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COAL CUTTING BIT AND HOLDER THEREFOR

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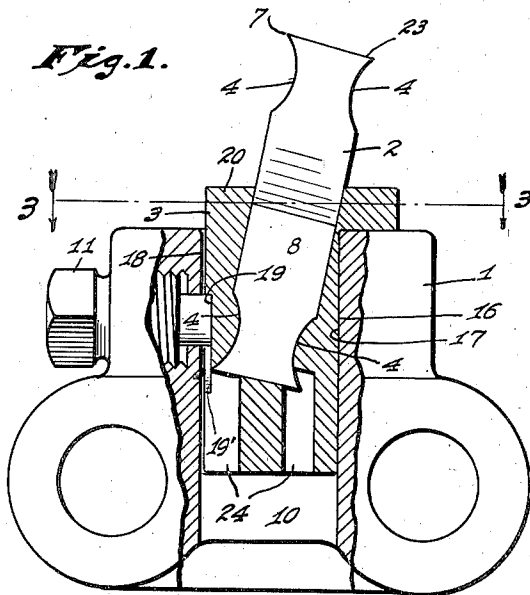


Fig. 1.

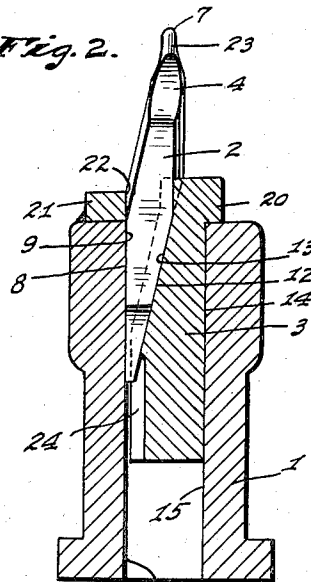


Fig. 2.

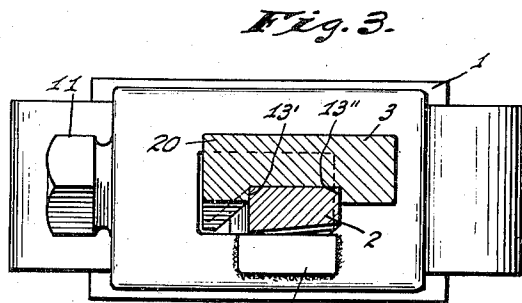


Fig. 3.

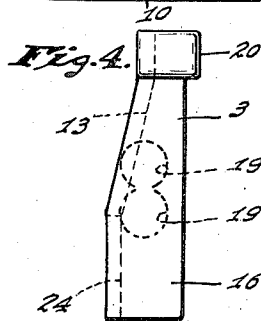


Fig. 4.

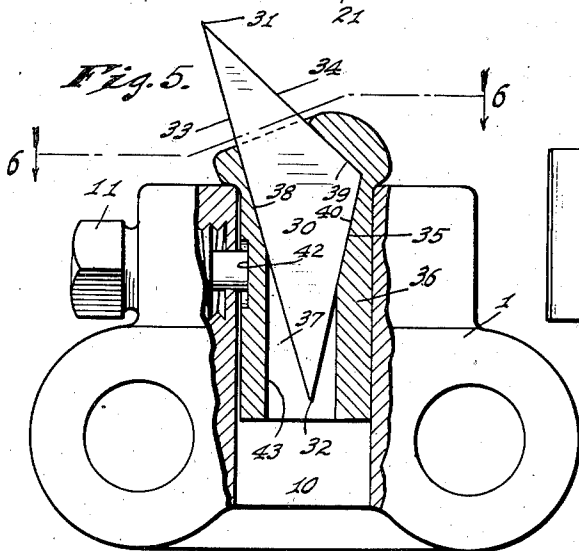


Fig. 5.

