Sept. 4, 1951 C. E. ANDERSON 2,566,758

TIP AND SHANK FOR HAMMER MILLS

Filed June 13, 1949 2 Sheets-Sheet 1

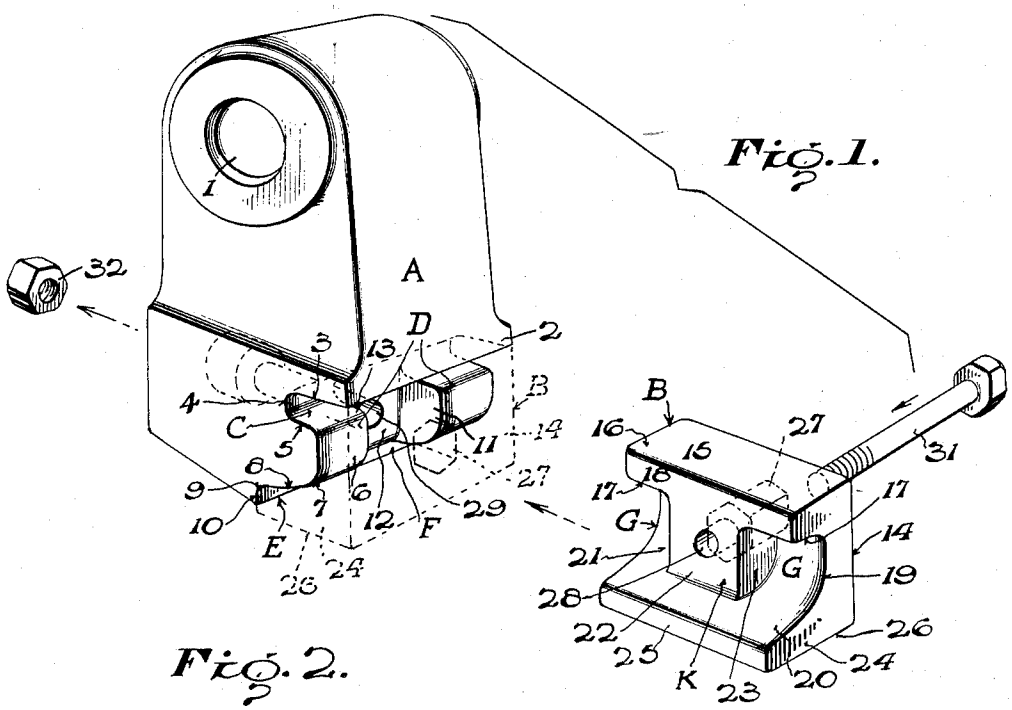


Fig. 1.

Fig. 2.

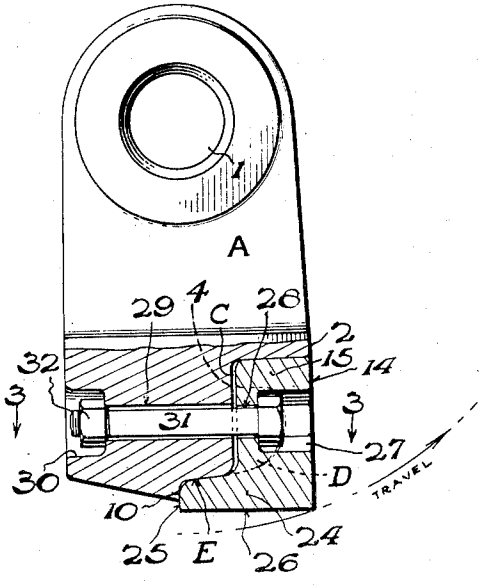
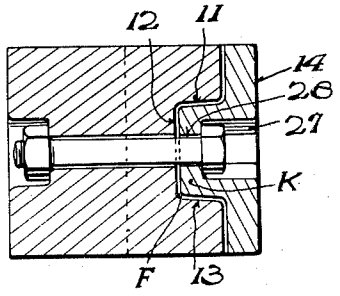


Fig. 3.



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Sept. 4, 1951 C. E. ANDERSON 2,566,758

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Filed June 13, 1949 2 Sheets-Sheet 2

Fig. 4.

