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MINING TREPAN

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Fig. 6

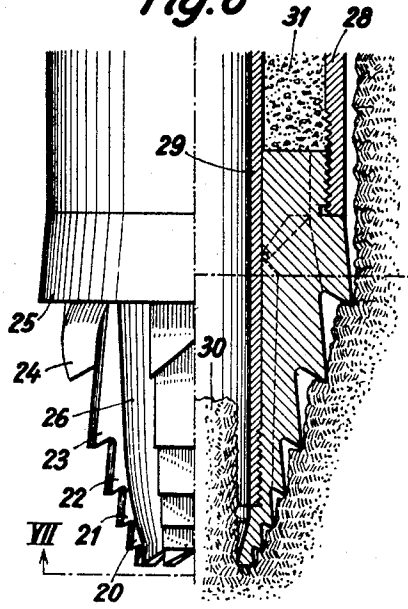


Fig. 10

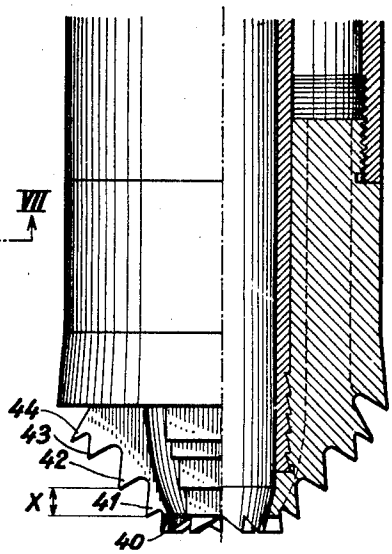


Fig. 7

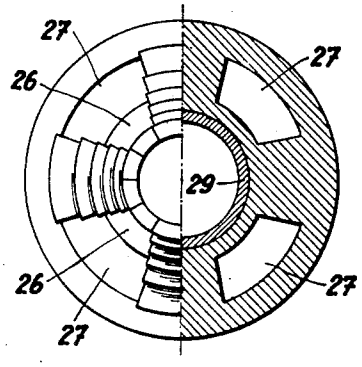


Fig. 11

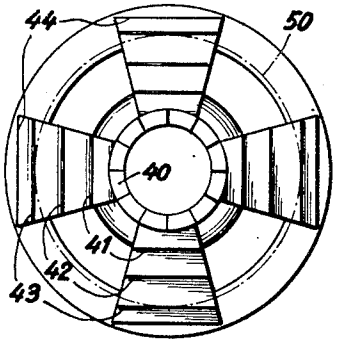


Fig. 8

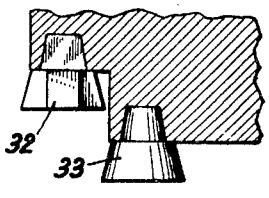
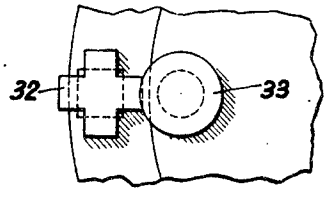