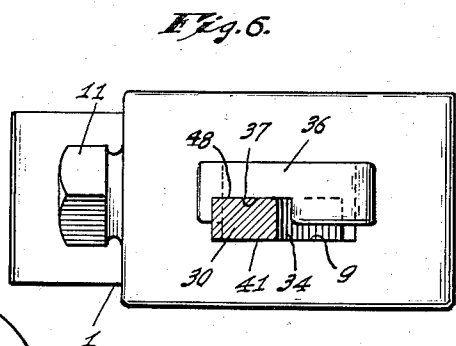


Fig. 6.

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COAL CUTTING BIT AND HOLDER
THEREFOR

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3 Claims. (Cl. 262—33)

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The present application is a continuation in part of my copending application Serial Number 474,044, filed January 27, 1943, for Coal cutting bit and holder therefor (now Patent No. 2,396,945), which, in turn, is a continuation in part of my prior application Serial Number 385,972 filed March 31, 1941, for Coal cutting bit and holder therefor, now abandoned.

A primary object of the present invention is to provide for the optional use of a multi-pointed factory hardened bit in a cutter chain adapted also for the use of conventional one-half inch by one inch shanked mine bits; so as to permit the user to employ either the conventional mine bit or my factory bit at will. A further object is to provide a plural-use bit made of a small piece of steel so formed as to carry out the intentions and attain the objectives of the present invention. A further object is to provide a positive and inexpensive keeper through which to associate my bit with a chain block formed with a socket adapted also to hold ordinary mine bits. A further object of the invention is to provide an assembly in which a one-piece holder or keeper element is associated with a plural-pointed bit to support the latter upon a mining machine chain link with a portion of the bit and a portion of the holder received within a socket formed in the link, with the keeper positioned wholly laterally on one side of the bit relative to the cutting path of the bit, so that the bit directly engages, and is laterally supported in one direction by, one lateral wall of the link socket, while the bit directly engages, and is laterally supported in the opposite direction by, the holder which, in turn, directly engages, and is laterally supported in said last-mentioned direction by, the opposite lateral wall of said link socket. A further object of the invention is to provide, in an organization of the character under consideration, alternatively usable bits and holders of variably complementary thicknesses, so that, for instance, the operator may at one time use bits $\frac{1}{8}$ " thick with holders having a complementary thickness of $\frac{3}{8}$ "; and may at another time use bits $\frac{3}{8}$ " thick with holders having a complementary thickness of $\frac{1}{8}$ ", the novel association of the bit and the holder disclosed herein being effective to support even so thin a holder against breakage under lateral stresses encountered in machine coal cutting. A further object of the invention is to provide, for use in holding a plural-pointed bit in a socketed mining machine chain link, a holder or keeper formed to engage one lateral surface of such bit and to engage certain of the edges of said bit at a plurality of points

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and in such relative positions as to hold said bit against movement with respect to the holder in the plane of the bit and in the direction of the active point thereof, while leaving the opposite lateral surface of said bit open to engagement with a lateral wall of the link socket, said holder, together with said bit, being insertable in said link socket, so that the bit is laterally supported between a lateral wall of the link socket and a surface of the holder, while the bit directly engages said link socket wall and the holder, and the holder directly engages the bit and the opposite lateral wall of the link socket. Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

In the drawings,

Fig. 1 is a side view of a bit and keeper constructed in accordance with my invention and assembled in the standard socket of a standard chain block, parts being shown in section for clarity of illustration;

Fig. 2 is a transverse section through the construction of Fig. 1;

Fig. 3 is a horizontal sectional view taken substantially on the plane indicated by the line 3—3 of Fig. 1;

Fig. 4 is an end view of the keeper of Fig. 1;

Fig. 5 is a view similar to Fig. 1, but showing a modified form of bit and keeper; and

Fig. 6 is a sectional view taken substantially on the plane indicated by the line 6—6 of Fig. 5.

