

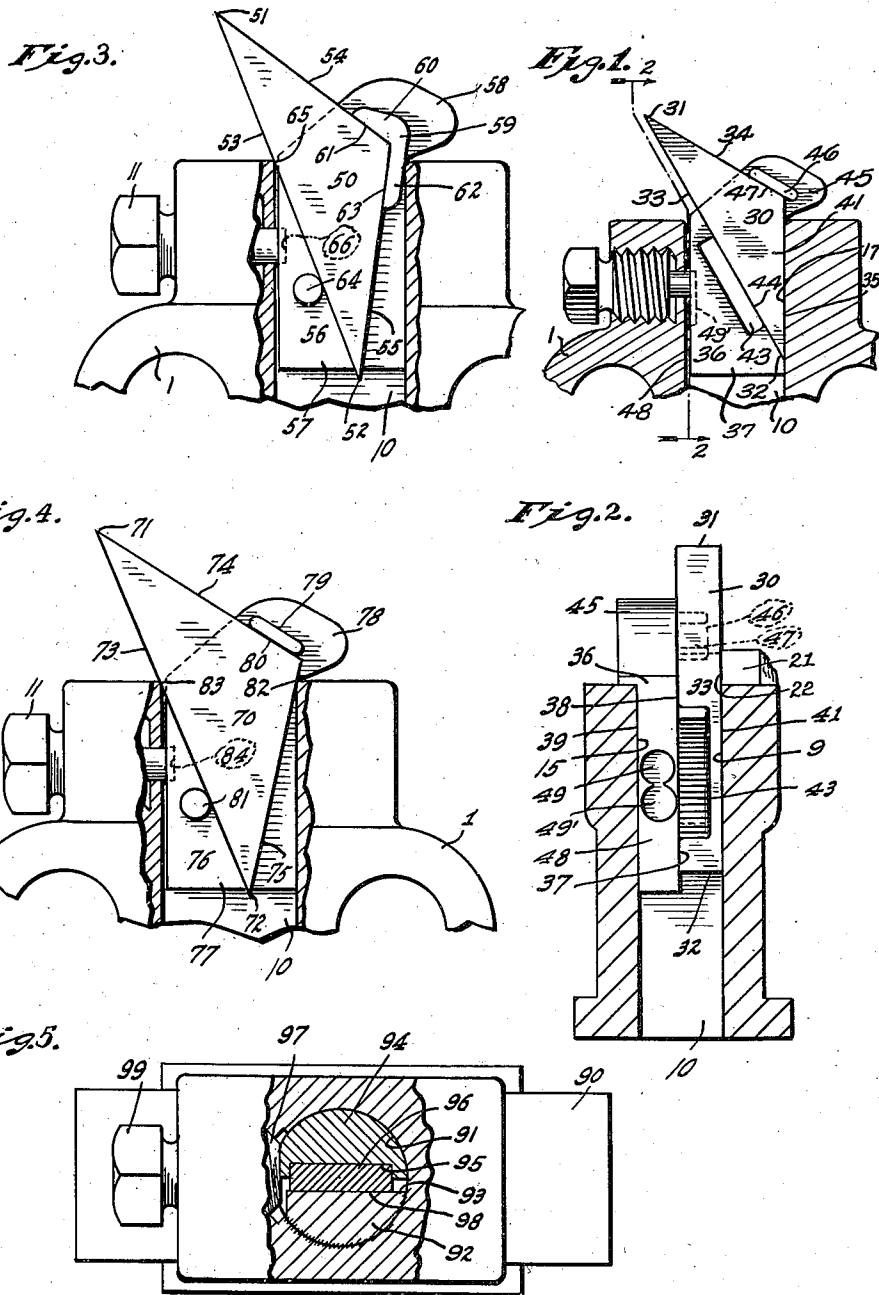
March 19, 1946.

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2,396,945

COAL CUTTING BIT AND HOLDER THEREFOR

Filed Jan. 27, 1943



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UNITED STATES PATENT OFFICE

2,396,945

COAL CUTTING BIT AND HOLDER
THEREFOR

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Application January 27, 1943, Serial No. 474,044

2 Claims. (Cl. 262—33)

The present invention is a continuation in part of my application Serial No. 385,972, filed March 31, 1941.