Fig. 9



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Fig. 1

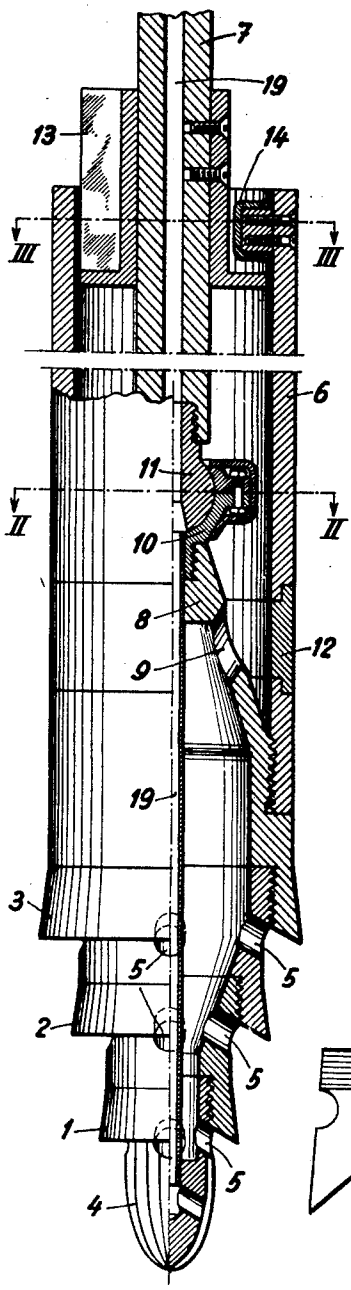


Fig. 2

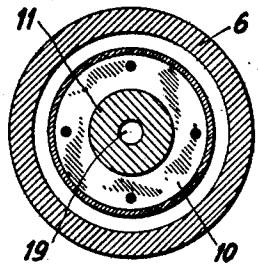


Fig. 3

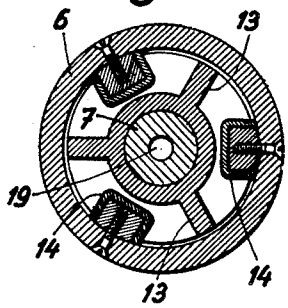


Fig. 3a

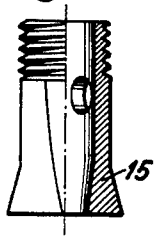


Fig. 4

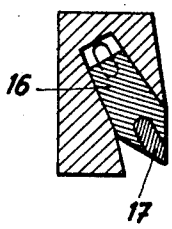
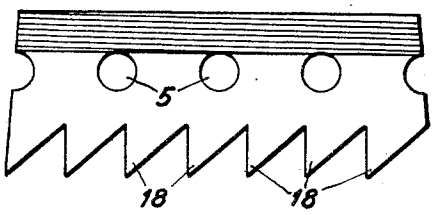


Fig. 5



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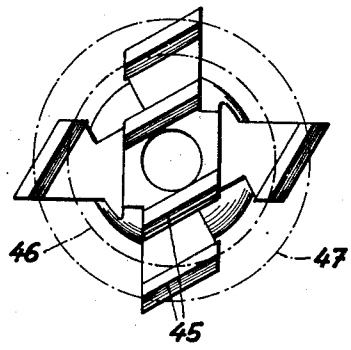


Fig.12

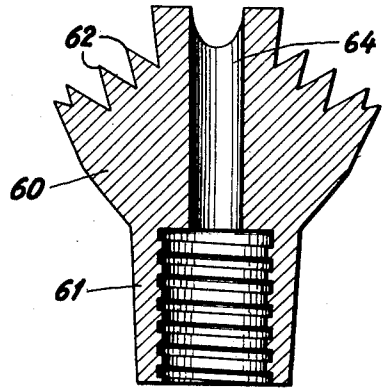


Fig.13

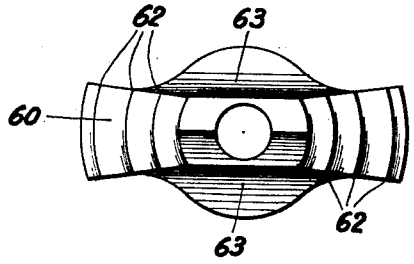


Fig.14

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UNITED STATES PATENT OFFICE

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MINING TREPAN

Joseph Dionisotti, Monthey, Switzerland

Application November 21, 1947, Serial No. 787,267
In Switzerland November 23, 1946

1 Claim. (Cl. 255—64)

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This invention relates to mining trepans comprising superposed crowns of cutting edges, the diameters of which increase from the head or point of the trepan onwards.

An object of the invention is to arrange these crowns around a cavity in which a part of the boring fragments can be discharged. For this discharge, e. g., compressed air or water under pressure may be used.

Another object of the invention is to provide the trepan in certain embodiments with a ball and socket joint permitting a better distribution of the shocks of the percussion rod to be obtained. In this way the efficiency will be increased and the tool less loaded.

A further object of the invention is to give the trepan in certain cases an open end in order to remove from the rock a cylindrical sample growing with the advancing of the trepan and penetrating into the central cavity of the latter.

Other objects and features will be apparent as the following description proceeds, reference being had to the accompanying drawings in which

Fig. 1 is a lateral elevation, partly in section, of a first embodiment.

Fig. 2 is a section along the line II—II in Fig. 1, and

Fig. 3 a section along the line III—III in Fig. 1.

Fig. 3*a* is a point which may be substituted for the point shown in Fig. 1.

Fig. 4 shows a detail of a second embodiment.

Fig. 5 is a developument of a crown of cutting edges of a third embodiment.

Fig. 6 is an elevation, partly in section, of another example.

Fig. 7 is a cross section along the line VII—VII in Fig. 6.

Fig. 8 is an elevation of a detail of a fifth embodiment, of which

Fig. 9 is a view from below.

Fig. 10 is an elevation, partly in section, of a sixth example, of which

Fig. 11 is a view from below.