The problem of so constructing a factory bit and holder as to be received in a conventional mine bit socket having rectangular dimensions slightly greater than one-half inch by one inch, so as to permit the optional alternative use of either the factory bit or a standard mine bit is very complicated, and numerous attempts to solve that problem have failed of success. A principal difficulty is that of providing sufficient strength in the factory bit and holder to avoid breakage of either, while holding the dimensions thereof small enough to fit the relatively small block socket. It must be remembered that in cutting coal, hard impurities are often met which may either break or rapidly abrade away any parts of bits and holders projecting outwardly

beyond the link, and may even ruin the link itself. The active point of the bit must be a considerable distance away from any part of the holder or link. I consider one and a half inches to be a minimum necessary spacing of a new active point from the link, and that the point should be disposed at least one inch from any part of the holder. Shocks, either lateral or in the plane of chain travel applied at the working ends of the bit, exert a strong tendency to break the bit or the holder right at the mouth of the bit block socket. The available cross section at the mouth of the socket is so small that any form of holder formed with a central socket or recess in the holder will be robbed of strength at this vital point by whatever part of its cross sectional area is displaced by any part of the bit inside the socket at or even near to the socket mouth. But it is not possible to enlarge this bit block socket if ordinary mine bits are to be optionally usable.

In order to overcome these difficulties, I have provided, in the shape of my bits and keepers and in the manner of their association with the bit block socket and with each other, a satisfactory solution to the difficulties outlined.

In Fig. 1, I have illustrated a bit block 1 formed with a standard bit socket 10 adapted to receive and support an ordinary mine bit, to be secured therein by set screw 11, as is customary. My bit 2 is mounted on block 1 with a substantial portion of the bit received in the socket 10 and at least one and a half inches of its length projecting therefrom. The lateral flat side 8 of my bit engages directly against the wall 9 of the socket 10. The opposite lateral flat side 12 of my bit bears against a wall 13 of an intermediate keeper element 3. The opposite lateral wall 14 of the keeper engages the side wall 15 of the socket 10. The end wall 16 of the keeper engages the end wall 17 of the socket; while screw 11 engages the leading end wall 18 of the keeper.

A pair of spaced indentations 19 and 19' are formed in the leading edge 18 of the keeper 3 for the purpose of securing the keeper in the socket 10 optionally at either of two positions, whereby the gage of the bit 2 may be optionally set at one and a half inches or one and seven-eighths inches from the block.

The wall 13 of my keeper 3 engaged by the side 12 of my bit is the bottom or floor of an indentation outlined by substantially perpendicular outstanding projections or walls 13' and 13'' conforming in shape to the edge contour of either end portion of my bit 2. Thrust upon my bit in the plane of chain travel is taken upon these walls or projections which cannot shear off because they are supported directly against the end walls of the socket 10. Side thrust upon my bit in the direction of the keeper is transmitted by compression through the keeper directly against lateral wall 15 of the socket; and side thrusts from the opposite direction are transmitted directly by the engagement of the lateral surface 8 of my bit against the lateral wall 9 of the block socket. The block socket side walls are, of course, amply strong to resist breaking outwardly.

The lateral thickness of my bit 2 is greatest at its midpoint, to resist breakage, tapering toward its cutting ends. Another distinct function of this taper lies in the fact that, with the wall 8 of my bit flatly engaged against the wall 9 of the socket, the active cutting point of my bit is positioned out of line with the socket wall 9, and directly in the central plane of the socket, where it

will cut in the track in which the socket was designed to present the cutting point of an ordinary mine bit, it being obvious that my bit is far less in thickness than a standard mine bit shank.

My keeper extends slightly beyond the link socket at 20, so that keeper wall 13 provides an upwardly extended lateral support for my bit, and in order to provide a similar extended support at the opposite side of my bit, I provide an extension of socket wall 9 beyond the link by welding alongside that wall a block 21, whose face 22 provides an extension of the wall 9 beyond the socket mouth alongside my bit 2.

The projections 13' and 13'' are shaped to correspond to the contour of the received bit portion, including the notches 4. It will be perceived, therefore, that the bit cannot be displaced from its position within the indentation. The keeper 3 cannot be displaced from the bit block socket because of the engagement of the nose of screw 11 in one or the other of the indentations 19 or 19' on the leading edge of the keeper. Normally, the indentation 19 is used, but if a "squeeze condition" arises, the kerf may be widened by shifting the bit-and-keeper assembly and engaging the screw 11 in indentation 19'.

