Aug. 10, 1948. E. H. TRIMBLE 2,446,795

DRILL

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Fig. 1.

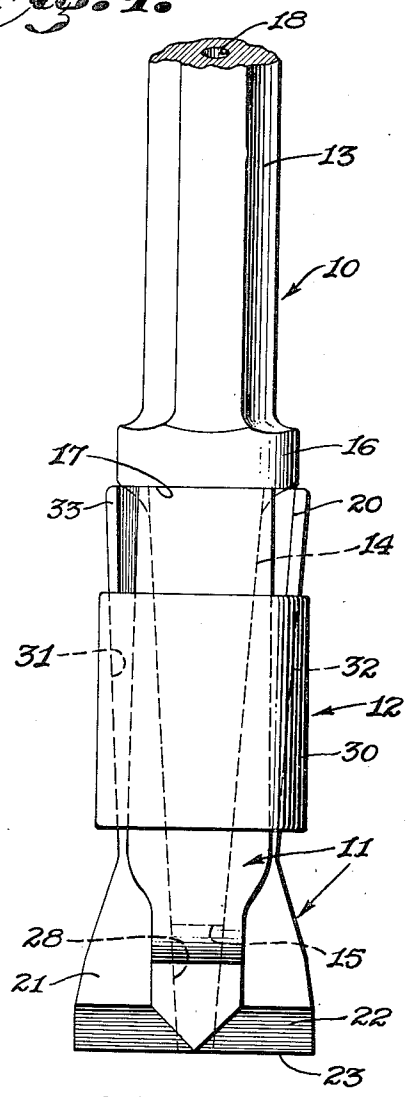


Fig. 2.

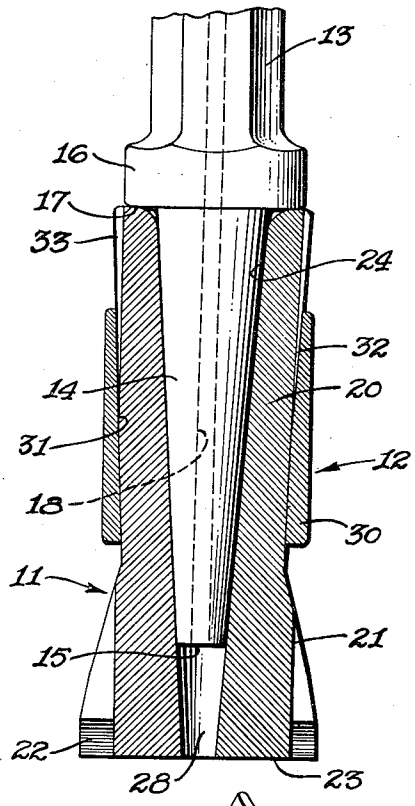


Fig. 3.

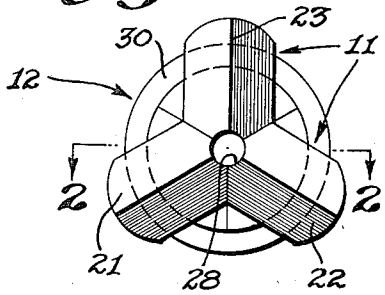
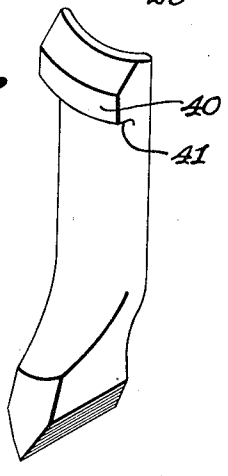


Fig. 4.



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Fig. 5.

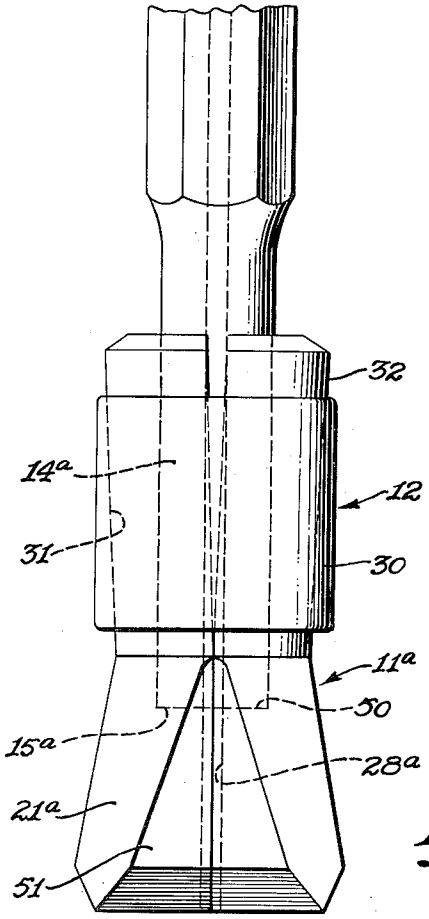


Fig. 6.