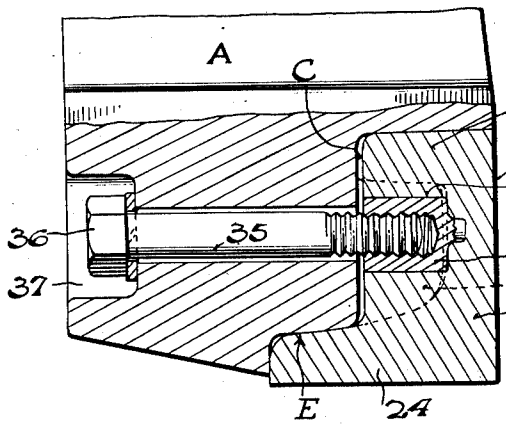


Fig. 6.

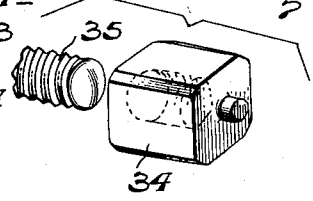


Fig. 5.

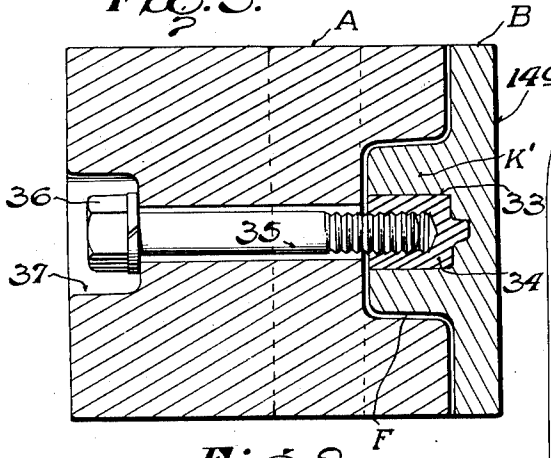


Fig. 7.

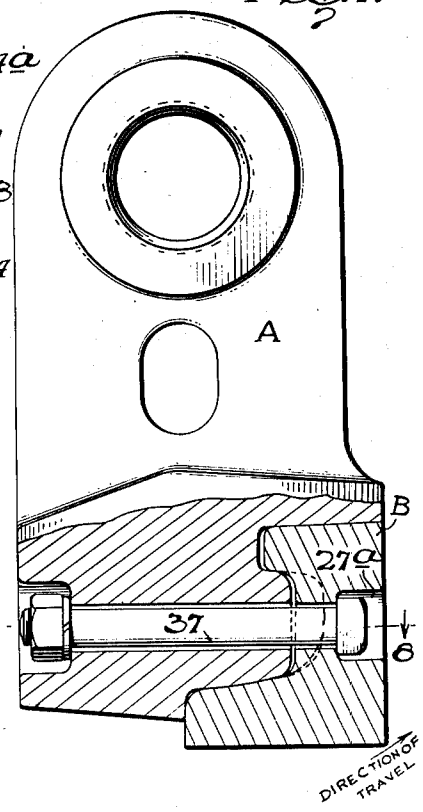
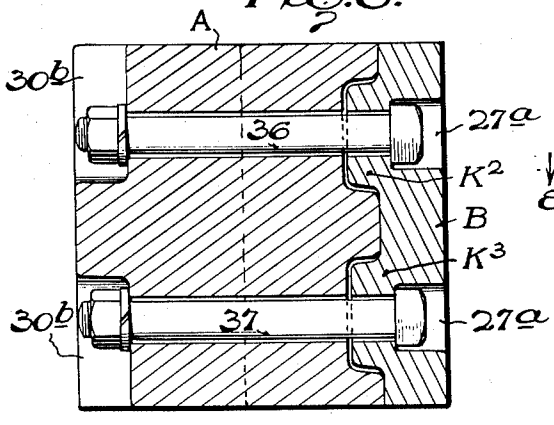


Fig. 8.



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TIP AND SHANK FOR HAMMER MILLS

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6 Claims. (Cl. 241—197)

1

This invention relates to rotary hammers, and more particularly to an improvement in a combined shank and renewable tip construction.