In further consideration of the limitations imposed, and the governing dimensions, it will readily be apparent that in devising my improved bit and keeper I have contrived to satisfy all the exacting requirements involved. My bit 2 is of a length to project one and a half inches outwardly beyond the block socket, and to present a sufficient depth of engagement of the side surface 8 within the socket 10 against socket wall 9, the length of my bit being more than twice its width at its midpoint. In order to present active cutting point 7 properly for cutting, permitting the notch 4 to serve as a rake angle below my cutting point, I must lean the major axis of my bit backward, which also relieves the end surface 23, whereby each corner of my bit may be successively positioned for cutting, and may in each instance provide a front rake and a rear relief. Obviously, with a substantial portion of my bit received within the socket, I must, in order to lean my bit rearwardly, provide that the body width of my bit be substantially less than the width of a side wall of the socket 10, which is slightly more than one inch to accommodate standard mine bits.

Obviously also, in order to interpose my bit between the wall 9 of the socket and the bottom of the indentation in the wall 13, my bit thickness must be very substantially less than approximately one-half inch which is the width of the socket.

Those familiar with the art will recognize the prime desirability of my employment of keeper 3 interposed between my bit and the socket wall 15. My bit is meshed with the keeper, by which I mean that it is partially embedded in an indentation in the lateral surface of the keeper, said indentation conforming in contour to the outline of the embedded portion of the bit, whereby the bit is held against movement with respect to the keeper. The keeper, of course, is held against movement in the socket by screw 11 engaging in one or the other of the indentations 19 and 19' in the keeper. Yet I can very rapidly unlock the keeper, reverse or replace the bit, and positively relock the assembly, only a partial turn of the screw 11 being required. I could not achieve these advantages, if I attempted to support my bit without the keeper interposed at the side of

the bit, or without the screw engaging the keeper. If I attempted to socket my keeper to place my bit into a central opening therethrough, the satisfactory formation of such a socket would be extremely difficult if not impossible, and such a socket would load up with coal dust which would seriously interfere with the setting of bits, or the socket walls might mash in under abrasion to interfere with changing the bit.

If, instead of the single, simply formed, and rugged keeper I have devised, I should try to employ two metal clamps to associate my bit with the block socket, these clamps would necessarily be so thin and weak (in view of the space limitations imposed by the standard socket) as to be unreliable. Furthermore, it is highly desirable to use as few loose parts as possible.

Preferably, the keeper is formed with passages, as at 24, to permit the discharge of coal dust from the indentation therein, and also to allow for burrs forming at the cutting points during active wear thereof.

The block 21, welded at the side of the bit socket in block 1, obviously will not interfere with the use of ordinary one-half inch by one inch shanked standard mine bits, when desired. The block 21 and the outwardly extended portion of the keeper 3 have their extremities disposed at least one inch from the active cutting point of my bit, so that there is little possibility of injury to these elements from coring, or in case a substantial portion of the extended end of the bit is abraded away rapidly against rock.

The walls of the indentation in my keeper are of substantially less dimension than the thickness of my bit, as is clear from a consideration of Fig. 3. This arrangement is desirable in order to prevent dirt accumulation, and a very slight projection of these walls 13' and 13'' is sufficient, in coordination with the socket walls, to retain the bit in operative position.

It will also be apparent that I may, with the simple construction provided, accomplish the extremely desirable objective of permitting the user a choice of several sizes of factory bits to perform the operations desired and indicated by the user's particular cutting conditions. The bit illustrated, with its relatively thin body and slender piercing point is ideal for easy cutting where minimum coal disintegration is desired. If the user has hard impurities to cut, bits with heavier body sections and heavier duty cutting points could be supplied, the use of such bits requiring merely an interchange of the keepers 3, thicker bits requiring thinner keepers.

