

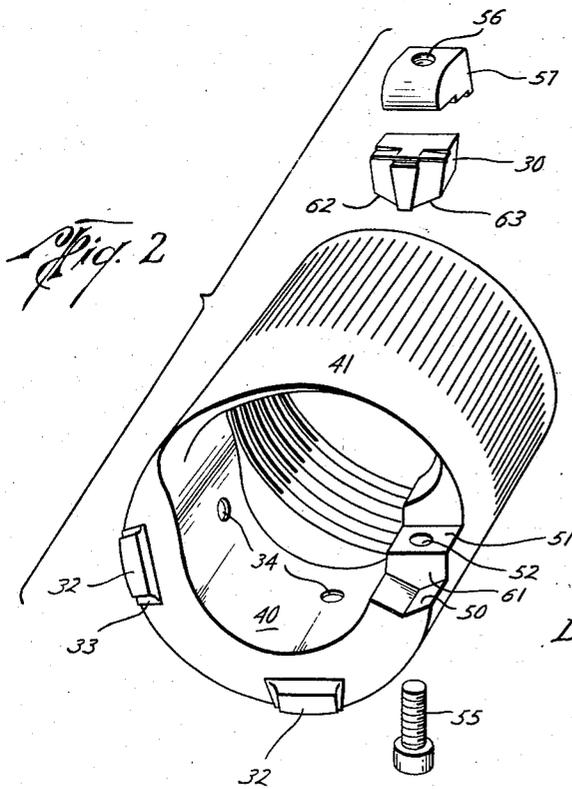
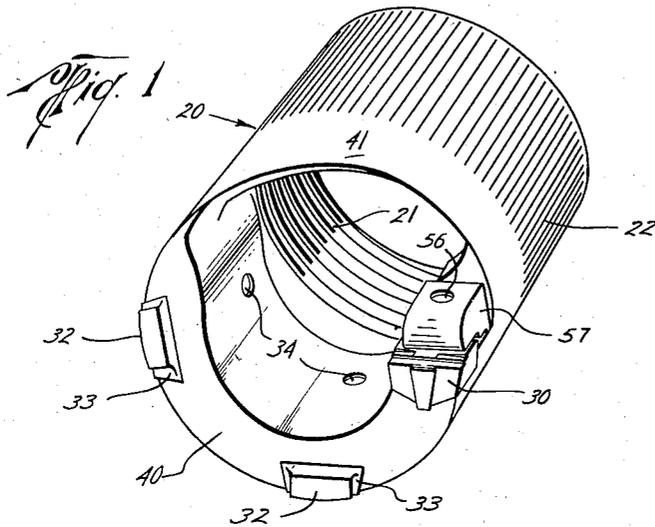
Jan. 20, 1959

