March 28, 1939. F. E. SMITH 2,152,332

HAMMER FOR IMPACT PULVERIZERS

Filed March 11, 1937 2 Sheets-Sheet 1

Fig. 1

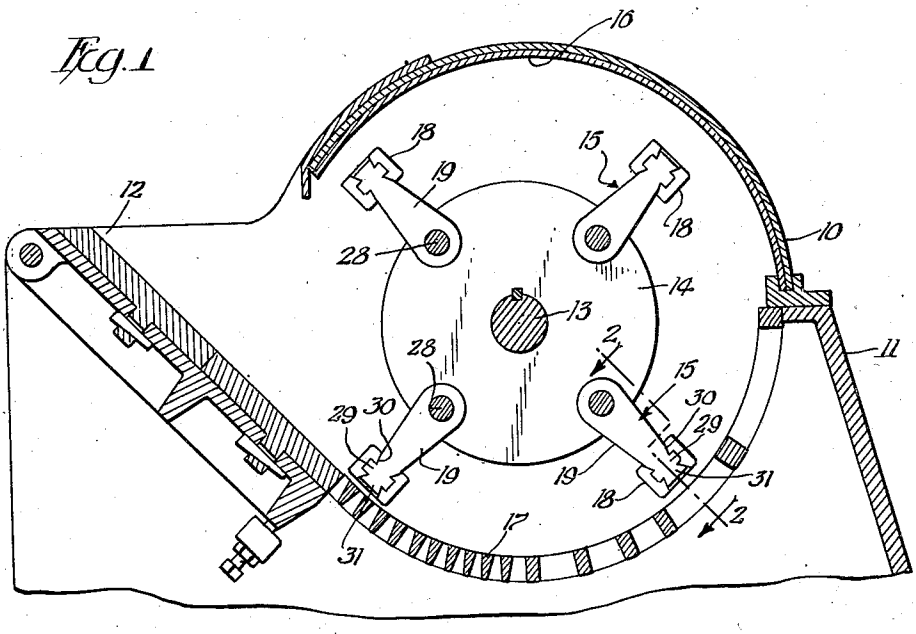


Fig. 2

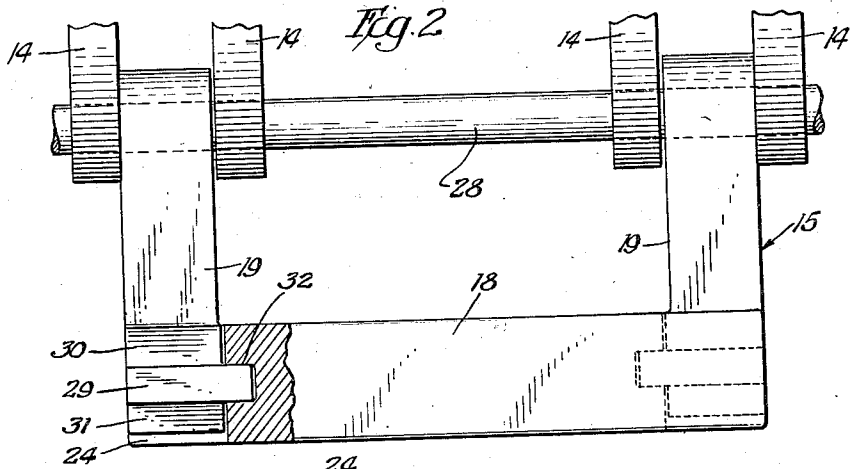
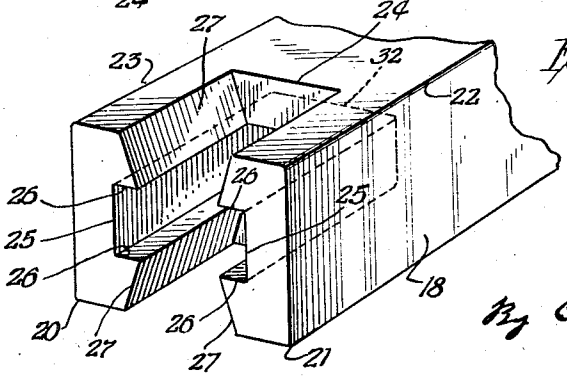