Bits of the character herein disclosed must be as inexpensive as possible. The bit of Figs. 1 to 4 may be readily sheared from thin, diamond bar stock, after which the four notches 4 may be easily cut from it by four round punches operating at a single stroke. Yet my bit, requiring only two or three ounces of steel, provides four successively usable ideal cutting points, the notches 4 properly meshing with the indentation in my keeper 3 regardless of which cutting point is placed in active position.

Under the trying limitation of space imposed, it will be seen that I do not rely, as often attempted heretofore, upon the strength of a bit holder, but rather upon the strength of my bit itself and the strength of the side walls of the bit block socket to which I directly transmit the stresses encountered in cutting, it being obviously impossible to break my simple keeper at any point by shocks from any direction, since the

forces acting upon it are almost entirely compressive.

As has been said, a bit of rhomboidal face elevation, such as that illustrated in Figs. 1 to 4, produces the advantageous result of throwing the active cutting point substantially into the median plane of the chain; that is, into the position which would be occupied by the point of a standard, resharpenable shanked bit. But it is not essential to the accomplishment of some of the important objects of my invention so to throw the active cutting point into that position. That is, the advantages inherent in the use of a small, plural-pointed, replaceable bit, together with a one-piece shanked holder so constructed that the bit may be meshed with one lateral surface of the holder before introducing the assembled bit and holder into the standard socket of a mining machine chain link in such a relation that one lateral surface of the bit is pressed, by the holder, into engagement with a correspondingly surfaced lateral wall of that socket, while the lateral surface of the holder opposite that surface with which the bit is meshed, is pressed against the opposite lateral wall of the link socket, so that lateral stresses applied to the active point of the bit in one direction are directly resisted by the solid wall of the link, while such stresses impressed in the opposite direction are transmitted purely compressively through the holder to the opposite side of the link, are so important that they quite overbalance any apparent disadvantage in the location of the cutting point in a position offset from the median plane of the link. It has for so long been considered necessary, in the mining machine chain art, to locate the cutting point midway between parallel planes containing respectively the lateral boundaries of the holder, that the thought of permitting the cutting point to lie outside that plane is quite startling. But I have found that assemblies in which the active cutting point of the bit does lie outside that plane may be arranged to operate quite satisfactorily, and that the advantages inherent in the concept above described completely outweigh any disadvantages arising from the unconventional relationship between the cutting point and the link. One such assembly is illustrated in Figs. 5 and 6.

In this connection, it is to be noted that the lateral dimension of the link socket is standardly one half inch. Any bit in standard use has a cutting point which will produce a kerf at least one-eighth inch wide. Therefore, a bit of the character illustrated in Figs. 5 and 6 and having a thickness of $\frac{1}{8}$ " or more will cut at least partially in the same path which would be cut by a bit standardly mounted.

Referring more particularly to Figs. 5 and 6, it will be seen that I have illustrated therein the same link block 1 with its socket 10 and set screw 11. I have illustrated a bit 30 of rectangular cross section and triangular side elevation, formed to provide alternatively usable cutting points 31 and 32 at the intersection with the leading cutting face 33 of trailing edges 34 and 35, respectively meeting the face 33 in equal angles. It may here be noted that in this assembly the elevational contour of the bit may be alternatively triangular, as illustrated, or trapezoidal, without affecting the other elements of the organization or the cooperation of the bit therewith.

A bit holder or keeper 36 of substantially rec-

tangular cross section is shaped to provide a flat surface or floor 37 adapted to receive and support one lateral surface 48 of the bit 30; and the lateral surface of said holder 26 opposite the surface 37 is adapted to engage and be supported by the lateral wall 15 of the link socket 10.

With the surface 48 of the bit 30 in engagement with the surface 37 of the holder, the bit-and-holder assembly may be inserted in the socket 10; and, when so inserted, the lateral surface 41 of the bit 30 is pressed against the lateral wall 9 of the socket 10, and is supported thereby.

