Sept. 21, 1943. O. PHIPPS 2,330,081

MINING MACHINE BIT

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Fig. 1.

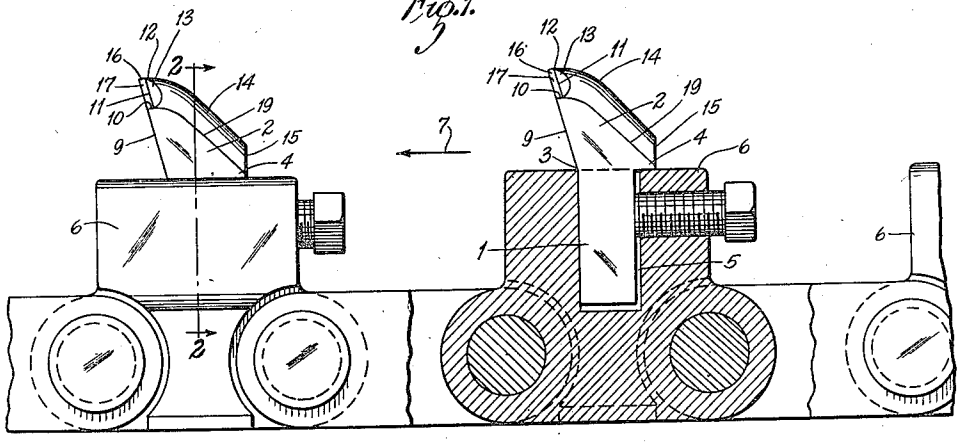
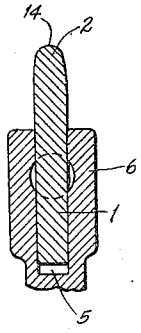


Fig. 2.



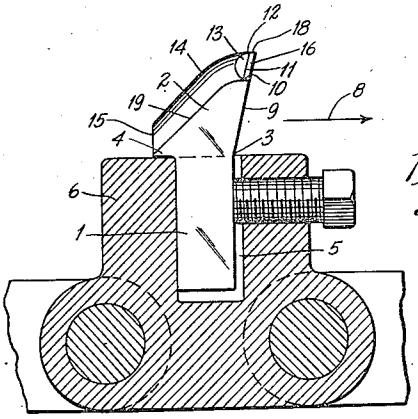


Fig. 3.

Fig. 4.

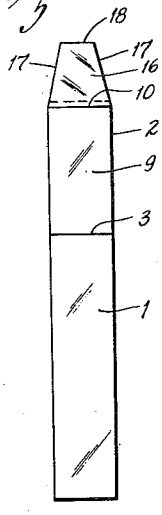


Fig. 5.

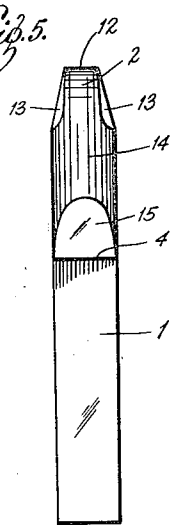


Fig. 6.

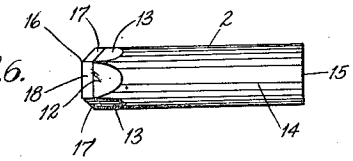
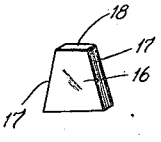


Fig. 7.



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Fig. 8.

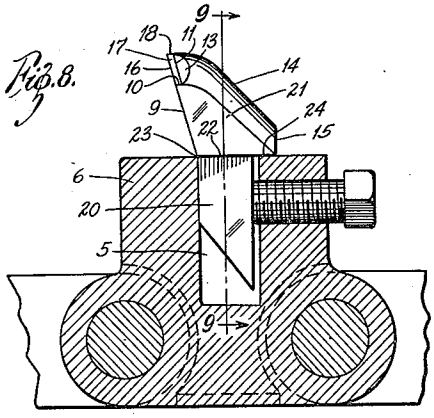


Fig. 9.

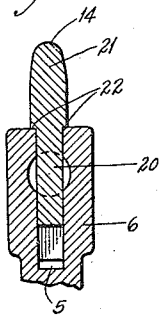


Fig. 10.

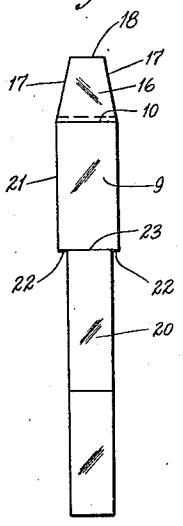
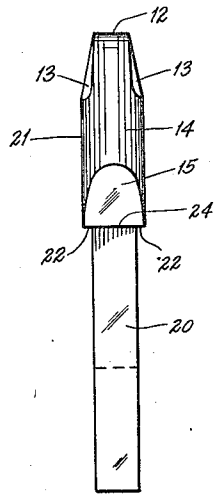


Fig. 11.