Fig. 3



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HAMMER FOR IMPACT PULVERIZERS

Filed March 11, 1937 2 Sheets-Sheet 2

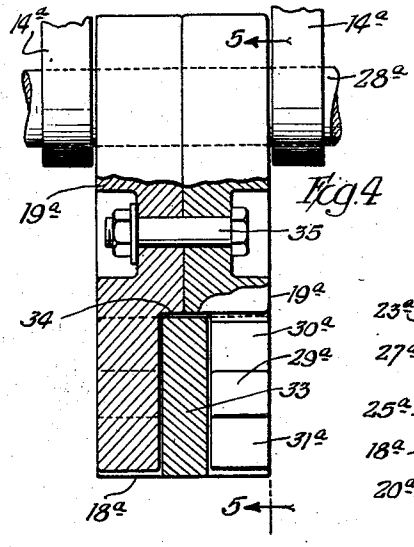


Fig. 4

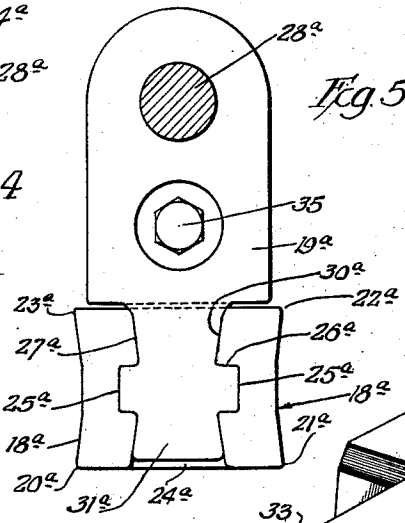


Fig. 5

Fig. 6

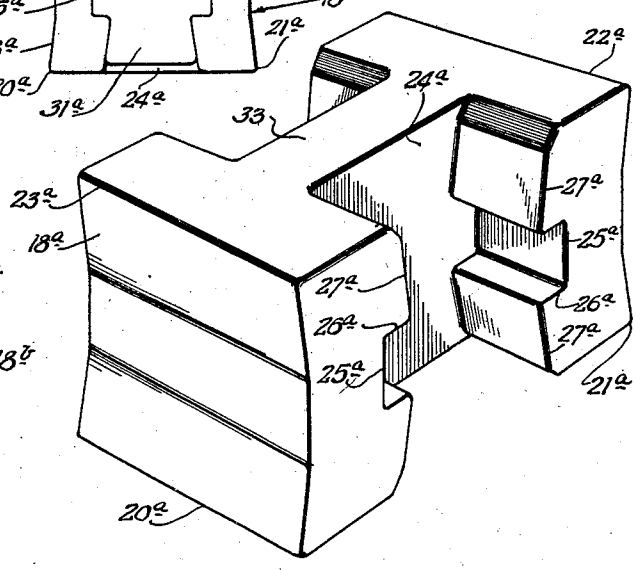


Fig. 7

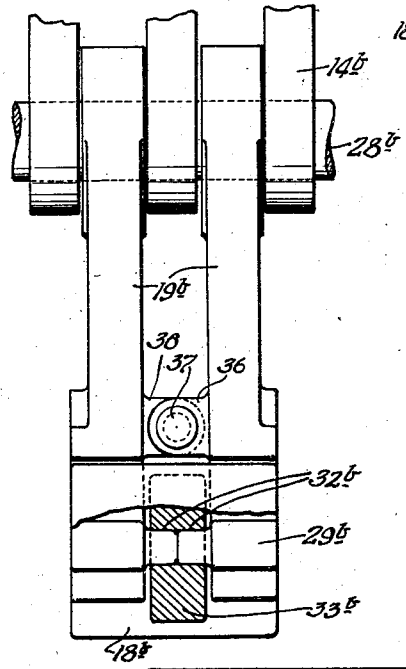


Fig. 8

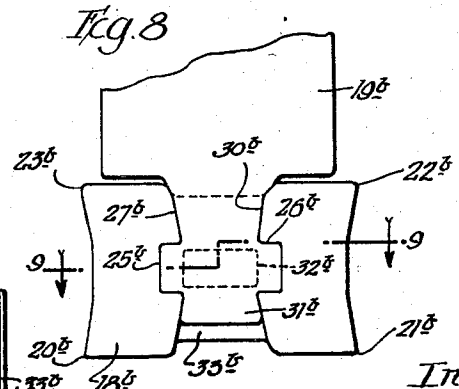
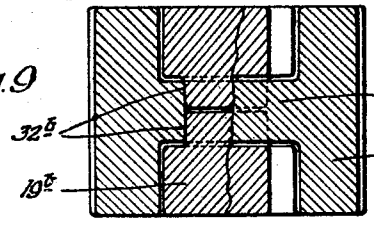