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 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 drawing, attention being called to the fact, however, that the drawing is 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.

20 In the drawing,

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 view taken substantially on the line 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is a similar view showing a further form of keeper;

Fig. 4 is a similar view showing still another type of keeper; and

Fig. 5 is a plan view of a modified link carrying still another form of bit and keeper assembly constructed in accordance with my invention, parts being shown in section for clarity of illustration.

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.

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, as in those illustrated in Figs. 3 and 4, 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 rectangular cross section is shaped to provide a flat surface or floor 37 adapted to receive and support one lateral surface 38 of the bit 30; and the lateral surface 39 of said holder 36 opposite the surface 37 is adapted to engage and be supported by the lateral wall 15 of the link socket 10.

With the surface 38 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.

Projecting substantially perpendicular from the surface 37 of the holder 36 is a lug or flange 43 formed to provide an inclined surface 44, substantially perpendicular to the surface 37, and adapted to engage and support a portion of the edge-face 33 of the bit 30. A portion 45 of the holder 36 projects outwardly (and, in the illustrated embodiment, rearwardly) beyond the mouth of the socket 10; and a lug or flange 46 is provided on said portion 45, projecting from the surface 37 of the holder and providing an inclined surface 47 substantially perpendicular to said surface 37 and adapted to engage and support a portion of one of the other edge surfaces of the bit 30. The flanges 43 and 46 will be seen to outline that portion of the floor 47 engaged by the bit surface 38. As shown in Fig. 1, the point 31 of the bit being in active position, the surface 47 engages and supports a portion of the bit edge 34. Obviously, the bit may be reversed to bring the point 32 into active position, in which case

a portion of the edge 35 will engage and be supported by the surface 47 of the lug 46.

In this form of the invention, the trailing edge of the bit which meets the bit face 33 in the inactive bit point engages and is supported by the rear wall 17 of the link socket 10.

The leading edge 43 of the holder 36 is adapted to be engaged by the nose of the set screw 11 to force said holder rearwardly toward the wall 17 of the socket. It will be seen that the surfaces 44 and 47 converge toward the active point 31 of the bit 30. Thus, pressure urging the holder 36 toward the wall 17 results in crowding or wedging the surfaces 44 and 47 upon the edges 33 and 34 of the bit, as rearward movement of the bit is prevented by engagement of its edge 35 with the socket wall 17. The holder is firmly locked against outward movement with respect to the chain link by the engagement of the nose of the screw 11 in one portion or the other of the double socket 49, 49', said two portions being spaced axially of the keeper shank for the purpose of securing the keeper 36 in the socket 10 optionally at either of two positions, whereby the gage of the bit 30 may be optionally set at one and one-half inches or one and seven-eighths inches from the block.

In Fig. 3, I have illustrated a somewhat simplified modification of the structure illustrated in Fig. 1. A bit 50 of generally triangular or trapezoidal lateral contour and rectangular cross section, is formed to provide alternatively usable cutting points 51 and 52 formed by the intersection, with a leading cutting face 53, of trailing edges 54 and 55 respectively meeting the face 53 in substantially equal angles. A bit holder or keeper 56, similar in many respects to the keeper 36, is formed to provide a flat surface or floor 57 against which engages one lateral surface of the bit. Upon a projecting head portion 58 of the holder 56 is formed a flange or outstanding projection 59 having angularly related arms 60 and 62 which, respectively, are arranged to provide angularly related surfaces 61 and 63, both of which are substantially perpendicular to the surface 57 of the keeper 56. The angle included between the surfaces 61 and 63 is equal to the angle at which the bit edges 54 and 55 intersect.

