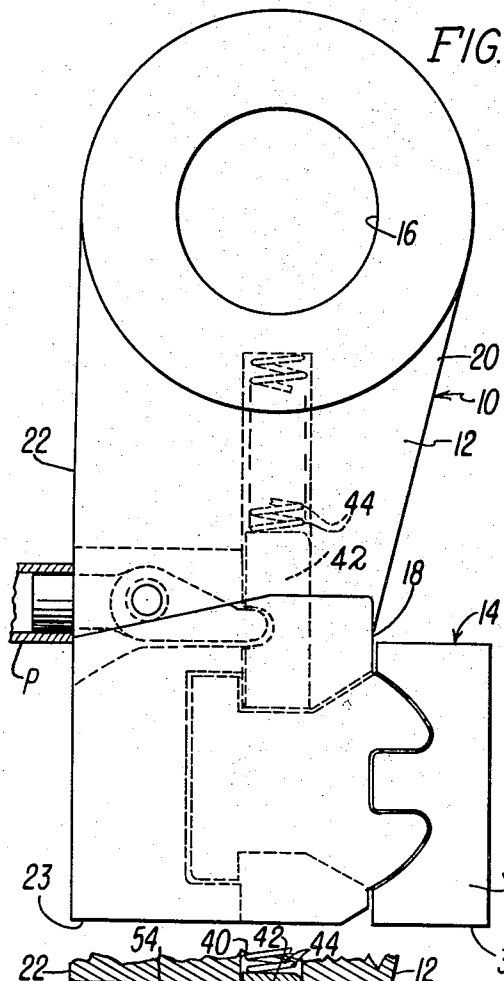
Aug. 23, 1960 F. E. SMITH 2,950,066

HAMMER FOR ROTARY IMPACT PULVERIZERS

Filed Aug. 3, 1959

3 Sheets-Sheet 1

FIG. 1



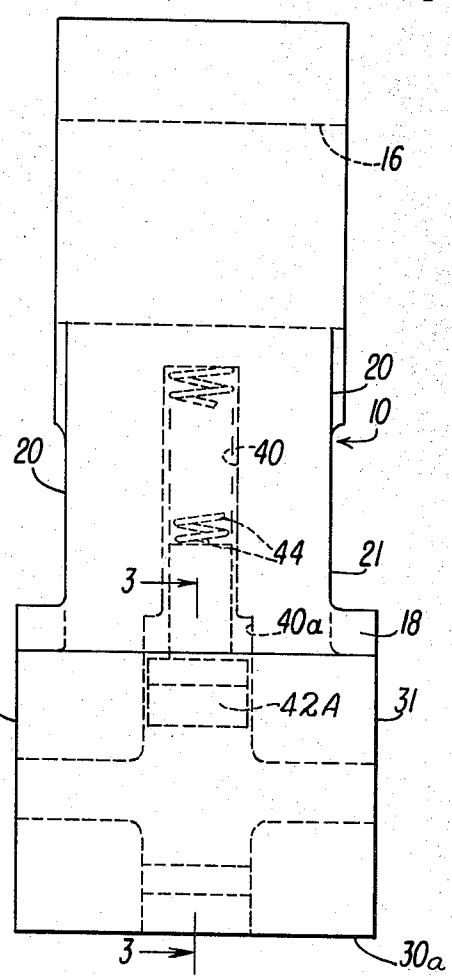


FIG. 2

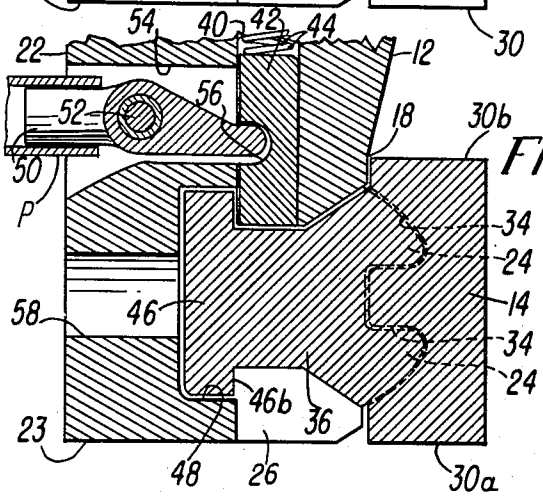


FIG. 3

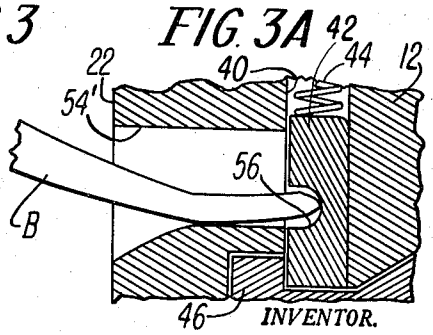


FIG. 3A

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HAMMER FOR ROTARY IMPACT PULVERIZERS