One of the objects of the present invention is to provide a hammer shank having a head including upper and lower transverse recesses which define an intermediate transverse rib, said recesses and rib having wedging surfaces medially interrupted by a keeper recess, and all of which recesses cooperate with mating parts of a renewable tip to securely hold the tip against vertical and sidewise movement when the tip and head of the shank are fastened together.

A further object is to provide a renewable tip that is readily replaced on the shank itself and which is simple and effective in construction and thereby lends itself readily to convenient manufacturing procedures.

With the above and other objects in view, which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangements of parts, hereinafter more fully described, illustrated and claimed.

A preferred and practical embodiment of the invention is shown in the drawings, wherein:

Figure 1 is an exploded perspective view of the preferred form of the invention with the tip turned 90° from its normal position;

Figure 2 is a side elevation, partly in section, of the hammer and tip of Figure 1 assembled;

Figure 3 is a horizontal cross section on the line 3—3 of Figure 2;

Figure 4 is a vertical cross section of a modified form of shank head and tip;

Figure 5 is a horizontal cross section of the construction shown in Figure 4;

Figure 6 is a detail perspective of the bolt end and nut of Figures 4 and 5;

Figure 7 is a side elevation partly in section of a hammer and tip used in primary crushing mills;

Figure 8 is a horizontal section taken on the line 8—8 of Figure 7.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

In all forms of the invention, the shank of the hammer is designated generally as A, and the tip is generally identified as B. The shank A is formed in one piece and the upper portion thereof is provided with an opening 1 for mounting the shank on the shaft or pin of the rotor.

The lower portion or head of the shank A is provided with a special head formation intended

2

to be complementary to the mating portion or inner face of the tip B. In all forms of the invention the mating or matching portions of the hammer and tip are the same, and such differences as may exist as between Figures 1 to 4 on one hand and Figures 5 and 6 on the other, reside in the holding means or bolts for removably connecting the tip to the hammer. In Figures 7 and 8, the same general matching or mating portions of the hammer and tip are employed except that in these latter figures, the construction is made heavier for primary mills, while in Figures 1 to 6, inclusive, the construction is of the type usually used in mills for fine crushing.

Referring to the head of the shank A, it will be observed that the front portion 2 is provided across its face with an upper recess or mortise C formed by the upper wall 3, substantially vertical wall 4, and a lower wall 5, the said walls 3 and 5 flaring outwardly. The lower wall 5 of the upper recess is connected by a fillet with a substantially vertical wall 6, and the lower portion of the vertical wall 6 is connected by a fillet 7 of relatively large radius with an arcuate wall 8. This arrangement provides a transverse rib D of substantial depth as compared with the vertical depth of the recess C. The arcuate wall or ledge 8 is joined by a fillet 9 with a vertical wall 10 which terminates at the lower end of the shank. As will be seen from Figure 1 in particular, the upper recess C overlies the horizontally extending subjacent rib D which in turn overlies the two-sided bottom recess E formed by the walls 8 and 10.

As will also be apparent from Figure 1, the rib 6 is medially provided with a vertical keeper recess F formed by the side wall 11, bottom or inner wall 12, and side wall 13, the walls 11 and 13 tapering outwardly.

The tip B is provided with a flat front face 14 and an upper portion or flange 15 formed by the upper wall 16 and the bottom wall 17 connected by a transverse wall 18. The walls 16 and 17 are tapered to match the flaring relationship of the walls 3 and 5 of the upper recess C of the shank and the walls 16 and 17 of the tenon are less than the depth of the recess C so as to originally leave clearance between the vertical wall 4 of the shank and the vertical wall 18 of the tip to provide room for take-up due to wear. The medial portion of the renewable tip B is provided with a transverse recess G whose upper wall is formed by the wall 17 of the tenon 18 and whose bottom wall 19 is connected with a relatively long curved wall 20 so that the said recess G snugly embraces

mating configuration of the transverse rib D on the shank A. The curve or arc of wall 20 is determined by the maximum point of wear on the tip as determined by the maximum point of wear on the tip as determined by test. The medial portion of the transverse recess of the tip B is provided with a key K for fitting in the vertical recess F of the shank. That is to say, the medial portion of the transverse recess of the tip B is provided with a vertical key K formed by the side wall 21, outer wall 22, and side wall 23. The side walls 21 and 23 have a matching taper with relation to the walls 11 and 13 of the medial recess of the shank. It will thus be apparent that the mating portions of the shank and tip described have a frictional or wedge fit so that the parts will be tight at the time of installation, and during use under the assisting force of the fastening means presently to be described.