D. M. WOLFE
TREPANNING HEAD

2,869,405

Filed June 5, 1957

4 Sheets-Sheet 1



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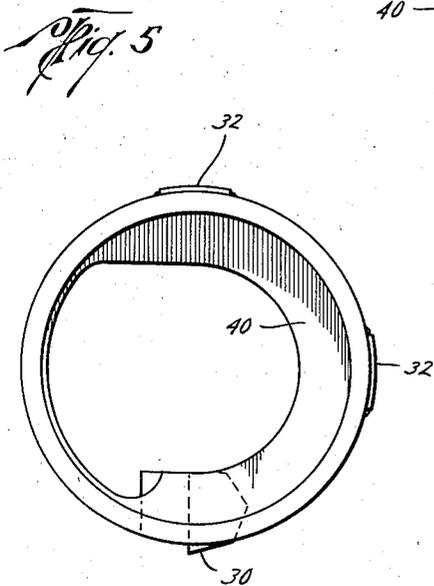
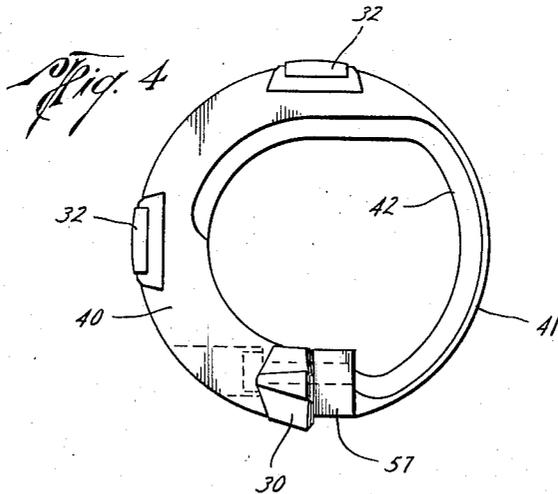
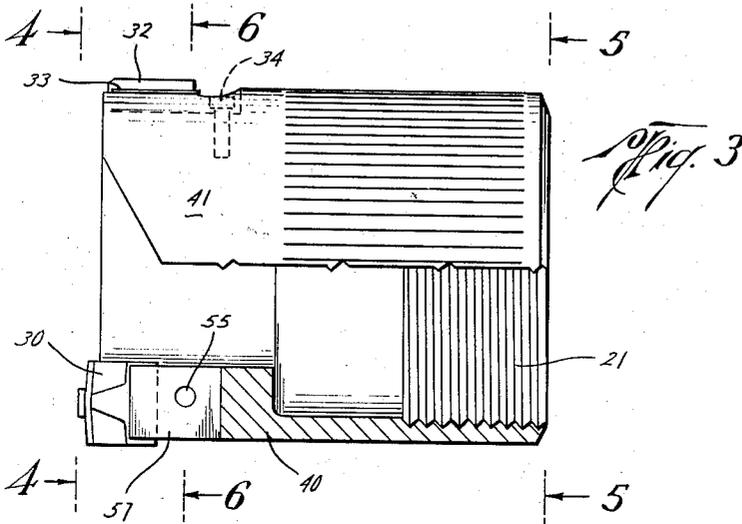
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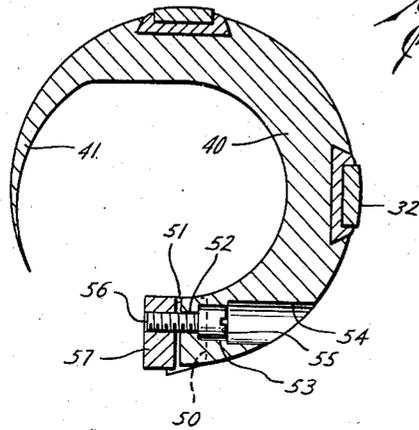


Fig. 6

Fig. 7

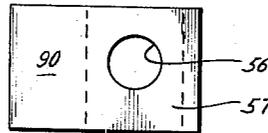


Fig. 9

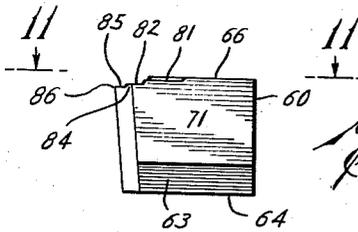
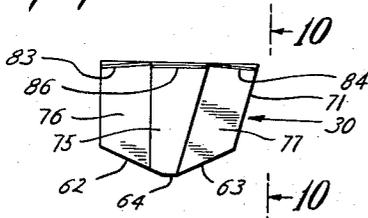


Fig. 10

Fig. 11

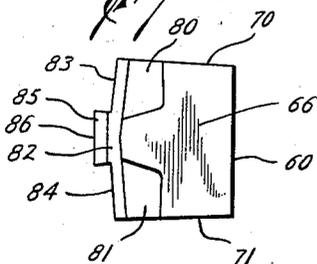
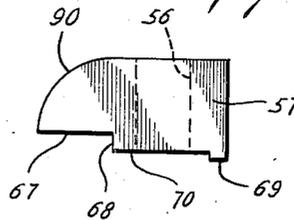