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FIG. 4

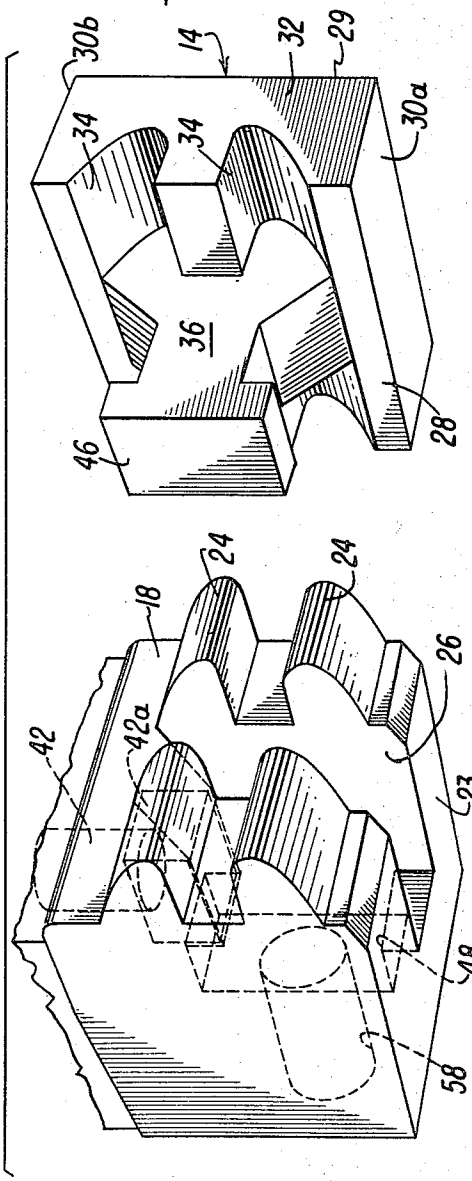
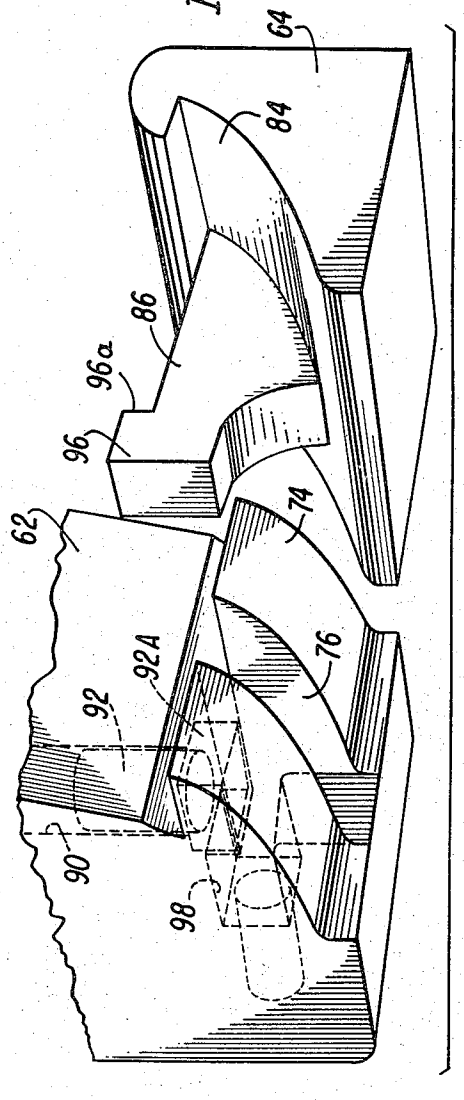


FIG. 5



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Fig. 6

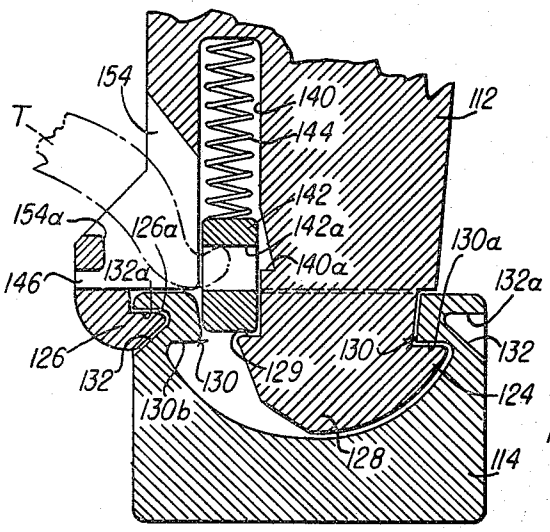


Fig. 7

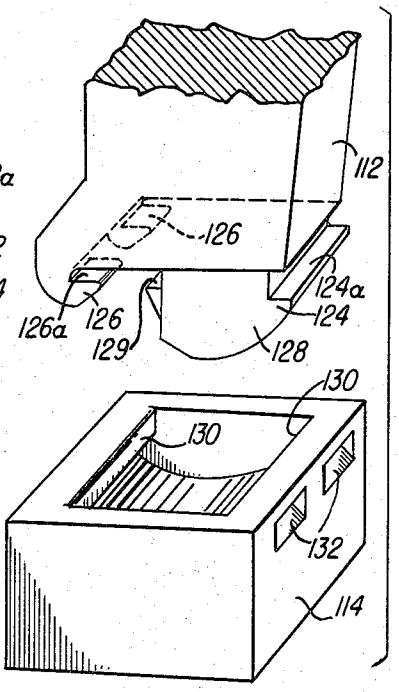


Fig. 8

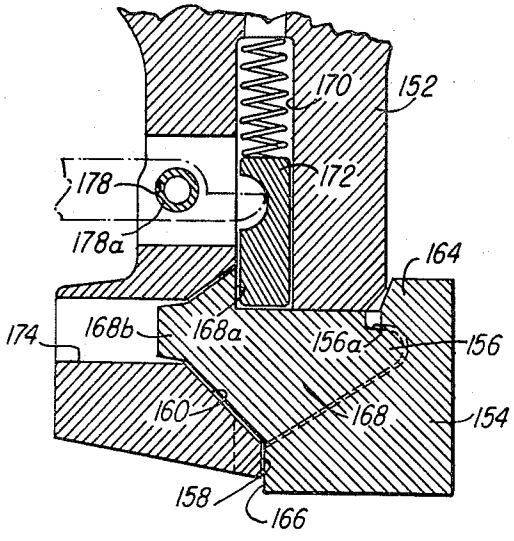
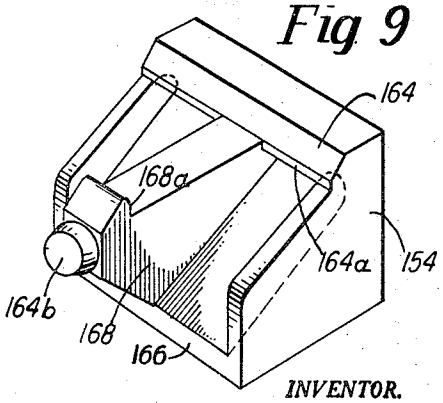


Fig. 9



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United States Patent Office

2,950,066

Patented Aug. 23, 1960

2,950,066

HAMMER FOR ROTARY IMPACT PULVERIZERS

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Filed Aug. 3, 1959, Ser. No. 831,411

9 Claims. (Cl. 241—197)

The present invention relates to rotary impact pulverizers or crushers and more particularly to improvements in the revolving hammers that form a part thereof.

