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3,454,118  
REAMER

Claude C. White, 3912 Cababa Road,  
Birmingham, Ala. 35243

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1 Claim

## ABSTRACT OF THE DISCLOSURE

A mine roof reamer including a rotatable shaft, a ram member within the shaft, the shaft being movable longitudinally with respect to the ram member, a wedge carried by a terminal of the ram member, blade elements having cutting members fixed to a terminal of the rotatable shaft and having the upper ends thereof in sliding engagement with the wedge, the blade elements being urged progressively outwardly by the wedge into reaming engagement with the roof inwardly thereof for forming a conical opening to receive an expansion shell carried by a mine roof bolt.

This invention relates to a reamer particularly adapted for forming conical openings in mine roofs for the reception of expansion shells carried by mine roof bolts.

### Background and objects

Attempts have been made over the years to develop a reamer capable of forming a conical opening in a mine roof complementing the shape of a roof bolt expansion shell. Up to the present time, these attempts have been unsuccessful due to the inability of the cutting members of the reamer to withstand the forces exerted thereon without permanent distortion thereof during the reaming operation.

It is an object of this invention to provide a reamer for forming a conical opening in a mine roof adapted to receive an expansion shell engaged with a roof bolt, the reamer including blade elements capable of withstanding the distorting forces exerted thereon upon rotation and reaming engagement with the mine roof.

Another object is to provide a reamer of the character described wherein the blade elements are constructed of a material having a high yield point to effect restoration of the blade elements to their initial position upon completion of the reaming operation.

A further object is to provide a reamer having blade elements equipped with cutting members detachably engaged with the blade elements to facilitate ready replacement thereof as required.

Other objects of the invention will be manifest from the following description of the presently preferred form of the invention taken in connection with the appended drawing, wherein:

FIGURE 1 is an elevational view of the reamer of the present invention, portions thereof being shown in section to illustrate details of construction;

FIGURE 2 is a fragmentary elevational view of the reamer of the present invention from the position indicated by the line 2—2 of FIGURE 1, looking in the direction of the arrows, a portion thereof being shown in section;

FIGURE 3 is a longitudinal sectional view of the reamer of the present invention illustrating its use and showing the blade elements thereof in fully extended position;

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 1, looking in the direction of the arrows; and

FIGURE 5 is a sectional view taken along the line 5—5 of FIGURE 1, looking in the direction of the arrows.

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Referring now in greater detail to the drawing, the reamer of the present invention includes a tubular shaft 10, the lower end of which is connected to a conventional drill (not shown) for rotating the reamer in a well-known manner. The upper terminal of tubular shaft 10 is reduced and externally threaded as indicated at 12. A bifurcated member generally designated 14 is threadedly engaged with threaded portion 12 of tubular shaft 10.

Bifurcated member 14 includes a lower cylindrical section 16 which is threadedly connected to portion 12 of tubular shaft 10.

Cylindrical section 16 issues into upwardly extending, substantially flat blades 18 which are in opposed relationship and are provided at the upper end with forked portions 20 forming a bit pocket or recess 22.

Each pocket 22 is adapted for the reception of a cutting bit which includes a shank 26 which complements pocket 22, the shank issuing into a body portion 28, the inner surface of which is angular as indicated at 30. The outer surface of the bit body portion is provided with a lateral cutting edge 32 and an upwardly directed cutting edge 34. A setscrew 36 extends through one element of fork portion 20 into retaining engagement with shank 26 of cutting bit 24 to normally hold the same in position. Setscrew 36 also facilitates removal and replacement of cutting bit 24 when necessary.

It is a salient feature of the present invention to provide a bifurcated member 14 which is made of a material having a very high yield point in the order of 250,000 pounds per square inch. Maraging steel has been found to give optimum results. Additionally, blades 18 are of substantial length and the intermediate portions thereof are of approximately  $\frac{3}{16}$  (three-sixteenths) of an inch thick in order to provide the flexibility necessary to permit outward movement of cutting bits 24 into reaming engagement with the mine roof.