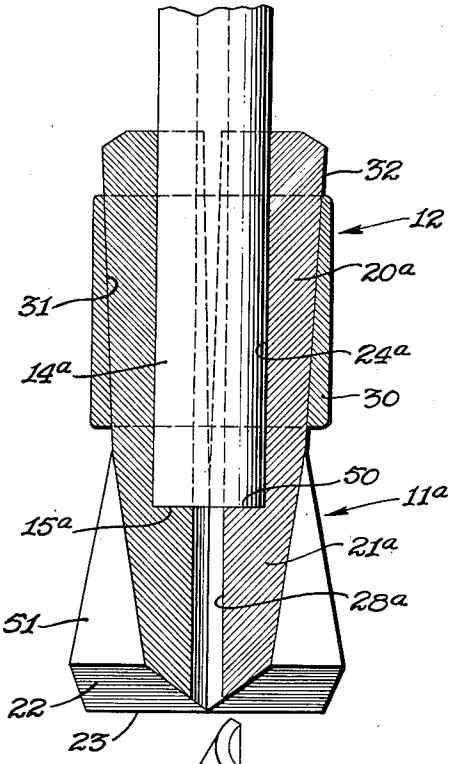


Fig. 7.

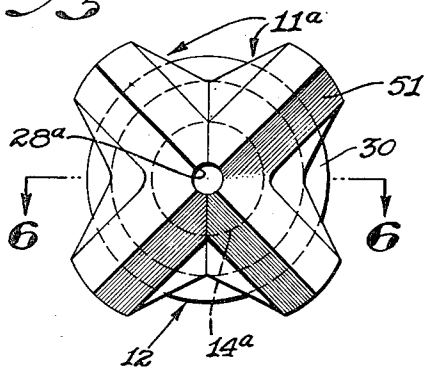
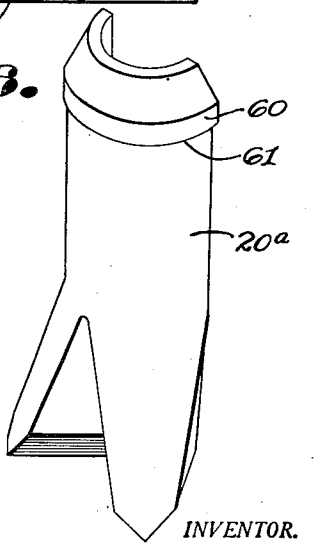


Fig. 8.



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Fig. 9.

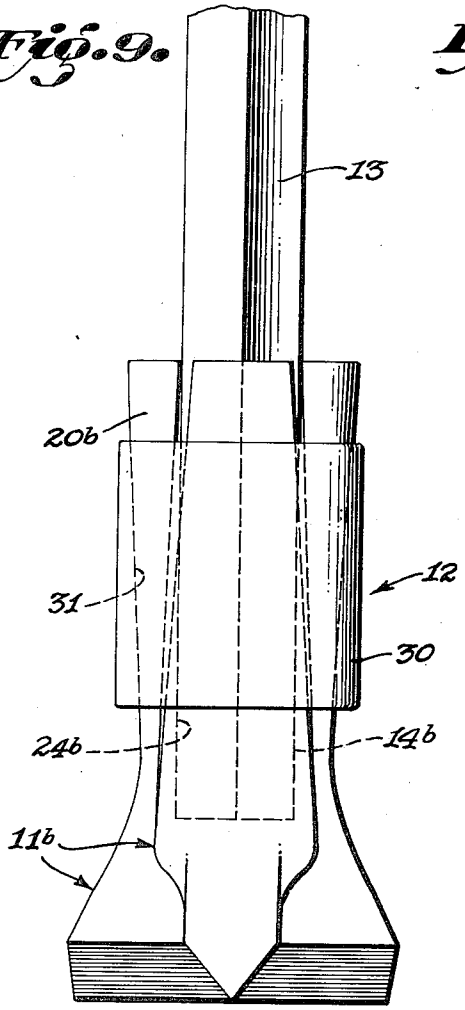


Fig. 10.