It is a general object of the present invention to provide an improved hammer having a replaceable tip so constructed and arranged as to facilitate installation and removal of the tip from the hammer shank and which is not susceptible of accidental disengagement even under the most severe operating conditions.

A further object of the invention is to provide a pulverizing hammer and a replaceable tip therefor being novelly constructed and arranged so that the tip is securely retained on the hammer during operation of the pulverizer in which it is installed, yet may be readily released for removal therefrom without necessity of any complicated procedure or even removal of the hammer from the pulverizer.

It is a further object of the invention to provide an improved pulverizing hammer which is inherently strong, rugged and durable, which has heavy duty working surfaces, yielding long and useful life against abrasive forces, and which permits of economical manufacture involving a minimum of machining operations.

The objects of the invention thus generally set forth, together with other objects and ancillary advantages are attained by the construction and arrangement shown by way of illustration in the accompanying drawings, in which:

Figure 1 is a side elevation of a hammer and reversible, replaceable tip embodying the features of the present invention;

Fig. 2 is a front elevation of the hammer and replaceable tip shown in the preceding figure;

Fig. 3 is a fragmentary sectional view taken substantially in the plane of line 3—3 of Fig. 2;

Fig. 3A is a view similar to Fig. 3 but illustrating a somewhat simplified form;

Fig. 4 is an exploded perspective view of the lower end of the hammer and reversible, replaceable tip shown in the preceding figures with the tip and lower end of the hammer in unfolded relation so as to illustrate the interengaging surfaces.

Fig. 5 is an exploded perspective view similar to Fig. 4, but illustrating a modified form of the invention embodying a nonreversible replaceable tip;

Fig. 6 is a fragmentary sectional view similar to Fig. 3 but illustrating a modified form of the hammer and a reversible, replaceable tip;

Fig. 7 is an exploded perspective view of the lower end of the hammer arm and reversible, replaceable tip illustrated in Fig. 6;

Fig. 8 is a fragmentary sectional view similar to Figs. 3 and 6 but illustrating a modified form of the hammer and a nonreversible, replaceable tip; and

Fig. 9 is a perspective view of the removeable tip shown in Fig. 8.

While the invention is susceptible of various modifications and alternative constructions there are shown in the drawings and will herein be described in detail certain preferred embodiments. It is to be understood, however, that it is not thereby intended to limit the invention to the specific forms disclosed. On the contrary, it is intended to cover all modifications and alternative constructions falling within the scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, there shown is an impact hammer embodying the features of the present invention. The hammer is adapted for use with various types and kinds of crushers, pulverizers, mills and the like. The hammer construction can be readily understood without reference to details of the pulverizer as a whole. Suffice it to say for present purposes, however, a plurality of such hammers are pivoted about the periphery of a rotating disk and are maintained in a radially extending relation thereto by the action of centrifugal force. The hammers are swung successively into contact with a mass of rock, coal, or similar frangible material so as to break up such material into a loose mass of smaller sized pieces as a result of the various hammer impacts.

The illustrative hammer, which is generally indicated by reference numeral **10**, includes a hammer arm or shank **12** and a tip **14** removably secured to its outer end. The hammer arm **12** is adapted to be pivoted pendulously at its inner end upon a suitable supporting shaft (not shown) which is adapted to extend through a cylindrical opening **16** provided transversely through the inner end of the arm **12**. The hammer arm **12** is of generally rectangular cross-section having a leading face **18**, side faces **20** and **21**, a rear face **22**, and an outer face **23**.

Figs. 1–4 inclusive illustrate the first form of the invention shown. Therein, the outer end of the hammer arm **12** has formed on the leading face **18** thereof a pair of longitudinally spaced, arcuately surfaced ribs **24** projecting forwardly therefrom and extending transversely across the leading face **18**. Intermediate the side faces **20** and **21** thereof the arm **12** is provided with a slot **26**. The slot opens forwardly through the leading face **18**, extending through the ribs **24**, and outwardly through the outer face **23**.

The replaceable tip **14** is complementally formed for interfitting engagement with the outer end of the arm **12**. Thus the replaceable tip has a rear face **28** which is adapted for abutting engagement with the outer end of the leading face **18** of the arm **12**. The tip has a leading or impact surface **29**. It is also provided with transverse faces **30***a*, **30***b*, and side faces **31** and **32** which, as shown, are adapted to lie respectively in coplanar relationship with the corresponding outer and side faces **23**, **21** and **20** of the outer end of the arm **12**. To receive the ribs **24** the rear face **28** of the replaceable tip **14** is provided with a pair of spaced transversely disposed arcuate grooves **34**.

Centrally of the rear face **28** of the tip **14** and projecting rearwardly therefrom for interfitting engagement in the arm slot **26** is a tongue **36**. Desirably the tongue is integrally formed with the remainder of the tip.

Experience has demonstrated that the majority of the wear or tip erosion occurs along the outer leading edge of the tip. Thus the tip **14** is constructed and arranged to be reversible with respect to the arm **12**. This construction and arrangement permits the tip edge between the leading face **29** and the face **30***a* to be replaced by the tip edge between the face **29** and the face **30***b* simply by reversing or inverting the tip **14** with respect to the arm **12**. To permit this reversal or alternative relative positioning of the tip **14** with respect to the arm **12**, the tip is symmetrically constructed about central transverse and vertical planes.

