This invention relates to teeth or bits for removable and replaceable association with and to function as the cutting elements of power-driven endless chains constituting the scarf-forming agencies of conventional mining machines, and has as an object to provide an improved construction and association of elements constituting such a tooth or bit.

A further object of the invention is to provide an improved bit adapted for removable, replaceable, and reversible operative association with and as a cutting element of the successive lugs in a chain-type, mining machine cutter assembly.

A further object of the invention is to provide an improved operating head conformation in a mining machine bit, whereby certain disadvantages of hitherto-known bits are obviated to enhance the practical utility of otherwise conventional cutter assemblies.

A further object of the invention is to provide an improved cooperative relationship of special alloy insert with the head of a mining machine chain bit or tooth, whereby the operative security and durability of the assembly is enhanced and manufacture of the unit is conveniently simplified.

A further object of the invention is to provide an improved multiple-insert construction for mining machine cutter assembly bits, whereby the efficiency and operative dependability of such bits is extended.

A further object of the invention is to provide an improved cutter bit conformation and construction adapted for practical development in bits of varying sizes and specific mounting characteristics; which is simple, inexpensive, and practical of manufacture; which is efficiently long-lived in use; and which is susceptible of simple and convenient repetitive rehabilitation throughout a long period of actual operative utility.

With the foregoing and other objects in view, my invention consists in the construction, arrangement, and combination of elements hither-inset forth, pointed out in my claims and illustrated by the accompanying drawing, in which—

Figure 1 is a side elevation, partially in section, of adjacent units of a conventional cutter assembly chain in operative association with alternative forms of the instant invention. Figure 2 is a section similar to the right-hand showing of Figure 1 illustrating a reversed position of the associated bit. Figures 3 and 4 are side elevations, on an enlarged scale, of the bits shown in Figure 1 separate and apart from their operative mountings. Figure 5 is a forward or leading edge elevation of the construction shown in Figure 4. Figure 6 is a trailing edge elevation of the construction according to Figure 4. Figure 7 is a face elevation of the special alloy insert employed to complete the improved bit unit as shown.

Certain types of mining machines extensively in use are characterized by a cutter assembly wherein an endless chain equipped with outwardly projecting teeth or bits is power driven for travel about and between fixedly-related axes for the development of a continuous scarf or cut within and through the material to be mined; the specific tooth or bit arrangement of a given cutter assembly varying in particular instances in accordance with the nature of the material to be intersected and the open width of the desired scarf. In the operation of machines of the type noted, the leading edges or margins of the bits or teeth accomplish the actual cutting as they are moved along and in pressure engagement against the face to be intersected and are hence subject to rapid wear and deformation, particularly when the material operated upon is highly-refractory in character, for which reason it has become general practice to mount the bits or teeth for convenient removal and replacement. Further, the exposure of the bit or tooth leading margins to rapid wear has inspired the use of highly wear resistant special alloy inserts in fixed relation with and to function as the bit or tooth leading edges, but the hitherto-known insert-type removable and replaceable cutter assembly bits have presented certain shortcomings in respect of their convenience of removal and replacement, the permanence and security of their insert mountings, and the operative dependability in the event of leading edge damage, and the improvements of the instant invention are hence directed to the overcoming and obviating of such deficiencies.

In the drawing, a fragment of a conventional cutter chain is shown as comprising chain links 10, of any operatively suitable specific construction, hingedly connecting between a succession of like bit-mounting blocks 11 thereby uniformly spaced apart along the entire length of and for travel with the chain assembly. The blocks 11 are formed and mounted to project outwardly beyond the associated chain links 10 when the chain assembly is operatively disposed, and each of said blocks is formed with a cross-sectionally angular bore or socket 12 which opens through
and centrally of the block outer end in perpendicular relation with the chain link axes and preferably extends entirely through the block, a bolt 13, or comparable clamping element, threadedly engaging through an outwardly-projecting side portion of the block 11 and in alignment with the path of chain travel for adjustable extension of its inner end within the bore or socket 12. The construction and cooperative association of the elements 10, 11, 12 and 13, as shown and described, is but representative of conventional chain assemblies commonly in use and por-

ures 1 and 2, the shoulder 16 effectively accomplishes its purposes as above set forth regardless of the head portion 15 directional disposition relative to the associated bolts 13, it being wholly immaterial whether said bolt intersects the leading or trailing end of the chain assembly travel, of its associated block 11. Similarly, forward margins of the head portion 15 and shank 14 are parallel and relatively offset, a plane perpendicular to said forward margins in parallel, offset relation with the plane definitive of the forward margin of the head portion within the block bore or socket with a minimum of pressure or strain on the bolt end therewith engaged. As is clear from a comparison of FIG.

