lower center of gravity in the rotor.

Another feature of some importance, because of its power saving feature, is the design of the beater with the cutting or beating edge farthest from the center of rotation with the following and supporting portion of the beater clearing the material in the machine and, therefore, materially reducing the frictional resistance of the rotor as compared with normal beaters and the reversible types.

The light weight of the renawable cutter tips insures negligible variations in weight of these tips when manufactured by standard low cost methods so that when used on rotors which are originally equipped with balanced members a balanced condition is maintained without the expensive rebalancing of beaters which the heavier designs require.

Having described the characteristic features of this invention in which the details may be varied without departing from the spirit of the novel and important advances which are shown in the art, by the disclosures here made, I claim:

1. In a pulverizer cutter the combination of a shank, a tetrahedral tip and means for locking said tip with relation to said shank.

2. In a pulverizer cutter the combination of a holder shank, a tetrahedral tip and a wedge member to clamp said tip in relation to said shank.

3. In a pulverizer beater the combination of a shank having a recess in one end adapted to receive and support three sides of a tetrahedron, a tip of tetrahedral form having a portion thereof located in said recess, a clamp for said tip slidable with relation to said shank and tip, and means adapted to hold said clamp against said tip for the purpose of securing said tip in relation to said shank.

4. In a rotary beater adapted for use in a pulverizer, the combination of a tip receiving shank, a solid renewable tip having four sides and means for clamping said solid tip against said receiving shank.

5. In a rotary beater, a four-sided tip, a shank adapted to receive in attachment thereto said tip and a third member, said shank and said tip being adapted to be clamped together by the third member which in conjunction with said shank is adapted to support said tip on its four sides.

6. A pulverizer cutter consisting of a shank, a regular four sided detachable cutter tip and means for attaching said four sided member to said shank.

7. A rotary beater, adapted for use in a pulverizer, consisting of a shank, a tetrahedral cutter tip, a wedge member and a ring for securing said wedge member in contact with said cutter tip and thereby clamping all of the said members together.

8. A rotary beater, adapted for use in a pulverizing machine, consisting of a shank, a cutter tip of tetrahedral form, a wedge member and clamping means for clamping said members together.

9. A rotary beater, adapted for use in a pulverizer, consisting of a shank, a cutter tip, a wedge member provided with screw threads and a nut for engagement with said screw threads.

10. In a beater, adapted for use in a hammer pulverizer, a shank, a removable cutter tip, a sliding member and a holding member all adapted to so co-operate as to clamp the cutter tip in position for effective operation.

11. In a beater, adapted for use in a hinged hammer crushing machine the combination of a crushing member in the form of a tetrahedron, a shank having a recess adapted to receive and support three sides of said crushing member, a movable member adapted to hold said crushing member in contact with said shank on the said three sides.

12. In a beater, adapted for use in a crusher rotor, a member adapted for hinged connection to said crusher rotor and providing a plurality of surfaces adapted to support a removable crushing member, a removable crushing member of tetrahedral form, and means for securing said crushing member to said member adapted for hinged connection.

13. A cutter, adapted for use in a shredding machine, consisting of a shank, a crushing member of tetrahedral form, a slide adapted for engagement with said shank and suitable for assisting in holding said crushing member of tetrahedral form in position for shredding.

14. In a beater the combination of a holder having a recess near one end thereof adapted for the reception of the major portion of a tip, and a tip the major portion of which is adapted to engage said recess, and another portion thereof being adapted to project outside of said recess, the said portion which is adapted to project outside of said recess being of greater width than the adjacent supporting portion of said holder and thus adapted to protect from wear the said supporting portion of said holder.

15. A rotary beater, for use in reducing machines, including a tetrahedral member and means for connecting same in operable combination with the rotor of said reducing machine.

16. In a beater, for use in reducing machines, the combination of a shank, a wearing member separable from said shank, a slide adapted for clamping said wearing member, said slide being further adapted to operate in clamping and unclamping said wearing member in the plane described by the rotation of said shank about its pivot mounting.

17. In a beater, for use in reducing machines, the combination of a beater having a pivoted end for attachment to the rotor of said reducing machine, and an end with a wearing member therein, a slide adapted to clamp said wearing member in operable position, said slide being adapted to receive a spring connection, and a spring for holding said slide in clamping position, said slide

being also adapted to withdraw from its clamping position in a plane described by the swinging of the beater about its pivoted end.

18. A beater adapted for pivotal support in swing hammer mill rotors with its principal plane perpendicular to its pivotal axis and provided with a shoulder adapted to act as a stop in pivotal rotation of said beater, when mounted in said swing hammer mill rotor, said beater being adapted to axially rotate, from its normal operating position, to a greater extent in one direction than in the opposite direction.

19. In a rotary beater, for use in reducing machines, the combination of a shank, a wearing member, and a clamping member tetrahedral form in the form of a slide, said slide presenting a greater width in a plane perpendicular to the plane of rotation, than is presented by said shank.

20. In a rotary beater, for use in crushing machines, the combination of a shank, a wearing member and a clamping member, said clamping member being adapted to present a greater width in a plane perpendicular to the plane of rotation of said shank than is presented by said shank adjacent to said clamping member and said clamping member thereby being adapted in use to protect said shank from wear.

In testimony whereof I have affixed my signature.

JOSEPH L. HILLER.