In accordance with the objects of the present invention, a ram rod 38 is positioned within bifurcated member 14 and of substantially the same length as that member. The lower terminal of ram rod 38 is threaded or secured in any other suitable manner to a bearing block 40. Spaced arms 42 extend downwardly from block 40 and are fixedly connected to a spring abutment 44. A convolute spring 46 of substantially the same diameter as the internal diameter of tubular shaft 10 extends through a substantial portion of that member and rests on a stationary block 48 which is fixedly positioned with respect to tubular shaft 10 by a setscrew 50.

The upper terminal of ram rod 38 is threaded at 52 for engagement with a wedge member designated 54. Wedge member 54 includes a generally cylindrical body portion 56, the lower end of which is reduced at 58 for threaded engagement with portion 52 of ram rod 38. Opposed portions of cylindrical member 56 are longitudinally tapered at 60 to provide an upwardly and outwardly extending wedge. Tapering surfaces 60 are adapted to be engaged by inner faces 30 of cutting bits 24. By virtue of this structure, upon relative movement of bifurcated member 14 with respect to cylindrical member 54, cutting bits 24 are progressively urged outwardly.

The present reamer further includes a cap 62 engaged with the upper terminal of cylindrical member 54, a thrust bearing 64 being interposed between the cap and member.

### Operation

In use of the reamer of the present invention, the mine roof which is designated 66 in FIGURE 3 is drilled in conventional fashion to a predetermined depth, forming a mine proof bolt hole or opening 68 which is of uniform diameter throughout its length. The reamer of the present invention is inserted into opening 68 until cap 62

abuts the upper limit thereof. The lower end of shaft 10 is engaged with a driving member (not shown) to rotate the same together with bifurcated member 14. Simultaneously, pressure is exerted upwardly on the reamer to effect compression of spring 46 with result in upward movement of shaft 10 and bifurcated member 14 with respect to ram rod 38 and member 54. The engagement of inner faces 30 of cutting bits 24 with tapering surfaces 60 results in a flaring outwardly of the cutting bits into reaming engagement with that part of the mine roof adjacent opening 68.

As cutting bits 24 are rotated and are urged upwardly along tapering surfaces 60, a conical recess 70 is formed in the mine roof at a point inwardly of the lower extremity of opening 68. Conical recess 70 complements the shape of an expansion shell of the type disclosed in my previously granted Patent No. 3,104,582. After the reaming operation is completed, upon release of the upward pressure on shaft 10, spring 46 acts to move cutting bits 24 downwardly along tapering surfaces 60 to the inoperative position shown in FIGURE 1.

During the reaming cycle, bifurcated member 14 is subjected to stresses tending to flex blade elements 18 outwardly, and also to exert torsional forces thereon caused by the rotation of these elements. Temporary distortion thereof results but, due to the high yield point from which member 14 is constructed, these elements revert to their initial shape when the reaming is completed. Maraging steel has been found to give optimum results under actual working conditions. With the apparatus of the present invention also, the use of guides, tracks or other means for limiting distortion of the blade elements is obviated.

I claim:

1. A reamer for mine roofs including:
  - (a) a tubular shaft,

- (b) a bifurcated member connected to a terminal of said shaft,
- (c) said bifurcated member including a lower cylindrical section,
- (d) opposed, substantially flat blades extending upwardly from said cylindrical section,
- (e) said flat blades being made of material having the characteristics of maraging steel,
- (f) the upper terminals of the flat blades issuing into forked portions forming recesses,
- (g) cutting bits removably mounted in the recesses,
- (h) a ram rod extending through said tubular shaft and bifurcated member,
- (i) a wedge member engaged with the upper terminal of said ram rod,
- (j) said wedge member having opposed tapering surfaces with which said cutting bits are slidably engaged, and
- (k) spring means within said tubular shaft and in engagement with the lower terminal of said ram rod to normally maintain the cutting bits in inoperative position,
- (l) the cutting bits being urged progressively upwardly and outwardly upon movement along the tapering surfaces of said wedge member when upward pressure is exerted on said tubular shaft against the force of said spring means.

#### References Cited

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35 ERNEST R. PURSER, *Primary Examiner.*