ures 1 and 2, the shoulder 16 effectively accomplishes its purposes as above set forth regardless of the head portion 15 directional disposition relative to the associated bolts 13, it being wholly immaterial whether said bolt intersects the leading or trailing end of the chain assembly travel, of its associated block 11. Similarly, forward margins of the head portion 15 and shank 14 are parallel and relatively offset, a plane perpendicular to said forward margins in parallel, offset relation with the plane definitive of the forward margin of the head portion within the block bore or socket with a minimum of pressure or strain on the bolt end therewith engaged. As is clear from a comparison of FIG.

ures 1 and 2, the shoulder 16 effectively accomplishes its purposes as above set forth regardless of the head portion 15 directional disposition relative to the associated bolts 13, it being wholly immaterial whether said bolt intersects the leading or trailing end of the chain assembly travel, of its associated block 11. Similarly, forward margins of the head portion 15 and shank 14 are parallel and relatively offset, a plane perpendicular to said forward margins in parallel, offset relation with the plane definitive of the forward margin of the head portion within the block bore or socket with a minimum of pressure or strain on the bolt end therewith engaged. As is clear from a comparison of FIG.

ures 1 and 2, the shoulder 16 effectively accomplishes its purposes as above set forth regardless of the head portion 15 directional disposition relative to the associated bolts 13, it being wholly immaterial whether said bolt intersects the leading or trailing end of the chain assembly travel, of its associated block 11. Similarly, forward margins of the head portion 15 and shank 14 are parallel and relatively offset, a plane perpendicular to said forward margins in parallel, offset relation with the plane definitive of the forward margin of the head portion within the block bore or socket with a minimum of pressure or strain on the bolt end therewith engaged. As is clear from a comparison of FIG.
such insert block or wafer being illustrated by Figure 7 and designated by the numeral 18. The special alloy insert or inserts comprising the bit of the instant invention are relatively thin, homogenous blocks having coplanar front and rear surfaces and side margins conforming to, or conforming to within the transverse outline of the bit head portion 15 outer or working margin. Such inserts have been heretofore employed in fixed association with mining machine cutter bits, but an important novelty of the improved bit resides in the particular arrangement utilized for mounting and permanently associating one or more such inserts in operative relation with the bit head portion 15. As is clearly shown in the drawing, a rectangular slot having a width sufficient to freely accommodate the thickness of an insert block 18 is formed transversely of and entirely across the outer leading corner of the head portion 15 at a slight inward inclination with and toward the Shank 14, in such manner as to open outwardly and forwardly through the head portion leading outer corner head portion to intersect and thereby bound said head portion and to extend inwardly of the head portion beyond the line of intersection with said forward margin a considerable distance to form a wedge-like lip 19 as an outwardly-directed termination of the head portion forward margin. With the transverse slot intersecting the head portion outer leading corner in the relationship shown and set forth, the base of an insert block 18 is fitted within the slot inner portion between the lip 19 and the opposed head portion outer corner head portion to form the rearward portion of the block 18, closing against the inclined longer or rearward face of the slot, and the said block is securely welded or brazed to the head portion and lip surfaces and margins with which it is in contact to permanently fix the block to the bit head portion with a slight position rake or bit angle and with the major portion of its forward face exposed in the direction of cutting travel, the base of said block being anchored behind the lip 19 to enhance the security of such mounting and to brace the block 18 in such manner, to bit rock in a manner which might disrupt the mounting bond. The particular welding or brazing technique employed to secure the block 18 in mounted association with its bit head portion may vary throughout the full range of acceptable practice, the modified socket type of insert block mounting facilitating use of a technique wherein thin sheets or laminations of suitable fusible metals may be interposed between the adjacent block and head portion surfaces and heat-bonded into connection of said surfaces. The forward face of the mounted block 18 is laterally traversed by the outer margin of the lip 19, the line of junction therebetween being closed by the welding or brazing operation, so that cuttings moving along the exposed portion of the inclined block outer face are deflected to travel along the head portion forward margin and past the shoulder 17 in a manner which minimizes, if not wholly obviates, any tendency of said cuttings to enter the block socket 12 or to pack between the block outer end and bit forward margin.