It will be apparent to one skilled in the art that wear

on hammers of this type is severe necessitating tip reversal or replacement at not infrequent intervals. With prior constructions tip replacement has involved considerable time and effort. Because of this it has heretofore been common practice to maintain separate hammers so that tip replacement could be effected away from the pulverizer itself. Thus worn hammers have been removed and replaced by the previously reconditioned hammers in order to minimize the "down time" of the pulverizer. Later the worn ones have been reconditioned. Even with this procedure considerable "down time" has been involved because of the necessity to remove the hammers with the worn tips from the pulverizer and for replacement thereof with the retipped hammers. Additionally, many of the replaceable tip hammers have involved constructions and arrangements incorporating rivets, bolts, threaded pins or similar fastening elements which frequently become deformed as a result of impacting of material being crushed in the pulverizers in which they are installed and thereby making their removal exceedingly difficult. Indeed at times such elements have required burning off of the rivets, bolts or threaded pins in order to release the tip for removal from the hammer arm.

In accordance with the present invention means are provided for positively retaining the tip in place upon the hammer arm of which the retaining components are completely protected from impact with the material being pulverized and yet which means facilitate tip replacement. More particularly, the present invention contemplates a construction and arrangement making unnecessary removal of the hammer from the pulverizer for tip replacement and requires but the simplest hand tools for accomplishing that end.

In carrying out the present invention, detent means is provided, incorporated entirely within the hammer arm, which means is engageable with the tip when the latter is installed upon the outer end of the arm, and access from the exterior of the hammer arm is provided for operating the detent means so as to release the tip for its removal.

As shown in the drawings the arm 12 has a longitudinal bore 40 therein axially slidable in which is a detent 42. The detent is urged outwardly by a biasing spring 44 which is disposed within the bore 40 and is interposed between the inner end of the detent 42 and the bottom of the bore. The outer end of the detent, as shown, is fashioned into an enlarged, generally rectangular, head 42A. The detent head 42A is adapted to extend into the arm slot 26 immediately adjacent the forwardly facing rear wall or bottom of the slot, for engagement with the tip tongue 36. To receive the detent head 42A upon withdrawal of the detent, the outer end of the bore 40 is appropriately enlarged as indicated at 40*a*.

It is to be noted that the tongue 36 has a cross-head 46 rigid therewith defining forwardly facing shoulders 46*a* and 46*b*. To receive the cross head 46 when the tip 14 is installed upon the arm 12 the forwardly facing rear wall or bottom of the arm slot 26 has a recess 48 formed therein which is complementally shaped with respect to the cross-head 46.

Provision is made for operating the detent 42 against the action of the biasing spring 44. As shown in Figs. 1 and 3, this means comprises a lever 50 which is pivoted intermediate its ends upon a transverse axis indicated at 52 within a slot 54 in the hammer arm 12. While the access opening or slot can be formed in any one of the hammer faces, for illustrative purposes the slot 54 is shown as being formed in the rear face 22 of the arm 12 and opens into the bore 40. The inner end of the lever 50 engages a notch 56 in the shank of the detent 42. Desirably the other end of the lever 50 projects outwardly through the slot 54 somewhat beyond the rear face 22 of the arm 12.

In Fig. 3A, a somewhat simplified construction is shown. Therein the components of the hammer arm, replaceable tip, and detent are identical with those previously described, and so to them the same reference numerals are applied. In this form it is contemplated that the detent 42 will be operated against the action of its biasing spring 44 by a prying tool instead of the lever 50 of the form previously described. Thus, in this form, the operating lever 50 and its pivot 52 have been omitted and an access opening 54' is formed to receive a pry bar B. The outer end of the pry bar is adapted to engage in the detent notch 56. To assist in the withdrawing movement of the detent 42 the bar B has its tip turned upwardly a slight amount, and the bar is fashioned to fulcrum upon the outer wall of the opening 54'.

It will be seen that to install the tip 14 upon the arm 12 its tongue 36 is inserted in the slot 26. Initially the tip is positioned forwardly and outwardly with respect to its final position. The tip is then moved bodily inward with respect to the arm so that the inner surface of the cross-head 46 engages the detent head 42A. Continued inward movement of the tip moves the detent inwardly, compressing the biasing spring 44, and the detent head 42A is moved into the enlarged outer end 40*a* of the bore 40. The tip 14 can then be pressed rearwardly so that the cross-head 46 of the tongue 36 enters the recess 48. At the same time the arm ribs 24 enter the tip grooves 34. When the tip reaches its fully installed position the detent 42 moves outwardly under the action of the biasing spring 44 so that the detent head 42A drops in front of the shoulder 46*a* as best shown in Figs. 1 and 3. Thus the tip 14 is positively held in place on the outer end of the hammer arm 12.

It will be appreciated that the detent 42 can be withdrawn from engagement with the tongue cross-head shoulder 46*a* by moving the projecting outer end of the lever 50 outwardly to pivot the same, in a counterclockwise direction as viewed in Figs. 1 and 3, about its pivot 52. In so doing the inner end of the lever moves inwardly so as to urge the detent 42 inwardly by virtue of the engagement of the lever with the detent shank notch 56. This operation withdraws the detent head 42A into the enlarged outer end 40*a* of the arm bore 40, clear of the slot 26. Similarly, the detent 42 of the form shown in Fig. 3A can be withdrawn by the bar B into the notch 56 and pressing outwardly on the projecting end thereof.