Fig. 8



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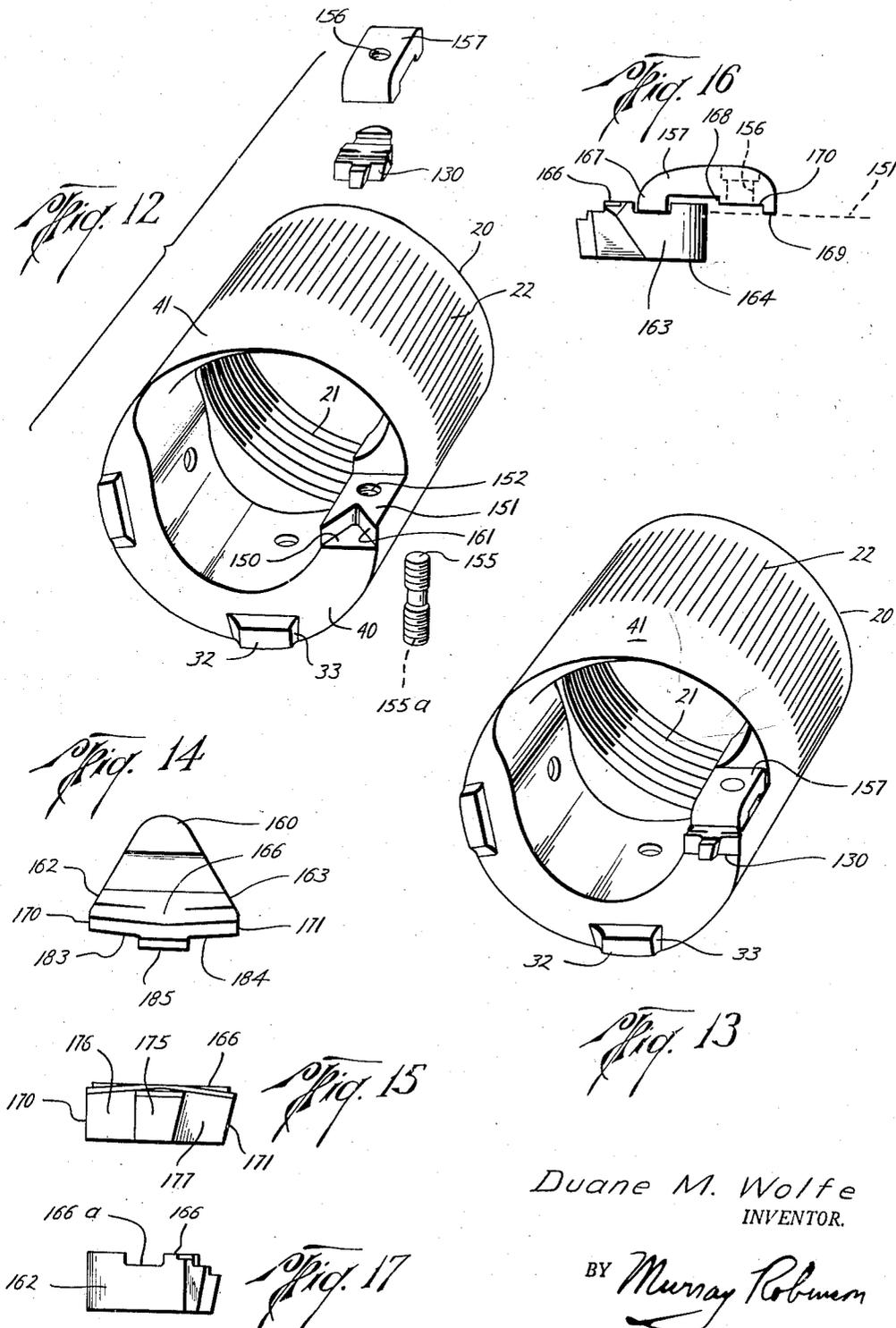
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4 Sheets-Sheet 4



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2,869,405

TREPANNING HEAD

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Application June 5, 1957, Serial No. 663,801

5 Claims. (Cl. 77—69)

This invention pertains to a boring tool and more particularly to the head of an annular boring tool, i. e., a trepanning head. This application is a continuation-in-part of my copending prior application Serial No. 569,532 filed March 5, 1956, entitled, "Trepanning Head," now abandoned.