A cylindrical post 64 projects substantially perpendicular from that portion of the surface 57 of the keeper 56 which is received within the socket 10, and is adapted to engage and support a portion of the bit edge 53. From an inspection of Fig. 3, it will be clear that a plane tangent to the cylindrical surface of the post 64 at the point at which said post is engaged by the bit edge 53, converges with the surface 61 toward the active cutting point 51 of the bit, and touches the leading edge 65 of the mouth of the socket 10. Clearly, the surfaces 61 and 63 and the above-mentioned plane outline that portion of the floor 57 with which the bit 50 is engaged.

Thus it will be seen that the bit 50 may be meshed with the keeper 56, with the adjacent portions of its trailing edges 54 and 55 engaging and supported by the flange surfaces 61 and 63, respectively, and with the post 64 engaging and supporting a portion of the leading edge 53 of said bit. The assembled bit and keeper may now be inserted in the socket 10 and thrust home, until the bit edge 53 engages the edge 65 of the socket mouth. The nose of the screw 11 will now be projected into the socket 66 similar to the socket 49, to hold the assembly in place. It will be noted that, in this form of the organization,

there is no socket portion corresponding to the socket portion 49', since the position of the keeper 56 axially of the socket 10 is depended upon to hold the bit edge 53 in engagement with the edge 65 of the mouth of the socket 10.

Referring, again, to the details illustrated in Figs. 1 and 2 (many of which will be incorporated in the modified forms of my invention illustrated in Figs. 3 to 5) it will be seen that my keeper 36 extends outwardly beyond the link socket, so that keeper surface 37 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 30.

The surfaces 44 and 47 converge toward the active bit point 31, wherefore, as will be obvious, the bit is held against any movement when the bit-and-keeper assembly is secured in place in the socket 10. The keeper 36 is held against movement in the socket by engagement of the nose of the screw 11 in one or the other of the indentations 49 or 49' on the leading edge of the keeper. Normally, the indentation 49 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 49'.

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 30 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 its side surface 41 within the socket 10 against socket wall 9, the length of my bit being more than twice its maximum width. Obviously, with a substantial portion of my bit received within the socket, I must provide that the body width of the received portion of the 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 keeper surface 37, 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 36 interposed between my bit and the socket wall 15. My bit is meshed with the keeper, by which I mean that it is supported with one lateral surface based upon a lateral surface of the keeper and with a plurality of its edges engaged by means on said keeper and cooperating with such bit edges, whereby the bit is held against movement with respect to the keeper. Thus, the bit is meshed with the keeper, while the keeper is held against movement in the socket by screw 11 engaging in one or the other of the indentations 49 and 49' 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.

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 36 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 abutments upstanding from the surface 37 of my keeper are of substantially less dimensions than the thickness of my bit, as is clear from a consideration of Fig. 2. This arrangement is desirable in order to prevent dirt accumulation, and a very slight projection of these abutments 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 36, thicker bits requiring thinner keepers.

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.

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 such as those illustrated herein 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.

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 herein and mounted as shown, and having a thickness of $\frac{3}{8}$ " or more will cut at least partially in the same path which would be cut by a bit standardly mounted.

A still further simplification of structure is illustrated in Fig. 4, in which a bit 70, having a lateral contour similar to the contours of the bits 30 and 50, is formed to provide cutting points 71 and 72 at the intersections, with a leading cutting edge 73, of trailing edges 74 and 75 meeting said cutting edge in substantially equal angles. A keeper 76 is formed to provide a flat surface or floor 77 against which is engaged and supported one lateral surface of the bit 70. The keeper head 78 is provided with a substantially perpendicularly projecting flange 79 extending laterally from the surface 77 and formed to provide a surface 80 substantially perpendicular to said surface 77. A cylindrical post 81 projects in the same direction from the surface 77. It will be seen that the surface 80 is adapted to be engaged by, and to support, that trailing edge of the bit which intersects the leading edge to form the currently active cutting point. It will further be seen that the plane tangent to the cylindrical surface of the post 81 at the point of engagement thereof by the bit edge 73 touches the leading edge 83 of the mouth of the link socket 10 and converges with the surface 80 toward the currently active cutting point. It will further be seen that the trailing edge of the bit intersecting the leading edge thereof in the currently inactive cutting point is, when the holder and bit assembly is set in the socket 10, engaged and supported by the trailing edge 82 of the mouth of the socket 10. The above-mentioned plane is substantially the plane of the surface 44 of Fig. 1, and, with the surface 80, outlines that portion of the floor 77 with which the bit is engaged.