With the detent 42 in withdrawn position, the tip tongue 36 can be moved inwardly and rearwardly within the arm slot 26 into installed position wherein the tip tongue cross-head 36 is received in the recess 48 and the arm ribs 24 are engaged in the tip grooves 34. When the tip is in its final or installed position the lever 59 can be released thereby releasing the detent 42 to the action of the biasing spring 44, whereupon the detent head 42A is urged outwardly into its final position in front of the cross-head shoulder 46*a*.

The detent head 42A when in extended position in front of the cross-head shoulder 46*a* prevents forward movement of the tip 14 with respect to the hammer arm 12. Outward movement of the tip 14 with respect to the arm 12 is prevented both by the rib-in-groove engagement 24, 34 and by the engagement of the cross-head 46 within the recess 48.

When it is desired to replace the tip 14 or to reverse the relative position thereof with respect to the arm 12, the outer end of the lever 50 is moved outwardly so as to withdraw the detent from engagement with the cross-head shoulder 46A. This can be readily accomplished in the form shown in Fig. 3A by the leverage afforded by the bar B. In the first of the illustrative forms, Figs. 1 and 3, this can be done if necessary by extending the length of the outer end of the lever 50 by inserting over it the end of a length of pipe, indicated at P in Fig. 3,

of appropriate length. When the detent is withdrawn the tip can be moved forwardly with respect to the hammer arm 12 to disengage the cross-head 46 from the notch 48 and to disengage the arm ribs 24 from the tip grooves 34. Thereafter the tip 14 can be moved outwardly so as to withdraw the tip tongue 36 from the arm slot 26. If desired the arm 12 can have an opening 58 formed therein which extends from the rear face 22 thereof and opens into the rear face of the groove recess 48. The purpose of the opening 58 is to provide access to the rear face of the cross-head 46. Thus, in the event that the tip 14 becomes jammed upon the arm 12 as by the entry of bits of the material being pulverized, a drift pin or similar object can be inserted through the opening 58 into engagement with the rear face of the cross-head 46 so that the tip 14 can be driven forwardly with respect to the arm 12 to disengage the cross-head 46 from the recess 48 and the tip grooves 34 from the arm ribs 24 thus releasing the tip from the hammer arm.

Turning now to Fig. 5 of the drawings there shown is a modified form of tip and hammer arm construction embodying the features of the present invention. While the illustrative embodiment of the invention previously described is such that the tip is reversible in position with respect to the hammer arm, this embodiment illustrates a nonreversible tip. In Fig. 5 there is fragmentarily indicated the outer end of a hammer arm 62 which is adapted to receive a non-reversible tip 64. Adjacent its outer end, the leading face of the hammer arm 62 is relieved to define forwardly projecting rib 74 which extends transversely thereacross. As shown the rib 74 is provided with a flat inner face and an arcuate outer face. The tip 64 has its rear face complementally formed with respect to the juxtaposed portion of the leading face of the outer end of the arm 62. Thus, the tip 64 is relieved to define a transversely extending groove 84 having an arcuate outer surface and a transaxial inner surface for interfitting engagement with the corresponding surfaces of the arm rib 74.

Centrally of the outer end of the arm 62 a slot 76 is provided. As was the case with the slot 26 in the embodiment previously described, the slot 76 opens forwardly through the leading face of the arm 62 extending through the rib 74 and outwardly through the outer face of the arm 62.

Centrally of the rear face of the tip 64 and projecting rearwardly therefrom for interfitting engagement with the arm slot 76 is a tongue 86. Desirably the tongue 86 is integrally formed with the remainder of the tip 64. As shown in dotted lines in Fig. 5 the arm 62 has a longitudinal bore 90 therein axially slidable within which is a detent 92. The detent 92 is adapted to be urged outwardly with respect to the arm bore 90 by means of a biasing spring (not shown) in the same manner as the detent 40 is urged outwardly by the biasing spring 44 of the illustrative form previously described. So, too, the outer end of the detent 90 is provided with an enlarged, generally rectangular head 92A which extends into the arm slot 76 for engagement with the tip of the tongue 86. The tip of the tongue 86 is provided with an inwardly extending head 96 to define a forwardly facing shoulder 96*a*. To receive the head 92A, the forwardly facing rear wall or bottom of the arm slot 76 has formed therein a complemental recess 98.

The tip 64 is adapted to be installed upon the outer end of the arm 62 in substantially the same manner as the tip 14 is installed upon the arm 12 of the form hereinbefore described. Thus the tip tongue 86 is inserted within the slot 76 and is moved rearwardly and inwardly with respect to the arm 62 until the tongue tip head 96 engages the recess 98. In this position the detent head 92A is moved outwardly under the action of its biasing spring so that it is positioned forwardly of the tongue head shoulder 96*a*. In this position of the detent the tip is positively prevented from being

moved forwardly with respect to the arm by means of the detent and, in this position, outward movement of the tip 64 with respect to the arm 62 is prevented by the engagement of the tip groove 84 with the arm rib 74 and the engagement of the outer surface of the tongue head 96 with the oppositely facing surface of the slot recess 98.

In order to simplify illustration detent operating means has not been shown in Fig. 5. Suffice it to say for present purposes, however, that this embodiment of the invention contemplates utilization of the same means operating in the same manner as in the forms hereinbefore illustrated and described. Thus by the same operation, namely, movement of a detent operating lever the detent 92 can be withdrawn into the arm bore 90 out of engagement with the tip head shoulder 96 so as to permit forward movement of the tip 64 with respect to the arm 62 for effecting disengagement of the tongue tip head 96 from the notch 98 and of the tip groove 84 from the arm rib 74. When such disengagement is effected the tip 64 can be removed from the arm 62 by a simple forward and outward movement.