The principal object of the invention is to reduce the cost of replacing the cutting bit in the head. To this end there is provided according to the invention a better mounting for the bit of the head. In this connection it is to be noted that a carbide bit, as is used in the subject tool, is somewhat brittle and must be well fitted in its mounting to avoid fracture. Because of this it is usual to braze the carbide bit to a special holder which in turn is removably mounted in the body of the tool head. The cost of manufacture of these special bit holders, which must be discarded with the worn bits, and the cost of brazing the bits to the holders, has been considerable. Nevertheless, because of the peculiar torsional as well as other stresses imposed on the bit in a trepanning head it has heretofore not been possible to eliminate the special holder. By means of the invention the special holder is eliminated and new bits can be easily, speedily, and economically inserted in the body of the head to replace old ones.

Other objects and advantages of the invention will appear from the following description of a preferred embodiment thereof wherein:

Figure 1 is a perspective view looking at the bit end of an assembled trepanning head embodying the invention;

Figure 2 is an exploded view of the head shown in Figure 1.

Figure 3 is an elevation, partly in section, of the head shown in Figure 1;

Figure 4 is an end view thereof looking at the bit end of the head;

Figure 5 is an end view thereof looking at the opposite or coupling end of the head;

Figure 6 is a section taken along line 6—6 of Figure 3;

Figures 7 and 8 are respectively top and side views of the clamp forming part of the head shown in Figure 1;

Figure 9 is an end view of the bit of the head shown in Figure 1;

Figure 10 is a view of the bit taken along line 10—10 of Figure 9;

Figure 11 is a view of the bit taken along line 11—11 of Figure 10;

Figures 12 and 13 are respectively exploded and assembled perspective views of a trepanning head embodying the invention having a modified shape of bit receiving socket in the body and a correspondingly modified bit; and

Figures 14—17 are respectively top, front, right side and left side views of the modified form of bit shown in Figures 12 and 13.

Referring now to Figure 1, the trepanning head there

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shown comprises a generally tubular body 20 provided on one end with means for connecting it to a boring bar or tube. Such connecting means comprises an internal thread 21. Further to facilitate such connection the body 20 may be provided with exterior knurling 22.

At the other end of the body of the trepanning head is mounted a bit 30, made of tungsten carbide or similar hard material. The bit is mounted to cut against a body rotating clockwise as viewed from the front in Figure

1. At 90 degrees and 180 degrees azimuthally back of bit 30, having reference to the rotational progress of the head into the stock, are disposed two wear pads 32 set in the side of the body of the trepanning head. These pads are made of hard material, preferably the same material as the bit 30. The wear pads take the wear on the side of the body of the head and keep the body full diameter so that the bit 30 will bore a full gage hole. Each wear pad is in the shape of a rectangular parallelepiped ground on its outer face to a cylindrical surface of the same radius as the body of the head. Each pad is brazed to the bottom of a channel in a holder 33 which in turn is received in an axial channel in the side of the head and held by a screw 34.

Referring now to Figures 3—6 as well as Figure 1, the portion of the body 20 at the bit end has an extra thick wall 40 from the bit 30 back around to wear pad 32. This provides a firm backup for the bit 30. The portion of the body 20 at the bit end azimuthally forward of the bit with reference to the rotational progress of the head into the stock, has a thin wall 41 and is of reduced axial extent, varying from a maximum reduction at the bit to full length near wear pad 32, thereby providing a passage for escape of cuttings into the annulus between the core cut by the head and the inside of the body of the head. There may be a bevel 42 (see Figure 4) around most of the inner periphery of the bit end of the head further to facilitate passage of cuttings from the bit into the annulus.