It is usual practice and safety of working end of the bit head portion 15 is transversely rounded or otherwise contoured for effective cutting action and is accurately rearwardly inclined so that its leading, block armed corner is advanced outwardly of the block 11 well beyond its trailing outer corner, thus insuring clearance of the head portion within the scarf being developed, and the side margins of the mounted insert block 18 are ground to merge smoothly with the adjacent head portion surfaces and to provide sharply angular forward corners or margins bounding the exposed face of the block and directed forwardly in the line of chain assembly travel against the material to be cut.

As is exemplified in Figures 1 and 3, a second transverse slot, similar to and paralleling the slot intersecting the head portion outer leading corner, may be formed in and to open through the outer margin of said head portion for the reception and fixed accommodation of a second special alloy block 18', substantially identical with the block 18, welded or brazed within its slot adjacent and rearwardly of the head portion 15 from the block 18. Exposed side and end margins of the second insert block 18' are ground into smooth conformity with the adjacent head portion surfaces so that said second insert block is positioned and disposed as a cutting element auxiliary to the block 18 and is thereby available to take up the cutting functions of the block 18 in the event of such damage to the latter as results in exposure of the block 18' cutting edges to contact with the material being worked, thereby reducing the frequency and minimizing the necessity for removal and replacement of damaged bit units.

As should be obvious from the foregoing, the improved bit is characterized by a useful life exceeding that of bits heretofore in use, since the seating of the forward insert block inner end and forward margin on the rock or rock-like blocks to the security of block mounting to forestall separation of the block from its operating association with the bit head portion, the provision of the auxiliary block 18' operates to continue the cutting function of the bit after damage to or loss of the block 18, and dressing of the head portion contours by means of simple grinding results in rehabilitation of the insert block cutting margins after margin-deforming wear. Further, provision of the shoulders 16 and 17, and the non-coplanar relation of the head portion forward margin with the insert block forward face, as developed in the improved bit, serve to enhance the efficiency of the tool in actual use and to speed the interchange or adjustment of the bits, all as heretofore elaborated and fully set forth.

Since many changes, variations, and modifications in the form, construction, and interrelation of the elements shown and described may be had without departing from the spirit of my invention, I wish to be understood as being limited solely by the scope of the appended claims, rather than by any details of the illustrative showing and foregoing description.

I claim as my invention:

1. A mining machine cutter bit comprising integrally-related head and shank portions of tractable metal, a head portion forward margin substantially perpendicular to the path of bit travel, a slot transversely of and obliquely intersecting the head portion outer leading corner to open outwardly therefrom in intersecting relation with said head portion forward margin, an insert block of hard, abrasive-resistant, alloy material fixed in and to fill said slot with its exposed forward surface angularly cooperating with the adjacent head portion forward margin and its edges smoothly conforming with the adjacent head portion surfaces, a second slot rearwardly adjacent and paralleling said first slot to open
through the head portion free end, a second insert block of alloy material fixed in and to fill said second slot with its edges smoothly conforming with the adjacent head portion surfaces, a right-angular shoulder determinative of bit mounting shank penetration defining the head and shank portion junction on the bit trailing side, and a similar shoulder paralleling and offset toward the head portion free end from the plane of said first shoulder terminating the head portion forward margin inwardly of the bit.

2. In a mining machine cutter bit having integrally-associated head and shank portions, a slot laterally traversing and opening obliquely outwardly and forwardly through the head portion outer leading corner, a head portion forward margin substantially perpendicular to the path of bit travel angularly intersecting and foreshortening the slot forward wall, a hard, abrasive, resistant, alloy insert block fixed in and to fill said slot with its outer, forward face portion exposed beyond and in angular relation with said head portion forward margin, a second slot rearwardly paralleling and adjacent said first slot in intersecting relation with the head portion free end, a second alloy insert block fixed within and to fill said second slot, and bit mounting means effective to space the head portion forward margin inner termination outwardly from an adjacent mount surface.

3. In a mining machine cutter bit, a head portion, a hard, abrasive-resistant, alloy insert block fixedly slot-seated to laterally traverse and extend obliquely of the head portion outer leading corner, and a second alloy insert block fixedly slot-seated transversely of the head portion outer end in rearwardly-adjacent parallelism with said first block.

ORVILLE PHIPPS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,908,161</td>
<td>Meutsch</td>
<td>May 9, 1933</td>
</tr>
<tr>
<td>2,330,981</td>
<td>Phipps</td>
<td>Sept. 21, 1943</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>705,133</td>
<td>France</td>
<td>Mar. 3, 1931</td>
</tr>
</tbody>
</table>

OTHER REFERENCES