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2,330,081

MINING MACHINE BIT

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Application April 23, 1943, Serial No. 484,142

5 Claims. (Cl. 262—33)

This invention relates to mining machine bits; and has special reference to a type of cutting bits sometimes called undercutting bits, which are for attachment to the lugs of endless power-driven cutter chains.

Objects of the invention are to provide an improved unitary or one-piece cutting bit comprising a body composed of an electric steel casting or drop forging and including a shank to be received in the chain lug socket, and a head integral with the shank and having alined shoulders at its front and rear sides for engaging against the outer wall of the chain lug at the front and rear sides of the socket into which the shank extends, and having a forwardly inclined wall extending from the front shoulder toward the outer end of the head; to provide a very hard synthetic metallic alloy insert in the form of a cutting blade or point located within a recess in the front side of the outer end of the head and having its front surface in alinement with said inclined wall and having its side cutting edges tapering or converging outwardly toward the outer end of the head and flush or in alinement with converging side edges of the head and terminating at and intersecting the outer end cutting wall of said insert which has a lateral width or length approximately equal to one-half of the thickness of the head at the opposite end of said insert; and to provide a bit structure in which the stresses and strains to which the cutting point or end of the bit is subjected when in use are imparted to the rear shoulder that engages against the outer surface of the chain lug at the rear of the socket into which the bit shank extends.

Another object of the invention is to provide an improved unitary or one-piece metallic undercutting bit having the form and arrangement defined in the preceding paragraph and in which the metallic synthetic alloy insert possesses substantially the hardness of diamonds and is welded or otherwise integrally attached to the head of the bit body within the recess provided for said insert and having its side and outer end walls alined with flat side and outer end walls of the head so that, when the end of the bit head becomes worn during use thereof, or when the insert becomes detached, dulled or damaged, it may be removed and the said flat side and outer end walls reformed by grinding and a new insert welded to the head within said recess in substitution for the one that had been removed, thus enlarging and extending the time during which the bit may be used much longer than the time during which bits of other constructions may be used.

Another object of the invention is to provide a metallic undercutting bit adapted to be detachably secured to the lug of an endless chain having a novel type and form of cutting blade integrally but detachably and replaceably secured within a recess in the outer end portion of the bit head and having three cutting edges of substantial length and width alined with the adjacent flat walls of the bit head.

Other objects of the invention will be apparent from the following description, reference being made to the annexed drawings, in which—

Fig. 1 is a side elevation of a portion of an endless mining machine chain having my improved bit attached thereto, one of said lugs being in section.

Fig. 2 is a cross-sectional view through the bit and a portion of the chain lug on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view of a chain lug similar to the sectional view of the lug shown in Fig. 1, showing the bit in reversed position in the lug for undercutting when the chain is moved in the opposite direction from the movement of the chain when the parts are arranged as in Fig. 1.

Fig. 4 is an enlarged front side elevation of the bit detached from the lug.

Fig. 5 is a rear elevation.

Fig. 6 is an outer end plan view of the bit.

Fig. 7 is a perspective view of the hard metallic synthetic alloy insert having three relatively long and wide cutting edges, before said insert is attached to the bit body.

Fig. 8 is a sectional view of a chain lug showing a bit of modified construction.

Fig. 9 is a sectional view on the line 9—9 of Fig. 8.

Fig. 10 is an enlarged front side elevation of the bit of Fig. 8 apart from the chain.

Fig. 11 is a rear side elevation of the bit.

As shown in the drawings, one specific form of my improved unitary or one-piece metallic cutting bit has a body composed of an electric steel casting and including a shank 1, a head 2 integral with the shank and having a shoulder 3 at and extending across its front side at the union of the shank and head, and a shoulder 4 at and projecting stubstantially beyond the rear side of the shank at the union of the head and shank. The shank 1 is arranged to extend into the socket 5 of the chain lug 6. The shoulders 3 and 4 are relatively alined so that both engage against the outer wall of the chain lug at the front and rear

sides of the socket 5 when the bit is properly mounted on the lug. The shank 1 has a thickness approximately equal to the width of the socket 5 transversely of the lug, and has a width in the opposite direction slightly less than the width of the socket in the plane of the movement of the chain, as indicated by the arrow 7 (Fig. 1), or as indicated by the arrow 8 (Fig. 3).