By virtue of the reduced axial length of the thin walled part of body 20 where it joins the thick walled part adjacent bit 30, there is exposed a transverse section 51 of the body. Referring especially to Figure 2, it will be seen that the corner at the junction of this transverse section with the end face of the thick wall 40 is cut out providing a socket to receive bit 30. One side 61 of the socket provides a seat to support the bit against the pressure of the work in the direction of the tool axis. The other side 50 of this socket provides a seat to support the bit against the pressure of the work directed tangentially of the tool i. e. perpendicular to both the axis and radius. In order to resist radial forces on the bit one side, in this case side 50, is V-shaped with the axis of the V lying in a plane perpendicular to the radius from the axis of the body of the trepanning head to the cutting edge of the bit 30. In this recess formed by side 50 is parallel to the axis of the body of the head. Extending from the surface of transverse section 51 there is a hole 52 which connects (see Figure 6) with a coaxial bore 53 and counterbore 54 in the side of the wall 40. A screw 55 extends through hole 52 from bore 53 into a threaded hole 56 in a clamp 57 (see also Figures 1 and 4) thereby holding bit 30 in recess 50.

Referring now to Figures 2 and 9—11, the bit 30 has a flat inner end 60 adapted to seat against side 61 of the bit socket. The azimuthally trailing side of the bit, having reference to the rotational progress of the bit into the stock as the stock rotates relative thereto, has angularly disposed plane seating surfaces 62, 63 adapted to engage the V-shaped recess 50 in the transverse section of the bit head. A flat portion 64 at the juncture of surfaces 62, 63 insures that they will fully engage the sides of recess 50.

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The azimuthally leading side of the bit has a flat surface 66 lying substantially in a diametral plane (see Figure 4) when the bit is assembled on the body of the head. The clamp 57 has a plane surface 67 (see Figure 8) adapted to engage bit surface 66. A shoulder 63 on the clamp 6 is spaced slightly from the inner end 50 (see Figure 1) of the bit where it extends beyond shoulder 61 of the body of the head. A plane surface 69 on the opposite side of hole 56 in clamp 57 from plane surface 67 is adapted to rest on section 51. The area 70 around the hole 56 is in a plane between the planes of surfaces 67 and 69, that is, it is relieved, so that the clamping force of screw 56 is exerted on the bit 30 through surface 67, surface 69 acting more or less as a fulcrum for the lever constituted by clamp 57.

The flanks 70, 71 of the bit are plane surfaces approximately perpendicular to the inner end 60 of the bit, there being a slight rake on both flanks. Flank 70 is also perpendicular to leading surface 66, while flank 71 is at a slight angle to the perpendicular.

The outer or cutting end of the bit and its junction with the leading side of the bit may in any appropriate way be shaped to provide a cutting edge or edges. As shown the cutting end is provided with a central plane surface 75 and two lower plane surfaces 76, 77, while the azimuthally leading side of the bit is cut back from surface 66 first to the level of surfaces 80, 81, at the sides and then all the way across at surface 82 to form side cutting edges 83, 84, at the juncture with end surfaces 76, 77, and finally is cut back still farther to the level of surface 85 to form cutting edge 86 at the juncture with surface 75. The central cutting edge 86 is thus slightly behind cutting edges 83, 84 in its cutting action, thereby breaking up the cutting. The clamp 57 is rounded off on the corner 90 thereof in front of the bit. Due to the flare of bit flank 71 the cutting edge 84 extends out beyond the outer periphery of the body 20 of the head to insure that there is clearance between the outside of the annulus cut by the bit and the outside of the body of the cutting head. The cutting edge 83 overlies the thick wall 40 of the body of the head so that clearance is also provided between the inside of the annulus, i. e. the outer periphery of the core, and the inner surface of the body of the head.

Referring now to Figure 2, in assembling the bit to the body, the bit 30 will first be placed in recess 50 and pushed against side 61 of the bit socket, then the clamp 57 placed against the bit with hole 56 aligned with hole 52, and screw 55 will be inserted through the side of the bit body and screwed into the clamp until the bit is held tight. As best shown in Figure 6, the head of the screw enters bore 53 and shoulders against the juncture of bore 53 and hole 52. By the reverse procedure the bit is easily removed for replacement.