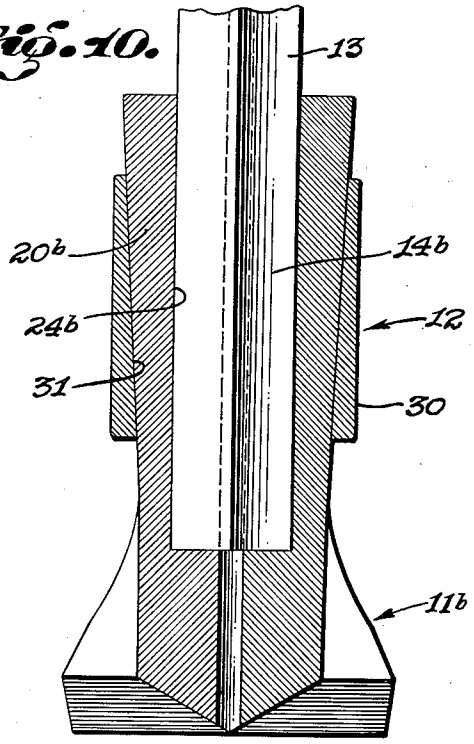


Fig. 12.

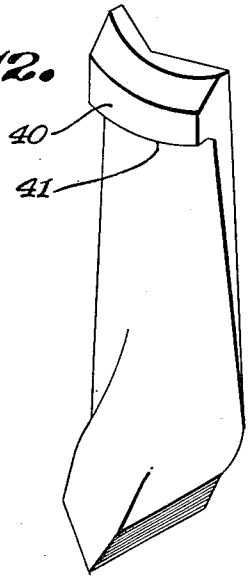
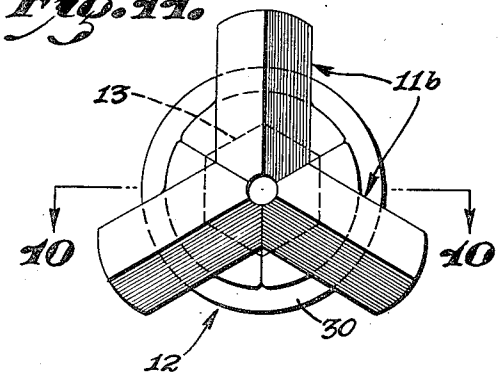


Fig. 11.



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DRILL

Earl H. Trimble, Los Angeles, Calif.

Application October 14, 1944, Serial No. 558,670

9 Claims. (Cl. 255—64)

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This invention has to do with a drill and has particular reference to a rock drill of the type commonly operated by a pneumatic hammer. It is a general object of this invention to provide a simple, practical and improved construction and formation of parts for a rock drill.

Drills of the type commonly termed rock drills and which are usually operated by pneumatic hammers for drilling rock, concrete, or like materials, involve a rod or bar usually equipped with a removable drill head which has sharpened cutting edges. The usual drill head is a separate part or unit fastened to the end of the rod and, in practice, this general construction is not altogether satisfactory and is not as economical as it might be.

It is a general object of this invention to provide a rock drill of the general character hereinabove referred to in which the drill head is segmental or sectional in form, each section being of simple, inexpensive construction. The construction of the present invention allows the head to be readily and cheaply manufactured in several sections, each of which has one or possibly two cutting edges readily accessible for grinding.

Another object of the present invention is to provide an improved, simple and effective structure for securing a segmental cutting head to a bar. The construction provided by the invention involves a single element or sleeve which serves to effectively secure the several sections of the head to the bar. The sleeve of the present invention is such that it can be readily released or disengaged to allow the sections of the head to be removed or replaced.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of the invention, throughout which description reference is made to the accompanying drawings, in which:

Figs. 1 to 3, inclusive, illustrate one form of the invention, Fig. 1 being a side elevation of a typical rock drill embodying the invention; Fig. 2 is a view similar to Fig. 1 showing parts in section; Fig. 3 is an end view of the construction being a view of the bottom end of the tool; and Fig. 4 is a perspective view of a modified form of cutter head section that may be employed in carrying out the invention.

Figs. 5 to 7, inclusive, illustrate another form of the invention, Fig. 5 being a side elevation of a construction embodying the invention. Fig. 6 is a view similar to Fig. 5 with parts shown in section to illustrate the details of construction, and Fig. 7 is a bottom end view of the structure shown in Figs. 5 and 6.