In Figs. 7 and 8 another modified form of the invention is illustrated. There shown is a hammer having an arm or shank 112 and a tip 114 removably secured to the outer end of the arm. As with the previously described forms the hammer arm is adapted to be pivoted pendulously at its inner end upon a suitable supporting shaft (not shown). The outer end of the hammer arm 112 has formed on the leading face 118 thereof a transversely extending rib 124. The rib 124 projects forwardly and defines an inwardly facing shoulder 124*a*. On the rear or trailing portion of the arm 112 there is formed a rearwardly projecting transverse protuberance indicated generally at 125, the lower end of which is made of hook-like form. Thus it is relieved so as to form a forwardly facing rib 126 having an inwardly facing surface 126*a*. Centrally of the outer end of the arm is an outward extension 128, the outer surface of which merges smoothly with the rib 124. The rear face of the extension 128 has a transversely disposed, inwardly facing ledge 129 formed thereon.

The replaceable tip 114 is reversible and is formed for interfitting engagement with the outer end of the arm 112. It is therefore made symmetrically about a median plane which includes the longitudinal axis of the hammer assembly when the tip is in installed position. The inner surface of the tip is hollowed out to receive the outer end of the arm so as to retain the tip secured 128. Adjacent its inner transverse marginal edge portions the tip 114 is undercut to define ribs presenting outwardly facing transverse surfaces 130*a* and 130*b* for alternative engagement with the inwardly facing surface 124*a* of the arm rib 124. Adjacent its inner edges both the forward or leading and rear or trailing faces of the tip 114 are provided with a pair of transversely spaced pockets 132. The pockets are so formed as to provide outwardly facing surfaces 132*a*.

For reception in the pockets 132 the forwardly facing arm rib 126 is centrally bifurcated. When inserted in the pockets 132, the rib surface 126*a* engages the pocket surfaces 132*a* thereby limiting outward movement of the rear portion of the tip with respect to the hammer arm. Outward movement with respect to the hammer arm of the forward portion of the tip 114 is limited by engagement of the tip surface 130*a*, or 130*b*, depending upon the position of the tip with respect to the arm, with the inwardly facing surface 124*a* of the tip rib 124.

As in the forms of the invention previously described, detent means is provided, which is incorporated entirely within the hammer arm 112, and which means is engageable with the tip when the latter is installed upon the outer end of the arm so as to retain the tip seceurely in place. Access from the exterior of the hammer arm is also provided for operating the detent means so as to

release the tip for its removal. As shown in the drawings, the arm **112** has a longitudinal bore **140** therein axially slidable in which is a detent **142**. The detent **142** is urged outwardly by a biasing spring **144** which is disposed within the bore **140** and is interposed between the inner end of the detent **142** and the bottom of the bore. It will be noted from Fig. 6 of the drawings that the inwardly facing ledge **129** which is formed on the arm extension **128** serves to limit outward movement of the detent **142** in the bore **140** under the action of the spring **144**.

Provision is made for operating the detent **142** against the action of the biasing spring **144**. Thus an access opening or slot **154** is formed in the rear face of the arm **112**. Through this access opening can be inserted a suitable prying tool T for engagement in a transverse opening **142***a* formed in the detent **142**. It will be apparent that the tool T can be fulcrumed upon the lower outer edge of the slot **154** as indicated at **154***a* in Fig. 6 so as to urge the detent inwardly in the bore **140** compressing the spring **144**. To permit the detent **142** to remain in a withdrawn position without the necessity of holding it there, the forward wall of the bore **140** is relieved to define an inwardly facing ledge **140***a*. It will be apparent that when the detent is moved sufficiently far into the bore **140**, the detent can be pushed forwardly so that its outer forward corner engages the ledge **140***a*.

When the detent is in its extended position with respect to the bore **140** the outer end thereof is disposed in juxtaposed relation to the rib **126** of the arm **112**. Thus it is in position opposite the trailing tip rib **130** when the tip **114** is installed and so that the bifurcated arm serves to prevent forward movement of the tip with respect to the arm. This then serves to lock the tip upon the outer end of the arm.

The installation of the tip **114** upon the arm **112** will be apparent from the foregoing. However, it may be summarized as follows. With the detent **142** withdrawn and the tip **114** disposed in forwardly offset relation with respect to the arm **112**, the tip **114** is moved inwardly with respect to the arm **112**. Such movement brings the arm extension **128** into the hollow inner portion of the tip **114**. The tip **114** is then moved relatively rearward with respect to the arm **112**. Such movement results in the disposition of the tip rib shoulder **130***a* or **130***b* in juxtaposed relation to the arm rib surface **124***a*. Simultaneously, upon such relative rearward movement of the tip **114** with respect to the arm **112**, the bifurcated rib **126** is moved into the external tip recesses **132** in the rear or trailing face of the tip **114** and the pocket surfaces **132***a* are engaged with the inwardly facing rib surfaces **126***a*. The detent **142** is then permitted to be urged outwardly by the action of the biasing spring **144**. Thus its outer end moves into position forwardly of the rear tip rib **130**, preventing relative forward movement of the tip **114** with respect to the arm **112**. Outward movement of the detent is limited by its engagement with the ledge **129** formed on the rear face of the tip extension **128**.

From the foregoing therefore it will be seen that the tip **114** is securely held in place and cannot be dislodged from the hammer arm **112** until the detent is positively withdrawn.

Desirably an opening **146** is provided in the rear face of the hammer arm to permit access to the bottom of the slot **154** and to the bore **140** so that dust or the like can be readily removed.

In Figs. 8 and 9 of the drawings still another form of the invention is illustrated. This form of the invention embodies a nonreversible, replaceable tip. In this view there is fragmentarily indicated the outer end of a hammer **152** which is adapted to receive a nonreversible tip **154**. Adjacent its outer end the leading face of the hammer arm **152** is relieved to define a forwardly projecting rib **156**. The rib **156** extends transversely across the leading face. As shown, the rib is provided with a flat inner surface **156***a* and an arcuate outer face **156***b* which merges smoothly with a transversely disposed, forwardly facing surface **158**. Centrally of its outer end the hammer arm **152** is provided with a forwardly and outwardly opening slot **160**. That is to say the slot **160** opens forwardly and outwardly through the leading face of the outer end of the arm **152** bifurcating the rib **156**.