The bit itself preferably is made of tungsten carbide cast into the above described shape so that a minimum of grinding is required to produce the cutting edges and finish the seating surfaces of the bit.

Referring now to Figures 12 and 13 there is shown a modified construction in which the parts that are the same as in the previously described construction are given the same reference numbers and parts which are different but analogous to those of the previous construction are given a number one hundred larger. It will be seen that the modified trepanning head includes a body 20 internally threaded at 21 and externally knurled at 22 and provided with wear pads 33 as in the first described embodiment of the invention. However the socket formed at the junction of transverse section 151 and the end of thick wall 40 and also the bit 130 received therein are of somewhat different shape.

The socket has a side 161 to provide a seat to support the work against pressure of the work in the direction of the tool axis, similar in this regard to side 61 of the first described embodiment of the invention. Also it has a side 150, similar to previously described side 50, to pro-

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vide a seat to support the bit against the tangential pressure of the work. But in this embodiment side 150 is plane and it is side 161 that is formed as a V-shaped recess in order to resist radial forces on the bit. It is easier to cut the recess in this side. It will be noted that as in the previous embodiment the axis of the V-shaped recess lies in a plane perpendicular to the radius from the axis of the body to the cutting edge of the bit, but the axis of the recess is not parallel to the axis of the head; instead it is perpendicular to the projection of that axis on the aforementioned plane.

Referring now also to Figures 14-17, the bit 130 has a flat surface 164 on its azimuthally trailing side adapted to seat on surface 161 of the body of the head. The bit has angularly disposed plane seating surfaces 162, 163 adapted to engage the V-shaped recess 150 in the bit head. The apex of the angle between surfaces 162, 163 is rounded at 160 with a larger radius than the apex of the V-shaped recess 150 to insure that the bit seats properly in the recess.

The azimuthally leading surface 166 of the bit is flat and lies substantially in a diametral plane when the bit is assembled on the body of the head. There is a groove 166A in the surface 166, which receives the plane end 167 of the clamp 157. The clamp has a shoulder 168 spaced slightly from the inner end 164 of the bit where it extends above surface 151. A plane surface 169 on the opposite side of hole 156 in clamp 157 from end 167 is adapted to rest on section 151.

The screw 155 which holds the clamp 157 to the head body 20 is provided with oppositely directed threads on its two ends with an unthreaded portion therebetween and the hole 152 in the body is threaded as well as the hole 56 in the clamp. With this arrangement turning of the screw by means of a wrench inserted in hexagonal socket 155A in the end of the screw positively moves the clamp towards or away from the body of the head to clamp or free the bit therebetween.

The flanks 170, 171 of the bit are surfaces substantially perpendicular to the plane front surfaces 175, 176, 177 of the bit. Flank 170 is also perpendicular to leading surface 166 while flank 171 is at a slight angle to the perpendicular.

The junctions of the surfaces 175, 176, 177 of the outer cutting end of the bit with the leading side 166 is approximately shaped to provide cutting edges 183, 184, at the sides of the bit and 185 at the center, these edges being ground down to different levels relative to end 164 of the bit to more easily break up the chips. Due to the flare of bit flank 171, the cutting edge 184 extends out beyond the outer periphery of the body 20 of the head like flank 71 in the previously described embodiment of the invention.

While a preferred embodiment of the invention has been shown and described, many modifications thereof can be made by one skilled in the art without departing from the spirit of the invention and it is desired to protect by Letters Patent all forms of the invention falling within the scope of the following claims:

What is claimed is:

1. In a trepanning head comprising an annular body, one end of said body being of varying axial extent to expose a transverse section thereof, a bit disposed adjacent said transverse section, the bit extending axially of said body beyond the portion of maximum axial extent of said end of said body, and means for holding said bit to said body, the improvement according to which the corner at the junction of said transverse section and the portion of the end of said body of greatest axial extent is cut out to provide a bit socket, one side of said socket facing generally axially to support a bit against axial pressure, the other side of said seat facing generally tangentially to support the bit against tangential, i. e. rotational pressure, one of said sides of the bit socket having a V-shaped recess to support the bit against radial

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pressure, the axis of said recess extending substantially perpendicular to the radius of said body, said bit having adjacent sides shaped correlative to said flat and recessed sides of said socket and being disposed therein, said bit holding means comprising means to clamp said bit against the said tangential pressure supporting face of the bit socket, said side of said bit correlative to said flat side of said socket being in direct contact therewith, the portion of said socket forming said flat side thereof being integral with said annular body.