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Fig. 8 is a perspective view of a modified form of cutter that may be used in the structure shown in Figs. 5 to 7, inclusive.

Figs. 9 to 11, inclusive, illustrate another form of construction embodying the invention, Fig. 9 being a side elevation of the structure; Fig. 10 being a view similar to Fig. 9 with parts shown in section to illustrate their formation, and Fig. 11 being a bottom end view of the structure shown in Figs. 9 and 10. Fig. 12 is a perspective view of a cutter of modified form that may be used in carrying out the form of invention shown in Figs. 9 to 11, inclusive.

The structure provided by this invention involves, generally, a bar or rod sometimes called a drill shank, a segmental head for application to the working end of the bar, and means for releasably holding the sections of the head together and on the bar. In the form of the invention shown in Figs. 1 to 3, inclusive, the bar 10 is of a form that can be advantageously used in carrying out the invention. The head is segmental in form and involves three separate sections 11 and the means 12 for securing the said sections together and to the bar is of the simple ring form characterizing the invention.

The bar 10 which is a simple unitary bar or rod involves, generally, an elongate body or stem 13 provided at its lower or working end with a tapered mandrel portion 14. The mandrel portion 14 is tapered downwardly and outwardly so that its tip end 15, which occurs in the vicinity of the tip portions of the cutter sections, is considerably smaller in diameter than the upper end or base portion which is part of or is joined to the stem portion of the bar. In the particular form of construction illustrated an enlargement or collar 16 is formed on the bar between the stem portion 10 and the tapered mandrel 14, the collar being such as to present a downwardly facing stop shoulder 17, operable to positively stop upward movement of the cutter sections on the mandrel should there ever be a tendency for them to move upward beyond the normal working position on the mandrel, as I will hereinafter describe. In the preferred construction the mandrel has a central circulation opening 18 extending longitudinally through it to discharge circulating fluid from the lower or tip end of the tapered mandrel. It is preferred that the construction thus far described be formed of a single unitary part or body of material so that the stem 10, mandrel 14 and collar part 16 are integrally joined, preferably forged, and it is preferred that the mandrel be turned to present a smooth finished surface. In practice it is unnecessary to finish the other parts of the bar. For instance, the stem 13 may be the

usual unfinished hexagonal bar common in tools of this general character.

In the form of the invention under consideration the cutting head has three radially disposed equally spaced cutting blades at its lower end. Under such circumstances it is advantageous to form the cutting head in three sections 11 and to provide each head with a blade. In the particular form illustrated each section 11 extends around through an angle of substantially 120° and includes a shank portion 20, a tip portion 21 and a blade part 22 on the tip portion, the lower end of which is sharpened to present a cutting edge 23.

The shank portion 20 is designed to bear upon the mandrel 14 and carries the retaining means 12. In the preferred construction the inner side or wall 24 of the shank 20 is made concave and tapered to correspond in shape to the exterior of the mandrel 14. In practice the tapered concave surface 24 continues from one end of the head section to the other or, in other words, it continues down beyond the shank portion proper and continues to the tip portion 21. From Fig. 2 of the drawings it will be understood how the face 24 provided in the section bears on or fits the mandrel 14 of the bar.

The tip portion 21 of each section joins or is carried by the lower end of the shank 20 and is in the nature of an enlargement usually projecting a substantial distance radially outward from the shank and when the several sections are assembled together the tip portions 21 form what may be termed wings projecting radially outward. The blade portion is a downwardly tapered part at the lower end or face of each tip 21 and in practice may be ground or otherwise dressed to present a suitable cutting edge 23.

In practice the several sections are related or proportioned so that when they are assembled together they surround the mandrel 14 and leave a fluid passage 28 between the tip end 15 of the mandrel and the plane at which the edges 23 occur. As a result of this formation and relationship circulating fluid is effectively emitted from the cutting end of the assembly.

It is important to note that each section of the cutting head is simple in form and is of such shape and character as to be inexpensively manufactured. It is further to be noted that the blade portion of each section is readily accessible so that the edges can be sharpened properly and conveniently.