Fig. 9



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UNITED STATES PATENT OFFICE

2,152,332

HAMMER FOR IMPACT PULVERIZERS

Forrest E. Smith, Chicago, Ill.

Application March 11, 1937, Serial No. 130,223

6 Claims. (Cl. 83—11)

The present invention relates generally to improvements in rotary impact crushers or pulverizers, and has particular reference to a new and improved hammer adapted for use therein.

One of the objects of the present invention is to provide a novel pulverizer hammer in which the part most subject to wear is easily and conveniently reversible and renewable.

Another object resides in the provision of a new and improved impact hammer having a tip which is reversibly and removably connected to the hammer arm by an interlocking joint free from backlash and not likely to break or work loose, and which may be provided in various sizes and shapes regardless of the pulverizer design.

A general object is to provide a novel impact hammer of the foregoing character which is simple and sturdy in construction and in effect rigid with the hammer arm, which is long lived and economical in use, and in which the tip can be renewed or reversed with a relatively small expenditure of time.

Further objects and advantages will become apparent as the description proceeds.

In the accompanying drawings,

Figure 1 is a transverse sectional view of a pulverizer provided with impact hammers embodying the features of my invention.

Fig. 2 is a fragmentary view on an enlarged scale of one of the hammers taken along line 2—2 of Fig. 1.

Fig. 3 is a fragmentary perspective view of one of the hammer tips.

Fig. 4 is a fragmentary plan view of a modified form of hammer.

Fig. 5 is a side view of the hammer illustrated in Fig. 4.

Fig. 6 is an enlarged perspective view of the hammer tip illustrated in Figs. 4 and 5.

Fig. 7 is a fragmentary plan view of another modified form of hammer.

Fig. 8 is a fragmentary side view of the hammer illustrated in Fig. 7.

Fig. 9 is a fragmentary view, partially in section, along line 9—9 of Fig. 8.

Referring more particularly to the drawings, the impact hammers embodying the present invention are adapted for use in various types and kinds of crushers or pulverizers, and for purposes of illustration one form of hammer is shown in connection with a rotary pulverizer of conventional design (Fig. 1). The pulverizer comprises a casing 10 which is mounted on a base 11, and which has a feed inlet 12 at one side for the material, such as stone, to be crushed or pulverized. Suitably mounted in the casing 10 is a drive shaft 13 adapted to be connected to a source of power (not shown). Hammer suspension means is mounted on the shaft 13, and in the present instance comprises a plurality of spaced parallel disks 14 secured in fixed relation. A plurality of hammers 15, four in the present instance, are suitably secured in uniformly peripherally spaced relation to the disks 14 and project radially therefrom. The casing 10 is provided in the top portion with a liner plate 16 and in the bottom with a grate structure 17, conforming generally to the circle of revolution of the hammers 15.

It will be understood that in use the hammers are revolved at very high speeds. Hence, they are subjected to heavy centrifugal force and also to severe impact in reducing the material to be pulverized. Wear occurs at the outer edges of the hammer tips, and necessitates frequent replacement of the hammers.

The primary feature of the present invention resides in the provision of an impact hammer having a renewable tip which is securely connected without lost motion to the hammer arm and not likely to work loose or break off with resultant damage to the pulverizer, which can be easily and quickly reversed end for end and side for side so as to permit use of all four longitudinal edges before requiring replacement, and which upon replacement requires the scrapping of a comparatively small amount of metal in relation to the amount that can be worn off in use.