2. The combination of claim 1 in which the side of the socket having the V-shaped recess is the said other side facing generally axially and said bit has a groove in its face opposite the said one side of the socket facing tangentially and said clamp means includes a clamp engaging said groove to also hold said bit in said recess.

3. In a trepanning head comprising an annular body, a part of said body at one end thereof having a thick wall over a circumferential portion thereof and a thin wall over the balance of the circumferential extent thereof, said thin wall being of reduced axial extent at one juncture with said thick wall, a bit disposed adjacent said juncture, the bit extending axially of the body beyond the portion of maximum axial extent of said end of said body, and means for holding said bit to said body, the improvement according to which said juncture is stepped, whereby adjacent thick walled transverse sections of said body are exposed, the shoulder joining said sections being flat to provide a seat, the one of said sections nearest the end of said body having a recess thereon of V cross-section with the axis of the recess extending parallel to the axis of said body, the other of said transverse sections having a hole therein extending out through the side of said body, said bit having a flat end disposed directly against said seat and angularly disposed side walls engaging said recess and a flat surface opposite said angularly disposed side walls, said bit holding means including a clamp having plane surfaces to engage said flat surface on the bit and said other of said transverse sections, said clamp having a hole therein extending out between said plane surfaces aligned with said hole in said other transverse section of the body of the head, and a screw in said holes securing said clamp to said body with said bit therebetween.

4. In a body for a trepanning head, said body being generally tubular in shape, one end of said body being provided with means for connecting it to a boring tube, the other end of said body having a thick walled part extending part way around its circumference joining a thin walled part extending the remainder of the way, said thin walled part being of reduced axial extent at one juncture with said thick walled part exposing a transverse section of said thick walled part, the improvement according to which the corner at the juncture of said transverse section and the thick walled portion of the end of said body being cut out to provide a bit socket, one side of said socket facing generally axially to sup-

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port a bit against axial pressure, the other side of said socket facing generally tangentially to support the bit against tangential, i. e. rotational pressure, one of said sides of the bit socket having a V-shaped recess to support the bit against radial pressure, the axis of said recess extending substantially perpendicular to the radius of the body, and means to clamp a bit in said socket against said tangential pressure supporting face of the bit socket, said clamping means lying entirely outside the bit socket whereby the bit may seat directly against the sides of said socket.

5. In a trepanning head comprising an annular body, a part of said body at one end thereof having a thick wall over a circumferential portion thereof and a thin wall over the balance of the circumferential extent thereof, said thin wall being of reduced axial extent at one juncture with said thick wall, a bit disposed adjacent said juncture, the bit extending axially of the body beyond the portion of maximum axial extent of said end of said body, and means for holding said bit to said body, the improvement according to which said juncture is stepped, whereby adjacent thick walled transverse sections of said body are exposed, the shoulder joining said sections having a recess therein of V cross-section with the axis of the recess lying at the intersection of a plane perpendicular to a radius of the body and a plane perpendicular to the axis of the body, the one of said transverse sections nearest the end of said body being flat to provide a seat, the other of said transverse sections having a hole therein extending out through the side of said body, said bit having a flat side disposed against said seat and having angularly disposed end portions engaging said recess, the surface of said bit opposite said flat side having a groove, the bottom of said groove being flat, said bit holding means including a clamp having plane surfaces engaging said flat surface of the bottom of said bit groove and said flat surface on said other of said transverse sections, said clamp having a hole therein whose axis is between said plane surfaces, aligned with said hole in said other transverse section of the body of the head, and a screw in said holes securing said clamp to said body with said bit between said clamp and said body and in direct engagement with said recess and seat of said body.

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