Before proceeding to a description of the fastening means, it is important to note that the tip B below the transverse recess G is formed with a bottom wear portion or flange 24 which includes the rear vertical wall 25 adapted to abut wall 10 and lower impact face 26. Thus, the tip has right angularly disposed impact or wear faces 14 and 26, and the face 14 is normally in the same plane as the short face 2 of the head of the shank while the impact face 26 is normally below the lowest point of the head of the hammer shank A. It may also be pointed out that the wall 7—8 of the shank is designed to follow the line of wear of the hammer, based on a worn solid hammer as gained from previous experience, so that as the front and bottom impact faces of the tip wear, the wear may take place to a maximum extent, that is, until wear approaches the ledge or wall 20 of the tip.

From the foregoing it will now be seen that the tip A is of substantially channel shape cross-section with the recess G forming a channel or trough bounded by the upper and lower flange elements 15 and 24.

Referring now to the means for holding the tip to the shank, it will be observed that the front face 14 of the tip B is preferably provided with a socket 27 communicating with an opening 28 through the key K of the tip, which opening in turn aligns with an opening 29 in the vertical recess F of the shank, and which opening extends to the rear face of the shank to communicate with a countersunk recess 30. The countersunk recess 27 at the impact face of the tip is intended to non-rotatably receive the head of a bolt 31, the said bolt passing through the aligned openings 28 and 29 to receive a nut 32 located in the rear countersunk recess 30. It will thus be seen that the opposite ends of the bolt lie in countersunk recesses so that at no time are they exposed to direct blows or impact. Also, the front recess or cavity 27 which receives the head of the bolt will soon become filled with fine debris and thus protect the head of the bolt from continued wear or abrasion.

When the bolt 31 is tightened up, it will, of course, be understood that the tip B will be wedged against the mating parts of the shank and that the tip will therefore always be held against vertical movement due to the interfitting of the related parts of the hammer and tip. The bolt 31 merely locks the tip to the shank while the recess E of the shank and the interfitting key K of the tip will absorb all lateral forces imposed on the tip and distribute them over the end of the shank. In other words, the key and recess bear the actual brunt of possible sidewise movement between the tip and the shank while the fastening principally serves to prevent separation of the tip from the shank in the reverse direction to that in which it is applied or assembled.

Figures 4 and 5 illustrate the same mating parts of the shank and tip as described in connection with Figures 1–3. However, in this form of the invention, the fastening means is different in the respect that there is no opening at the front face 14^a of the tip. In this arrangement the key K^1 of the tip is provided with a socket or cavity 33 to receive an internally threaded non-circular bushing or nut 34 which is wedged in the socket and receives the threaded end of a bolt 35 applied through mating openings in the shank and the tip so that its head 36 is accessible through the recess 37 countersunk in the rear face of the shank.

Figures 7 and 8 illustrate the same arrangement of mating parts on the shank and the tip except that two keys K^2 and K^3 and corresponding keeper recesses are provided due to the heavy duty to which a tip of this type is subjected. Also, two fastening bolts 36 and 37 are assembled in the same fashion as described in connection with Figure 1 except that it will be understood that the front face 14^b of the tip shown in Figures 6 and 7 is provided with two countersunk openings 27^a and, the rear face is provided with elongated recesses 30^b whose outer ends open at the sides of the shank head for convenient access to the nuts on the bolts 36 and 37.

From the foregoing, it will be understood that the principal features of the invention are the mating configurations of the one-piece shank and the one-piece tip held together by appropriate fastening means. Figures 4 and 5, and Figures 7 and 8 illustrate the range of possible modification within the scope of the improved mating or interlocking features of both the shank and the tip.