In order to attain its several advantages and objects, the head 2 of this bit is made of novel construction and form. It has a forwardly inclined wall 9 extending from the front shoulder 3 toward the outer end of the head and terminating at the end wall 10 of a recess 11 formed in the front side of the outer end of the head. From the end wall 10 to the flat outer end wall 12 of the head, two flat walls 13 converge to intersection with said flat wall 12. The transverse width of the flat wall 12 when seen from the front or rear of the bit is about one-half of the thickness of the head of the bit, more or less.

From the rear end of the flat outer end wall 12, the head of the bit includes a symmetrically formed rounded rearwardly and inwardly inclined end wall 14, which facilitates movement of the bit through the mineral cuttings when the chain is moved to provide such cuttings. The rounded end wall 14 extends to intersection with the end wall 15 of the rear shoulder 4.

A very hard synthetic metallic alloy insert constituting a cutting blade or point 16 is fitted in the recess 11 with its inner end seated on and against the end wall 10 of said recess, its outwardly converging side walls 17 even and in alinement with the two flat walls 13, and its outer end wall 18 even and in alinement with the flat outer end wall 12 of the bit head. The cutting blade 16 is integrally attached to the end of the bit by welding so as to dispense with the use of screws, clamps, or other equivalent fasteners. The front surface of the cutting blade 16 is in the same inclined plane with the wall 9 which inclines rearwardly and inwardly to the outer wall of the lug 6. The sides of the head 2 are flat, and are parallel with each other from the shoulders 3 and 4 to the lines 19 extending from the end wall 18 to the end wall 10 of the recess 11 and along the inner sides of the two flat walls 13. The lines 19 are parallel with each other and with the outer and rear edge of the head defined by the rounded end wall 14.

When the end of the head 2 defined by the flat outer end wall 12 becomes worn, and the cutting blade 16 becomes worn or damaged, the said worn or damaged cutting blade may be detached from the head 2 by breaking the weld by which said blade is attached to the head; and the head 2 may be ground across the front to extend the length of the recess 11 that had been shortened by wearing away of the end of the head; and may be ground at both sides to form two flat side walls like the original flat walls 13, and also ground to form a flat outer end wall like the original flat outer end wall 12; and then a new or substitute cutting blade 16 may be welded in connection with the reshaped and reground bit head in substitution for the one that had become worn and damaged and had been removed. This considerably extends the usefulness of the bit for a longer period of time than the useful period of any unitary bits with which I am familiar. The bits may thus be repaired at the mines and the cost of operation correspondingly reduced, a facility that has long been desired and sought.

The modified specific form of metallic cutting bit shown in Figs. 8 to 11, inclusive, has the shank 20 provided for the same purpose as the shank 1, and the head 21 of greater transverse thickness than the transverse thickness of the shank 20, thus providing two side shoulders 22 in alinement with each other and in alinement with the front shoulder 23 and rear shoulder 24. All of the shoulders 22, 23 and 24 engage against the outer wall of the chain lug 6 when the shank 20 is extended into the socket 5 of the lug. The remaining structural features of the head of this form of bit are the same as the structural features of the bit first described, are for the same purpose, and have the same reference numerals applied thereto in the drawings.

Either form of bit may be mounted in reverse position in the chain lug, as shown in Figs. 1 and 3, so that the clamping set screw 25 may engage the rear side of the bit shank when the chain is moved in the direction of the arrow 7 (Fig. 1), or may engage the front side of the bit shank when the chain is moved in the direction of the arrow 8 (Fig. 3).

In both specific forms of the bit, the front or exposed corners of the cutting blade formed by intersection of the two elongated side walls 17 and by intersection of the outer end wall 18 with the front wall of the cutting blade, are the cutting edges of the blade and bit. The bit does not extend into the solid mineral; that is, the bit does not and is not intended to cut into the solid mineral deeper or to a further extent than the length of the cutting blade 16. Thus, the corners of the bit head formed by intersection of the flat side walls 13 with the inclined wall 9 do not cut into the solid mineral through which the bit is operated. The arrangement is such that the cutting blade 16 defines the depth or thickness of the cutting and is long enough to perform the entire cutting operation; that is to say, such cutting operation may be performed by said cutting blade only throughout the entire length of the cutting edges or corners formed by intersection of the side walls 17 with the front wall of the blade.

When either specific form of the bit is equipped with a new cutting blade in substitution for one that had been worn or damaged and detached from the head, the relationship of the cutting blade with other cooperative features of the head is not undesirably affected or changed to any appreciable extent. The inclined rounded end wall 14, which is rearwardly beyond the flat outer end wall 12 and rearwardly beyond the two converging flat walls 13, does not become worn to any appreciable extent even though the end of the bit head defined by said end wall 12 and the end 18 of the cutting blade 16, and the side walls 17 of the blade and the converging flat walls 13 of the head, become worn to such an extent that the length and width of the cutting blade are substantially reduced or lessened. These structural features of the bit head are arranged and formed in such a manner that a new cutting blade may be substituted for one that had become worn or damaged, or for one that had become accidentally detached, to restore the bit to a condition for further and much longer use.