The means 12 providing for securing the sections of the cutting head together and to the bar involves a simple ring 30, the inner side or bore 31 of which fits the outer walls 32 of the shanks 20. In accordance with the invention the outer walls 32 of the shanks are formed so that they are substantially concentric with the axis of the assembly of cutters or the axis of the mandrel 14 and they are tapered to extend upwardly and outwardly toward the stem end of the mandrel at a suitable angle, preferably at an angle slightly less than that of the mandrel 14. With this construction the head is considerably larger in diameter at the end toward the stem than it is at the free or outer end of the mandrel. The bore 31 of the sleeve or ring 30 corresponds in taper or shape to the exterior form presented by the several shanks 20. In the particular case illustrated the extreme upper end portion 33 of the outer side of each shank 20 is shaped to match the fillet of shoulder 16, as shown in Fig. 2.

To condition the tool for operation the several sections 11 are assembled together in the ring 30 with the ring in a lowered position on the shanks 20. This assembly is then applied to the mandrel 14 so that the mandrel enters between the shanks 20 as shown in Fig. 2. Slight upward movement of the ring 30 tightens the sections onto the mandrel and as soon as the tool is put in operation the ring tends to creep up on the shanks and consequently tightens its grip on the shanks, causing them to be held in firm, secure engagement with the mandrel 14. Whenever it is desired to remove the entire head from the shank either to redress or replace sections of the head, it is a simple matter to force or drive the ring 30 downward on the shanks 20 thus releasing the head from the mandrel and when the head is removed from the mandrel the individual sections can be readily removed from the ring.

In the form of the invention shown in Fig. 4 the segmental cutter instead of having the upper portion of its outer side relieved as at 33, has an enlargement 40 on its upper end portion presenting a downwardly facing shoulder 41. The shoulder 41 acts as a stop to prevent the ring 30 from moving too far up on the assembled cutters.

In the form of the invention shown in Figs. 5 to 7, inclusive, the mandrel 14a of the bar instead of being tapered, as shown in Figs. 1 and 2, is a straight turned member, that is, it is a member round in cross section and uniform in size throughout its length. In the form of the invention shown in these figures of the drawings the head has four cutting blades or cutting edges and the head is divided into two sections 11a each of which has two blades or edges. In this form of the invention the shank portion 20a of each section is substantially semi-circular in cross section and its inner finished face 24a formed to fit the exterior of the mandrel 14a terminates in the region where the shank 20a joins the tip 21a and at this point there is an upwardly facing shoulder 50. This shoulder 50 may abut the tip end 15a of the mandrel to form a stop for determining the position of the head section on the mandrel.

Where each section of the head has two blade parts it is advantageous to form the tip portion 21a with two radially projecting enlargements or wings 51 each of which has its lower end finished to form a blade 22 having a sharpened lower edge 23. The wings 51 are preferably spaced 90° apart and the two wings are related on each head section so that when the sections are assembled the four wings are spaced 90° apart around the head. To accommodate circulation the tip portions 21a are recessed at 28a forming a duct for carrying circulation from the mandrel to the cutting edges of the head.

In this form of the invention the means 12 may be like that first described, that is, it may comprise a single ring 30, the inner bore 31 of which is tapered so that the opening in the ring is larger at the upper end than at the lower end, the outer faces 32 of the shanks are concentric with the axis of the tool and are tapered corresponding to the bore 31.

To use the tool the two sections 11a are assembled with the ring 30 and the head thus assembled is applied to the mandrel 14a. When the ring is forced upwardly it wedges the shanks 20a tight on the mandrel 14a and when the tool goes into use there is a tendency for the ring to creep up on the shanks and thus keep them tight on the mandrel.

In the form of the invention shown in Fig. 8 the shank 20a of each section is provided with an enlargement or head 60 near its upper end which

head presents a downwardly facing shoulder 61 forming a stop to limit upward movement of the ring on the shanks. In practice the parts are related and proportioned so that when the structure is assembled ready for operation the upper end of the ring 30 is spaced somewhat below the shoulder 61 and under normal conditions the ring will never reach the shoulder. However, should conditions be severe or after long usage the ring may be expanded or stretched so that it abuts the shoulder.

In the form of the invention shown in Figs. 9, 10 and 11 the bar instead of having a special part finished or turned to form a mandrel, simply has a lower end portion which may be termed a mandrel portion 14b. In the particular case illustrated the bar is polygonal in cross section, that is hexagonal, and the mandrel portion 14b is of like shape being simply a continuation of the stem or shank 13 of the bar.