The tip **154**, as with the previously described replaceable tips, is fashioned for interfitting engagement with the outer end of the hammer arm. Thus it has its rear face relieved to define a rearwardly projecting rib **164**. The rib **164** is so formed as to present an outwardly facing surface **164***a*. The rear transverse face of the tip **154**, as indicated at **166** is formed to abut the transverse face **158** of the outer end of the arm **152**. Centrally of the rear surface of the tip **154** and projecting rearwardly therefrom for interfitting engagement with the arm slot **160** is a tongue **168**. Desirably the tongue **168** is integrally formed with the remainder of the tip **154**.

As shown in Fig. 8, the arm **152** has a longitudinal bore **170** therein axially slidable within which is a detent **172**. Detent **172** is adapted to be urged outwardly with respect to the arm bore **170** by means of a biasing spring in the same manner as the detents are urged outwardly by their biasing springs in the previously described illustrative forms.

The detent **172** is adapted to extend into the arm slot **160** for engagement with the tip of the tongue **168**. Thus the tip of the tongue is fashioned to define a forwardly facing shoulder **168***a*. When the detent **172** is in its extended position it is disposed forwardly of and in engagement with the tongue surface **168***a*, thereby preventing forward relative movement of the tip with respect to the hammer arm **152**.

The rear end of the tongue **168** is provided with a rearwardly projecting boss **168***b*. When the tip **154** is in installed position upon the hammer arm **152** with the tongue **168** received in the arm slot **160**, the tongue tip boss **168***b* is received in an opening **174** that extends rearwardly through the outer end portion of the arm **152** opening in its rear face. The opening **174** thus permits insertion of a suitable tool, such for example as a drift pin or similar device, to engage the inner end of the tongue and facilitate removal of the tip from the hammer arm.

As shown, the hammer arm **152** is provided with an access opening **176** that extends from its rear face into the bore **170** so that a suitable tool can be inserted to engage and withdraw the detent **172** against the action of its biasing spring. If desired, and as shown in Fig. 8, the arm can be provided with a transverse passage **178** for the reception of a pivot or fulcrum pin for use in conjunction with the tool that is inserted to withdraw the detent **172**. Thus the passage **178** is transversely disposed adjacent the rear face of the arm **152** and intersects the opening **176**. If desired, a suitable bushing **178***a* may be provided within the passage **167**.

The tip **154**, it will be seen, is adapted to be installed upon the outer end of the arm **152** in substantially the same manner as described for the preceding forms of the invention. Thus the tip tongue **168** is inserted within the arm slot **160** and is moved rearwardly and inwardly with respect to the arm **152** until the tongue tip boss **168***b* engages the forward end of the opening **174**. During such movement the tip rib **164** is moved into engagement with the arm rib **156** and the surfaces **156***a* and **164***a* are brought into juxtaposed relation. In this position the detent **172** moves outwardly, under the action of its biasing spring, into its locking position forwardly of the tongue shoulder **168***a*. In this position of the detent the tip is positively prevented from being moved forwardly with respect to the arm by means of

the detent, and outward movement of the tip **154** with respect to the arm **152** is prevented by engagement of the tip and arm rib surfaces **164***a* and **156***a*, and by engagement of the tip tongue boss **168***b* in the opening **174**. Removal of the tip however, can be readily effected simply by the insertion of a suitable tool through the opening **176** into engagement with the detent **172** and operation thereof to withdraw the detent. This permits relative forward movement of the tip with respect to the arm **152** with subsequent outward movement thereof to clear the tip tongue **168** from the arm slot **160**. Should the tip become jammed in its installed position, it can be readily loosened by the use of a drift pin or the like through the opening **174** as previously noted.

From the foregoing it will be seen that a hammer having a replaceable tip constructed and arranged so as to embody the teachings of the present invention has the tip positively retained in place upon the hammer arm and the means for accomplishing this end is entirely enclosed within the hammer. This construction and arrangement embodies no rivets, bolts, threaded pins, or the like, and permits of tip replacement with only the simplest of tools. It will be apparent, therefore, to one skilled in the art that tip replacement can be readily effected and without necessity for removal of the hammer from pulverizing device of which it forms a part. The construction and arrangement not only positively retains the replaceable tip in installed position with respect to the hammer arm and facilitates replacement thereof as may become necessary as a result of wear, but in addition embodies an exceedingly rugged construction permitting of economical manufacture as by casting, followed by a minimum of machine and assembly operations.

I claim as my invention:

1. An impact hammer for rotary pulverizers, comprising, in combination, an arm having leading and outer faces and having a slot opening into said leading and outer faces with a forwardly opening recess in the bottom of said slot, a tip complementally formed for interfitting engagement with said arm at the outer end thereof, a tongue rigid with said tip and projecting rearwardly therefrom for insertion in said arm slot, a head on said tongue complementally formed for reception in said recess and defining a forwardly facing shoulder, and detent means disposed within said arm and extending into said slot for engagement with said shoulder to hold said tongue head in said recess and said tip in installed position upon said arm.

2. An impact hammer for rotary pulverizers, comprising, in combination, an arm having leading and outer faces and having a slot opening into said leading and outer faces with a forwardly opening recess in the bottom of said slot, a tip complementally formed for interfitting engagement with said arm at the outer end thereof, a tongue rigid with said tip and projecting rearwardly therefrom for insertion in said arm slot, a head on said tongue complementally formed for reception in said recess and defining a forwardly facing shoulder, detent means disposed within said arm and extending into said slot for engagement with said shoulder to hold said tongue head in said recess and said tip in installed position upon said arm, and means including a lever accessible through one face of said arm and engaging said detent means for withdrawing the same from engagement with said shoulder to release said tip for removal from said arm.