The synthetic metallic alloy insert 16 is defined and known as "tungsten-titanium carbide," corresponding to the chemical formula $WTiC_2$, produced by powder metallurgy. This alloy is fine grained and is "crater resistant," having compression strength of 690,000 pounds per square inch and a Rockwell hardness of 90.6. The insert

is welded or brazed on the bit head. It cuts through the hardest minerals and is much less subject to wear than other cutting blades or bit heads with which I am familiar.

It is now known that this type of bit is practicable; may be manufactured at quite low and permissible cost; may be used for much longer periods of time than other known unitary or one-piece bits; and appreciably lowers the cost of mine operation. These advantages and savings have long been desired and unsuccessfully sought by other expedients. Heretofore, when the unitary or one-piece bits became worn, it was impossible to provide or equip them with hard cutting blades or to regrind them so as to extend their life very appreciably.

I claim:

1. In a mining machine metallic cutting bit having a shank for attachment to a chain lug, and a head integral with the outer end of said shank beyond the lug to which the shank is attached; alined front and rear shoulders at the front and rear of the bit extending forwardly and rearwardly beyond said shank at the union of the head shank for engaging against the outer wall of the chain lug, a front wall inclining forwardly from said front shoulder toward the outer end of the head, a recess in and across the entire front side of the outer end portion of the head outwardly beyond said front wall, two flat outwardly converging side walls at the outer end portion of said head at the two sides of and extending the length of said recess, a flat outer end wall at the outer end of said head, and a cutting blade fitted in said recess and having its front surface in alinement with said inclined wall and having two side walls and an outer end wall alined with said flat side walls and flat end wall of said head respectively.

2. In a mining machine metallic cutting bit having a shank for extension into a socket in a chain lug, and a head integral with the outer end of said shank beyond the lug into which said shank extends; said head having a recess in and across the entire front side of the outer end portion thereof, a front wall inclining forwardly from the plane of union of said shank and head to said recess, two flat outwardly converging side walls at the outer end portion of said head at the two sides of and extending the length of said recess and to the outer end of said head, a flat outer end wall at the outer end of said head intersecting said flat side walls and the rear wall of said recess, and a cutting blade integrally attached to said head in said recess and having its front surface in alinement with said inclined wall and having its two side walls and its outer end wall alined with said flat side walls and said flat end wall of said head respectively.

3. In a mining machine metallic cutting bit having a shank for extension into a socket in a chain lug, and a head integral with the outer end of said shank beyond the lug into which said shank extends; a front wall inclining forwardly from the plane of union of said shank and said head, a flat outer end wall at the outer end of said head extending parallel with the line of union of said shank and said head, two flat outwardly converging side walls at the outer end portion of said head intersecting said flat outer end wall, said head having a recess in its front side extending the full length of said flat side walls and terminating at said front wall, and a hard synthetic metallic alloy cutting blade integrally attached to said head in said recess and having its side walls and outer end wall in the same plane with said flat side walls and said flat end wall of said head respectively.

4. In a mining machine metallic cutting bit having a shank for extension into a socket in a chain lug, and a head integral with the outer end of said shank beyond the lug into which said shank extends, said head having a recess in the front side of its outer end portion; a front wall inclining forwardly from the plane of union of said shank and said head to said recess, a flat outer end wall at the outer end of said head intersecting the rear wall of said recess and extending approximately parallel with the line of union of said shank and said head, two flat outwardly converging side walls at the outer end portion of said head and at the sides of said recess intersecting said flat outer end wall and leaving the width of said outer end wall approximately one-half the thickness of said head, a rearwardly and inwardly inclined rounded wall on said head extending from the rear sides of said flat side walls and said flat end wall to the rear side of the head, and a hard synthetic metallic alloy cutting blade integrally united with said head in said recess and having its side walls and outer end wall in the same plane with said flat side walls and said flat end wall of said head respectively, and cutting edges at the intersection of the side walls and end wall of said cutting blade with the front wall thereof.

5. As an article of manufacture, a mining machine metallic cutting bit having a head provided with a recess its its front side extending inwardly from its outer end, a flat outer end wall extending rearwardly from said recess, a rear wall inclining inwardly and rearwardly from said flat wall at the outer end of said head and having its sides extending to the sides of the inner end of said recess, two flat outwardly converging side walls at the outer end portion of said head intersecting said flat outer end wall and extending to the inner end of said recess, and a hard synthetic metallic alloy cutting blade attached to said head in said recess and having its outer end wall and side walls in the same plane with said flat end wall and said flat side walls of said head respectively.

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