Referring to Figs. 1 to 3, each hammer 15 has a reversible and renewable tip 18 in the form of a bar or head removably connected at opposite ends with a strong joint to the outer ends of two parallel radial hammer arms 19 spaced longitudinally of the shaft 13. These joints avoid the use of, or reliance on, rivets which would require an objectional amount of time in reversing or renewing the tip 18, and also avoid the use of bolts or pins which would be likely to work loose. Moreover, such fastening means as rivets, bolts and pins would provide a joint inadequate in strength in view of the heavy centrifugal forces and severe impact to which the hammer is subjected in use, and hence likely to break and cause wrecking of the pulverizer.

The tip 18 has four longitudinal wearing edges 20 to 23 adapted to be presented selectively as the outer leading impact edge; and is formed in opposite ends respectively with longitudinal slots or channels 24 adapted for slidable inter-

locking reception of the outer ends of the hammer arms 19. Each slot or channel 24 is cruciform in cross section, and opens radially through the tip 18 to the outer and inner faces. An intermediate longitudinal guide groove 25 is formed in each side of the slot 24, and defines parallel oppositely facing abutments or projections 26. The two guide grooves 25 define the relatively wide head portion of the slot 24, and the projections 26 have outwardly inclined faces 27 defining restricted throat portions opening from the head portion to the outer and inner faces or sides of the hammer tip 18.

The inner ends of the spaced hammer arms 19 are suitably secured to the disks 14, for example, by means of a removable bolt or pin 28. Preferably, each arm 19 is closely confined between two of the disks 14 to prevent spreading.

The outer ends of the hammer arms 19 are complementary in shape to the slots 24, and adapted to be assembled therewith by relative sliding movement longitudinally of the hammer tip 18. More particularly, the outer end of each hammer arm 19 is cruciform in cross section, and has a wide rectangular head 29 slidable at opposite sides in the guide grooves 25 and coacting with the abutments 26 to provide a strong tight radial interlock with the hammer tip 18. The neck portion of the arm 19 extends through the inner throat of the slot 24, and preferably has inclined sides 30 closely engaging the projection faces 27. Preferably, the arm 19 has a dovetail projection 31 on the head 29 extending into the outer throat of the slot 24, and engaging the outer projection faces 27.

It will be evident that I have provided a strong and rigid interlock between the hammer tip 18 and arms 19. The interlock has no radial lost motion and cannot become loose. Assembly may be quickly and conveniently effected by inserting the outer ends of the arms 19 into the slots 24, and then securing the arms in fixed position between the disks 14. Thus, the hammer tip 18 is held removably and reversibly between the arms 19. When one of the outer edges of the tip 18 becomes unduly worn, the tip may be reversed end for end to present the other outer edge in the lead. When both outer edges are worn down, the tip 18 may be reversed about its longitudinal axis to present the other two edges at the outside. This reversibility is obtained since the arms 19 and slots 24 are dimensioned alike for interchangeable engagement and since each slot is provided with two oppositely opening throats. Although the tip is reversible and renewable, no loss in strength is involved. When the tip 18 is worn out and replaced, only a small amount of metal in relation to its wear capacity need be scrapped.

If desired, a transverse groove 32 may be formed in the tip 18 at the inner end of each slot 24 and connecting the inner ends of the grooves 25, and the guide head 29 may be elongated to project into the groove 32, thereby increasing the area and strength of the interlock resisting the radial pull set up by centrifugal force.

The hammer permits of flexibility in design, and may be provided in various sizes and shapes regardless of the pulverizer design. In the form of Figs. 1 to 3, the hammer arms 19 are spaced to accommodate relatively long hammer tips 18.

Figs. 4 to 6 illustrate a modified form of the invention adapted for relatively short hammer tips. The construction of the interlocking joints between the hammer tip and arms is substantially the same as in the first form, and hence the corresponding parts thereof are identified by the same reference numerals plus the distinguishing letter *a*.

In the hammer tip 18^a shown in Fig. 6, the inner ends of the slots 24^a are separated by a narrow wall 33, and hence are not formed with grooves corresponding to the grooves 32. The side or impact faces of the tip 18^a are somewhat dished instead of being flat.