3. An impact hammer for rotary pulverizers, comprising, in combination, an arm having leading and outer faces and having a slot opening into said leading and outer faces with a forwardly opening recess in the bottom of said slot, a transverse rib rigid with and extending forwardly from the leading face of said arm adjacent the outer end thereof, a tip having a transverse groove in the rear face thereof of complemental shape to said arm rib for interfitting engagement therewith, a tongue rigid with said tip and projecting rearwardly therefrom for insertion in said arm slot, said tongue terminating at its outer end in a head for reception in said recess and defining a forwardly facing shoulder, and spring biased detent means disposed within said arm and extending into said slot for engagement with said shoulder to hold said tongue head in said recess and said arm rib and tongue groove engaged whereby said tip is positively retained in installed position upon said arm.

4. An impact hammer for rotary pulverizers, comprising, in combination, an arm having a slot in the outer end thereof with a recess in the bottom of said slot, a tip complementally formed for interfitting engagement with said arm at the outer end thereof, a tongue rigid with said tip and projecting therefrom for insertion in said arm slot, a head on said tongue complementally formed for reception in said recess and defining a shoulder, said arm having a longitudinal bore therein opening into said slot, a detent axially slidable in said bore, and a spring within said bore biasing said detent into said slot for engagement with said shoulder to hold said tongue head in said recess and said tip in installed position upon said arm.

5. An impact hammer for rotary pulverizers, comprising, in combination, an arm having leading, rear, side and outer faces and having a slot opening into said leading and outer faces with a forwardly opening recess in the bottom of said slot, a tip complementally formed for interfitting engagement with said arm at the outer end thereof, a tongue rigid with said tip and projecting rearwardly therefrom for insertion in said arm slot, a head on said tongue complementally formed for reception in said recess and defining a forwardly facing shoulder, said arm having a longitudinal bore therein opening into said slot, a detent axially slidable within said arm bore, a biasing spring in said bore urging said detent into said slot for engagement with said shoulder to hold said tongue head in said recess and said tip in installed position upon said arm, said arm having a second slot therein opening in one of the faces thereof and in said bore and a lever pivoted within said second slot and having one end accessible exteriorly of said arm and the other end of said lever engaging said detent for withdrawing the same against the action of said spring and from engagement with said shoulder to release said tip for removal from said arm.

6. An impact hammer for rotary pulverizers, comprising, in combination, an arm having leading, rear and outer faces and having a slot opening into said leading and outer faces with a forwardly opening recess in the bottom of said slot, a pair of transversely disposed spaced ribs rigid with and extending forwardly from the leading face of said arm adjacent the outer end thereof, a tip having a pair of transverse grooves in the rear face thereof of complemental shape to said arm ribs for interfitting engagement therewith, a tongue rigid with said tip and projecting rearwardly therefrom for insertion in said arm slot, said tongue terminating at its outer end in a cross-head for reception in said recess and defining forwardly facing shoulders, said tip grooves, tongue, cross-head and cross-head shoulders being symmetrically disposed about central vertical and transverse planes for alternative positioning of said tip with respect to said arm, spring biased detent means disposed within said arm and extending into said slot for engagement with the juxtaposed one of said cross-head shoulders to hold said cross-head in said recess and said arm ribs and tongue grooves engaged whereby said tip is positively retained in one or the other of its alternative positions upon said arm.

7. An impact hammer for rotary pulverizers, comprising, in combination, an arm having leading and outer faces and having a slot opening into said leading and outer faces with a forwardly opening recess in the bottom of said slot, a transverse rib rigid with and extending for-

wardly from the leading face of said arm adjacent the outer end thereof, said rib having a flat inner surface and an arcuate outer surface, a tip having a transverse groove in the rear face thereof having a flat outwardly facing surface and an arcuate inwardly facing surface and complemental to said arm rib surface for interfitting engagement therewith, a tongue rigid with said tip and projecting rearwardly therefrom for insertion in said arm slot, said tongue terminating at its outer end in a head for reception in said recess and defining a forwardly facing shoulder, spring biased detent means disposed within said arm and extending into said slot for engagement with said shoulder to hold said tongue head in said recess and said arm rib and tongue groove engaged whereby said tip is positively retained against both forward and outward movement with respect to said arm.

8. An impact hammer for rotary pulverizers, comprising, in combination, an arm having a leading face, a transverse rib extending forwardly with respect to said leading face adjacent the outer end thereof, a removable tip formed for interfitting engagement with the outer end of said arm and said rib and having a portion engageable with said rib and also providing a forwardly facing surface spaced rearwardly thereon, and spring biased detent means carried by said arm and engageable with said forwardly facing surface of said tip when the latter is in fully installed position upon the outer end of said arm for positively holding said arm and tip in assembled relation.

9. An impact hammer for rotary pulverizers comprising, in combination, an arm having leading and trailing

faces with an extension on the outer end thereof, a transverse rib rigid with and projecting forwardly from said leading face adjacent the outer end thereof defining an inwardly facing surface, a second forwardly projecting rib adjacent said trailing face and defining an inwardly facing surface, a removable tip having its inner surface hollowed out for the reception of said arm extension therein, a rib adjacent each of the forward and rear inner marginal edge portions of said tip and defining outwardly facing surfaces for alternative engagement with said inwardly facing arm rib surface, said tip further having leading and trailing impact surfaces with each having a recess therein for the alternative reception of said second rib and providing an outwardly facing surface for engagement with said inwardly facing surface of said second rib, detent means carried by said arm and engageable between said arm extension and the rib adjacent the rear marginal edge portion of said tip holding said tip and arm against relative movement with said second arm rib within the tip recess in its trailing surface and the inwardly facing surface of said first arm rib in engagement with the outwardly facing surface of the tip rib adjacent the leading inner edge portion thereof.

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