The surface 37 of the keeper 36 constitutes the bottom or floor of an indentation outlined by substantially perpendicular outstanding projections or walls 38, 39 and 40, conforming in shape to the midsection of the edge contour of the bit 30. It will be readily apparent from an examination of Fig. 5 that the bit 30 is meshed with the keeper 36 in the same sense in which the bit 2 is meshed with the keeper 3, so that neither bit can be engaged in the indentation of its keeper except by relative movement in a direction perpendicular to the floor of its indentation. When the bit 30 is meshed with its keeper 36, its leading edge 33 lies in flush abutment with the indentation wall 38, and its equiangularly related edges 34 and 35 lie respectively in flush abutment with the indentation walls 39 and 40. The bit 30 is thus solidly supported, between the keeper surface 37 and socket wall 9, and between the indentation wall 38 and indentation walls 39 and 40, against any possible movement with respect to the keeper 36. The keeper, in turn, is held against movement within the socket 10 by the engagement of the nose of the set screw 11 in a socket 42 in the leading edge of the shank of said keeper. The socket 42 may, if desired, be composite like the socket 19, 19' of the keeper 3.

Obviously, the bit 30 may be reversed to bring the point 32 into active position, in which case, the bit edge 25 will engage the indentation wall 39, while the bit edge 34 will engage the indentation wall 40. As is clearly to be seen in Fig. 5, the indentation in the keeper face includes a parallel-walled extension 43 in which is disposed the inactive bit point, and which is equivalent in function to the passages 24 of the embodiment of my invention illustrated in Figs. 1 to 4.

The lateral extent of the walls is such that, when the bit-and-keeper assembly is inserted into the socket 10, said walls terminate short of the socket wall 9. Of course, the combined thickness of the keeper and bit is such as to produce a snug fit in the socket 10.

I claim as my invention:

1. In combination with a cutter chain including a link having a socket adapted to receive and support a standard rectangularly shanked mine bit, a keeper having a side received in said socket and fitting one lateral wall of said socket, the side of said keeper opposite said first-mentioned side being formed with an indentation having a wall inclined to said first-mentioned side, and a plural pointed bit of rhomboidal edge

outline, one wall of said bit defining such outline fitting in said indentation against said inclined indentation wall, and an angularly related wall of said bit fitting the opposite lateral wall of said socket, the maximum thickness of said bit being substantially one-half the width of said socket, whereby one sharp angle of the rhomboidal outline of said bit is located within said socket and substantially in contact with said last-mentioned socket wall while the other sharp angle thereof is located outside said socket and substantially in the median axial plane of said socket, the lateral outline of the portion of said bit received within said indentation including at least one reentrant section, and the outline of said indentation conforming to said lateral outline of said bit portion.

2. The combination with a cutter bit having four cutting points defining the corners of a rectangle having a major axis and a minor axis, of a holder for said bit removably secured to a mining machine chain block and enclosing and securing in place substantially the whole of said bit lying on one side of said minor axis and holding the major axis of said bit inclined outwardly and rearwardly with respect to a plane perpendicular to the line of chain movement.

3. In combination with a mining machine cutter chain including a link having a socket, a plural-pointed bit and a keeper, said keeper having a surface generally parallel with the plane of chain movement, and said surface being formed with an indentation bounded by walls generally perpendicular to such surface and corresponding in contour to a portion of the outline of said bit, said portion of said bit being enterable in said indentation only by relative movement of said bit and keeper in a direction substantially parallel to said walls, and said bit-and-keeper assembly having a portion simultaneously enterable in said link socket with one surface of said bit substantially parallel with said plane of said chain movement engaging a substantially parallel wall of said socket, with the opposite surface of said bit engaging the bottom of said indentation, and with the side of said keeper opposite the first-mentioned surface thereof engaging a wall of said socket opposite and substantially parallel to said first-mentioned socket wall, and a screw threadedly mounted in said link and engaging said keeper, whereby said bit-and-keeper assembly is locked in said socket.

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