To accommodate the short tip 18^a, the hammer arms 19^a are disposed together in direct engagement, to constitute in effect a single split shank or arm, and are formed with opposed notches 34 in their outer ends to define a space for the wall 33. The arms 19^a are mounted on the pin 28^a jointly between two disks 14^a, and are separably connected intermediate their ends by a suitable bolt 35. It will be evident that the hammer tip 18^a is securely clamped between the arms 19^a, and is interlocked with the outer ends against radial displacement. Even if the bolt 35 should fail or become loose, the interlocking joints would hold the hammer tip 18^a in position since spreading of the arms 19^a would be prevented by the disks 14^a.

The modified form illustrated in Figs. 7 to 9 is adapted for hammer tips of intermediate lengths. The hammer is closely similar to those in Figs. 1 to 6, and hence corresponding parts thereof are identified by the same reference numerals plus the distinguishing letter *b*. In this form, the tip 18^b is of such length that the grooves 32^b are defined by opposite ends of a space opening through the wall 33^b. The hammer arms 19^b extend in parallel spaced relation and are alternated with the disks 14^b. As in the form of Figs. 4 to 6, the arms 19^b are rigidly connected to clamp the tip 18^b between the outer ends. In this instance, a plurality of interfitting lugs 36 on the adjacent sides of the arms 19^b are secured together by a bolt 37.

I claim as my invention:

1. An impact hammer for rotary pulverizers comprising, in combination, a one-piece hammer tip formed with a channel opening in one end, said channel being cruciform in cross section and having restricted throats opening respectively to opposite sides of said tip, a hammer arm adapted to extend selectively through either one of said throats and having an enlarged head slidably disposed in said channel between said throats, and a projection on the outer end of said head slidably disposed in the other of said throats.

2. An impact hammer for rotary pulverizers comprising, in combination, a hammer tip formed with a longitudinal slot opening to one end and having two restricted throats opening respectively to opposite sides, the inner end of said slot opening to a groove, and a hammer arm adapted to extend selectively through one or the other of said throats and having an enlarged head slidably disposed in said slot and projecting into said groove.

3. An impact hammer for rotary pulverizers comprising, in combination, a hammer tip formed with two longitudinal slots, one opening to each end, each of said slots having two restricted throats opening respectively to opposite sides, two hammer arms in side engagement and having spaced guide heads on their outer ends adapted for sliding engagement with said slots in any position of assembly of said tip end for end or side about its longitudinal axis, and means interme-

diate the ends of said arms inwardly of said tip for rigidly connecting said arms to confine said tip between said heads.

4. An impact hammer for rotary pulverizers comprising, in combination, a hammer tip formed with two longitudinal slots, one opening to each end, each slot having two restricted throats opening respectively to opposite sides, two spaced hammer arms having guide heads on their outer ends adapted for sliding engagement with said slots in any position of assembly of said tip end for end or side for side about its longitudinal axis, and means for rigidly connecting said arms to confine said tip between said heads.

5. An impact hammer for rotary pulverizers comprising, in combination, a hammer tip formed with two longitudinal slots, one opening to each end, each slot having two restricted throats opening respectively to opposite sides, two hammer arms having guide heads on their outer ends adapted for closely fitting sliding engagement with said slots in any position of assembly of said tip end for end or side for side about the longitudinal axis, two lugs formed respectively on said arms and extending therefrom into overlapping relation, and means for rigidly connecting said lugs so as to cause said arms to confine said tip between said heads.

6. An impact hammer for rotary pulverizers comprising, in combination, an elongated one-piece hammer tip having longitudinal impact faces and edges and being symmetrical end for end and side for side, said tip being formed in opposite ends respectively with longitudinal slots, each slot having two restricted throats which open respectively to opposite sides of said tip and which are formed with outwardly diverging surfaces, and each slot extending inwardly of the end of said tip beyond said throats to define a groove, two hammer arms having guide heads on their outer ends adapted for freely separable sliding engagement with said slots in any position of assembly of said tip end for end or side for side about its longitudinal axis and extending into said grooves, said arms projecting through the throats opening to one side of said tip, two dovetail projections respectively on the outer ends of said arms outwardly of said heads and slidably disposed in the throats opening to the other side of said tip, and means for maintaining said arms in assembled relation with said tip.

FORREST E. SMITH.

CERTIFICATE OF CORRECTION.

Patent No. 2,152,332. March 28, 1939.

FORREST E. SMITH.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 74, claim 3, after the word "side" insert for side; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of June, A. D. 1939.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.