When one of the tips B in any form of the invention becomes worn, it is believed to be apparent that it is unnecessary to remove the shank A from the rotor in order to renew the tip. In other words, it is simply necessary to remove the fastenings holding the tip B to the shank A and substitute a fresh unworn tip. Due to the fact that the tip protects all of the mating surfaces of the shank, the latter are subjected to little or no wear and the new tip will readily seat in the complemental portions of the old shank.

Without further description it is thought that the features and advantages will be readily apparent to those skilled in the art, and it will, of course, be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

I claim:

1. A hammer for rotary crushing mills, comprising, a shank having a head provided with a front face and formed below its front face with an inset transverse upper recess, a subjacent transverse rib overlying a two-sided bottom recess, said rib having a medial keeper recess therein; a removable tip having angularly disposed front and bottom impact faces and provided at its inner side with a medial transverse recess for embracing the rib, a key in the last-mentioned recess for fitting in the said keeper

recess of the rib, said transverse recess in the tip being bounded by upper and lower flanges having wedging engagement respectively within the upper and lower recesses of the shank head, and bolt and nut means for fastening the head and tip together.

2. A hammer according to claim 1 wherein, the front impact face of the tip and the rear face of the shank are provided with countersunk portions and communicating openings to receive a bolt whose head is shielded within one of the openings and whose clamping nut is shielded in the other of said openings.

3. A hammer for rotary crushing mills according to claim 1, wherein, the key is provided with with a threaded socket registering with an opening in the shank head and the rear face of the shank head is provided with a countersunk recess, and a bolt threaded at one end and adapted to enter said opening and said threaded socket and having its head disposed in said countersunk recess.

4. A hammer for rotary crushing mills according to claim 1, wherein, the rib on the head is provided with a plurality of spaced keeper recesses and the transverse recess at the inner side of the rib is provided with a plurality of spaced mating keys, and a plurality of fastening elements holding the shank-head and tip at the location of said keys and their mating keeper recesses.

5. A hammer for rotary crushing mills, comprising, a shank having a head provided with a front face and formed below its front face with an inset transverse upper recess, a subjacent transverse rib overlying a two-sided bottom recess, said rib having a medial keeper recess therein; a removable tip having right angularly disposed front and bottom impact faces and provided at its inner side with a medial transverse recess for embracing the rib, a key in the last-mentioned recess for fitting in the said keeper recess of the rib, said transverse recess in the tip being bounded by upper and lower flanges having wedging engagement respectively within the upper and lower recesses of the shank head, a non-circular internally threaded nut in the rear face of the key on the tip, and a fastening having a head at one end and threaded at the other, said fastening passing through the shank head and having its threaded end engaging the internally threaded nut.

6. In a hammer composed of a shank and a renewable tip for use in hammer mills, wherein the lower portion of the shank has a transverse rib and a recess with outwardly flared upper and lower planar walls, a second recess below said rib having an arcuate wall curved in the direction of said lower planar wall of the first recess and a continuous terminal transverse wall connected to said arcuate wall by a fillet, the shank

and tip having complementary mating surfaces held together by a fastener extending through said tip and shank and exposed at each end for ready access to either end of said fastener, said tip being provided at its inner side with upper and lower flanges, said upper flange having upper and lower planar bearing surfaces conected by a rear vertical planar surface, said upper and lower planar bearing surfaces being tapered in the direction of said rear vertical planar surface, said lower flange projecting rearwardly substantially twice the extent of said upper flange over only a fractional part of the lower portion of the shank to said terminal transverse wall, the vertical rear wall of said lower flange being parallel to the wear face of the tip and forming a continuous transverse wall abutting said terminal transverse wall across the lower portion of the shank, said lower flange of the tip having an upper curved bearing surface, said tip flanges and their said respective bearing surfaces forming a transverse recess, and a projecting locking key formed with a countersunk socket for non-rotatably receiving the head of said fastener, said key being integral with the tip, the outermost projecting face of the key being substantially coplanar with the said rear vertical planar surface of the upper flange, said key lying medially in the recess between said upper and lower flanges of the tip for reception in the recess in the transverse shank rib to hold the vertical rear wall of the lower flange in cooperative abutment with said continuous transverse terminal wall across the lower portion of the shank when the fastener is in position to prevent lateral movement and shearing stresses on said fastener, said key and lower portion of the shank being shielded by said lower flange against wear.

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