In this form of the invention the head to be applied to the bar may be substantially the same as the heads hereinabove described, except that the inner wall 24b of each shank has flat sides designed to fit the flat exterior sides of the mandrel portion 14b. Where the head is divided into three sections 11b as is shown in the drawings the shank 20b of each section has two inner faces 24b which are flat and which are angularly related to bear on adjacent flat sides of the mandrel part 14b of the bar. Where the head is divided into three sections 11b it may be formed substantially the same as the head in the form of the invention shown in Figs. 1 to 3. In the form of the invention shown in Figs. 9 to 11 the retaining means 12 is the same as that above described, that is, it comprises a single ring 30 with a tapered bore 31 which receives and bears against the shanks 20b of the head sections. The action of the means 12 is the same as has been hereinabove described.

In Fig. 12 of the drawings there is illustrated a perspective view of a head section such as may be used in place of that shown in Figs. 9, 10 and 11. In this case, as in the forms shown in Figs. 4 and 8, the shank has an enlargement or head 40 at its upper end presenting a forwardly facing shoulder 41 to limit upward movement of the ring should that be necessary.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. In a drill, a bar having a stem and a mandrel portion at one end of the stem, a sectional head supported by the mandrel portion and having blade parts, and means securing the head on the mandrel comprising a ring surrounding the head where it engages the mandrel, the head and ring having tapered engaging faces pitched out in the direction of the stem and the ring being free to wedge toward the stem to tighten the head on the mandrel.

2. In a drill, a bar having a stem and a mandrel portion at the end of the stem, a sectional head surrounding and supported by the mandrel portion and having blade parts, and a wedge ring surrounding the head opposite the mandrel and securing the head on the mandrel, each section of the head having a shoulder bearing against the outermost end of the mandrel, the ring and head having tapered engagement and the ring being free to slide up on the head toward the stem to tighten the head on the mandrel.

3. In a drill, a bar having a stem and a central straight round mandrel portion on the end of the same, a sectional head surrounding and supported by the mandrel portion, each section of the head having a shank to bear on the mandrel and having a tip on the shank having a cutting blade, and a wedge ring securing the head on the shank, each section of the head having a shoulder bearing against the outermost end of the mandrel, the ring having tapered engagement with the head and being free to move toward the stem to tighten the head on the mandrel.

4. In a drill, a bar having a downwardly facing shoulder and including a stem above the shoulder and a central mandrel depending from the shoulder, a sectional head surrounding and supported by the mandrel below the shoulder, the exterior of the head being tapered, and a retaining ring supported entirely by the head opposite the mandrel and free to engage and move upwardly on the taper of the head to tighten the head onto the mandrel with the upper ends of the head sections bearing on the shoulder.

5. In a drill, a bar having a stem and a central mandrel portion at the end of the stem tapered in toward its free end, a sectional head surrounding and supported by the mandrel portion and having blade parts, and means securing the head on the mandrel comprising a ring surrounding and having tapered engagement with the head where it engages the mandrel, the ring being free to wedge toward the stem to tighten the head on the mandrel.

6. In a drill, a bar having a stem and a central mandrel portion on the end of the stem, there being a downwardly facing shoulder at the upper end of the mandrel portion, a sectional head surrounding and supported by the mandrel portion and limited in movement toward the stem by the shoulder, and a ring surrounding and having tapered engagement with the head where it engages the mandrel, the ring being free to wedge toward the stem to tighten the head on the mandrel.

7. In a drill, a bar having a mandrel portion, a downwardly and inwardly tapered sectional head supported by the mandrel portion, each section of the head having a shank to bear on the mandrel and having a tip on the shank having a cutting blade, and an internally tapered ring fitting around the head and slidably engaging the shanks of the head and free to move along the shanks away from the blades to wedge the shanks on the mandrel.

8. In a drill, a bar having a stem and a central tapered mandrel portion on the end of the stem with its large end adjoining the stem, a sectional head surrounding and supported by the mandrel portion, each section of the head having a shank to bear on the mandrel and having a tip on the shank having a cutting blade, the several shanks forming an assembly on the mandrel tapered in the same direction as the mandrel and means for securing the head on the shank comprising only a ring surrounding the several shanks of the head sections opposite the mandrel and having a tapered bore receiving the assembly of shanks, the ring being free to move along the shanks toward the stem to wedge the shanks to the mandrel.

9. In a drill, a bar having a stem and a mandrel portion at the end of the stem, a sectional head supported by the mandrel portion, each sec-

tion of the head including a shank to bear on the mandrel, an outwardly projecting enlargement at the upper end of the shank, and a tip at the lower end of the shank having a cutting blade, and a ring securing the head on the mandrel portion and having tapered engagement with the shanks and confined between the enlargements and tips.

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