The leading edge of the holder is formed with a socket 84 similar to the socket 66, in which the nose of the screw 11 may be engaged to hold the holder-and-bit assembly in the illustrated position, in which the bit is solidly secured in place.

In Fig. 5, I have illustrated an organization incorporating many of the advantages of the structures illustrated in Figs. 1 to 4. In that figure, I have shown a chain link 90 in which is formed, by drilling or the like, a cylindrical socket 91. After the socket 91 has been formed, a part-cylindrical block 92 is set thereinto and welded in place, said block being formed to provide a plane surface 93 so located as to constitute a

minor arc of the periphery of the socket 91. A keeper 94, which is part-cylindrical in cross section, and which is formed to provide a surface substantially parallel with the surface 93, is further formed in that surface with an indentation 95 contoured to correspond with the elevational contour of a portion of a bit 96. The bit 96 may have any elevational contour which provides for a plurality of alternatively usable cutting points and which further provides, in any selective position of the bit to bring any one of the cutting points into active position, for contour surface portions which converge toward the currently active cutting point, whereby the engagement of the bit in the indentation 95, with one lateral surface pressed against the floor of said indentation, firmly holds the bit against movement with respect to the holder 94.

The bit holder 94 is formed with a leading surface 97 for engagement by the nose of a set screw 99 to hold the assembly in place in the socket 91. Said surface 97 may or may not be the bottom of a single or double socket like the socket 66 or the sockets 49, 49'.

I claim as my invention:

1. In a mining machine chain, a link having a socket, a bit whose elevation comprises two sides converging at equal angles with a third side to form two cutting ends, a bit keeper having a shank and a head, said shank being enterable in said link socket and having front and rear surfaces and one lateral surface engaging corresponding walls of said socket when so entered, said keeper being formed to provide a flat floor opposite said one lateral surface, said floor being spaced from the corresponding wall of said socket, means projecting substantially perpendicularly from said floor to provide abutments angularly related to each other at an angle equal to the angle included between said two first-mentioned sides of said bit, and other means projecting substantially perpendicularly from said floor, said bit being supported with one lateral surface pressed against said floor, the opposite lateral surface pressed against said last-mentioned socket wall, its two first-mentioned sides engaged with said first-named means, and its third side engaging said last-named means and an edge of the mouth of said socket, and means for retaining said keeper shank against removal from said socket.

2. In a mining machine chain, a link formed with an outwardly opening socket of rectangular cross section whose dimension in the direction of chain travel is approximately 1 inch and whose dimension transverse to the direction of chain travel is approximately $\frac{1}{2}$ inch, a bit keeper having a head and having a shank of rectangular cross section, said shank being enterable in said socket, the cross sectional dimension of said shank in the direction of chain travel being slightly less than 1 inch and the cross sectional dimension of said shank transverse to the direction of chain travel being less than $\frac{1}{2}$ inch, said keeper being formed to provide a plane floor parallel with the plane of chain travel and parallel with one lateral wall of said shank and with a lateral wall of said socket engaged by said lateral shank wall, a bit of rectangular cross section, the distance between said shank wall and said floor plus the thickness of said bit being substantially equal to the minor dimension of said socket whereby, when said bit is laid with one lateral surface engaged with said floor and said bit and keeper shank are inserted in said socket,

said lateral wall of said shank engages one lateral wall of said socket, one lateral wall of said bit engages said floor, and the opposite lateral wall of said bit engages the opposite lateral wall of said socket, said bit having a lateral elevation comprising two sides converging at equal angles with a third side to form two cutting ends, means projecting substantially perpendicularly from said keeper floor toward, but not to, said lateral

5 wall of said socket engaged by said bit, and providing abutments engaging said three sides of said bit to hold the latter, when said bit and shank are entered in said socket, against movement relative to said keeper, and means for retaining said keeper shank against removal from said socket.

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