Fig. 12 is a bottom view of a seventh performance.

Fig. 13 is an axial section through an eighth embodiment, of which

Fig. 14 is a bottom view.

Referring now to Figs. 1, 2 and 3, the illustrated mining trepan comprises members with crowns of cutting edges 1, 2 and 3, these members being screwed into one another. The diameters of these crowns increase from the crown 1 adjacent the point 4 up to the crown 3. The cutting point

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4 is screwed to the member of crown 1. Each member has holes 5 provided between its crown of cutting edges and its screw thread. The trepan being assembled, these holes 5 lie just below the crown of the adjacent larger member.

The member 3 has exterior screw threads to which a tube 6 is screwed, extending towards the top along a part of the operating rod 7. The upper portion of the member 3 ends in a cap 8 pierced by a hole 9. This cap carries a socket 10 receiving a ball 11 fixed to the rod 7.

Holes are provided along the tube 6, into which plugs 12 are screwed for a purpose described later on. Wings 13 are fixed to the rod 7, cooperating with drivers 14 mounted on the tube 6 in order to impart a rotary motion to the trepan, if desired.

The rod 7 and the ball and socket joint 10, 11 are traversed by a channel 19 going through the cap 8 of the member 3 and extending down to the cutting point 4.

The trepan described and illustrated works as follows:

The rod 7 is coupled in a usual manner to a rock-boring machine of any kind whatever (not shown in the drawing), which imparts to the rod either a pure axial shock or an axial and rotary movement together. These axial shocks are transmitted to the crowns of cutting edges by the intermediary of the ball and socket joint 10, 11 and the members screwed into one another. The fragments produced on boring are removed by compressed air supplied through the channel 19 and escaping through the point 4. These fragments after having been expelled through the point 4 enter through the holes 5 into the hollow space within the crown members which they leave through the hole or holes 9 for being discharged through the tube 6.

With the device shown in Fig. 1 it is not possible to take samples of the rock. For doing so, the point 4 must be replaced by a point such as 15 in Fig. 3*a*. With this point 15 an intact rock cylinder may be formed in the middle of the bore, which can be taken out together with the complete tool, from which it may be removed by unscrewing the members 1, 2 and 15.

The cutting edges may consist of individual pieces fixed to the crown members. These pieces may form cutters such as shown in Fig. 4, distributed on the circumference of the crown members. These cutters consist of a conical shank 16 carrying a cutting element 17.

In the embodiment shown in Figs. 6 and 7, the crowns of cutting edges 20, 21, 22, 23, 24 and 25 are all made from the same steel block. On this

block grooves **26** are provided, substantially parallel to the longitudinal axis of the trepan, which divide the different crowns of cutting edges into a certain number of teeth groups. These grooves **26** run into holes **27** provided in the block and connecting the grooves **26** with a fragment-collecting chamber **31** limited towards the outside by a tube **28** screwed to the upper end of the block and towards the inside by a second tube **29** screwed to the lower part of the block. On the bottom the trepan is open so that, on driving-on the bore, a cylinder **30** is cut out of the rock, serving as a sample showing the nature of the rock to be worked upon.

The rock cylinder **30** is not in contact with the tube **29**. Compressed air is supplied through this tube to the end of the trepan, from which it passes outside along the crowns and escapes through the grooves **26** and the openings **27** in order to carry the rock fragments away into the collecting chamber **31**.

Should a rock sample not be required, a point corresponding to that described in connection with the former example might be fixed to the trepan in an ordinary way. Instead of making the cutting edges in one piece with the block, they may be formed as individual cutters **32** or **33** (Fig. 8) which are either circular or cross-shaped in plan view, as shown in Fig. 9. These cutters have a conical shank. They may thus be adjusted to bring successively different parts of their cutting edges into working position, or they may even be replaced totally.

It has proved advantageous to give the crowns of cutting edges diameters which are in direct relation to the distance separating these crowns from one another. The efficiency of the tool is e. g. considerably improved if each crown has a diameter equal to that of the adjacent smaller crown augmented by twice the axial distance of these crowns from each other. There are also certain cases where the efficiency of the trepan is improved if the cutting edges of the different crowns have their ends not on the same circle with its center in the middle of the tool, but on two different circles.

The rock-boring tool shown in Figs. 10 and 11 has a certain number of crowns of cutting edges **40**, **41**, **42**, **43**, all made from the same steel piece, and the diameters of which increase from the lowermost crown **40** to the upermost crown **43**. As above-mentioned, the crown **41** has a diameter equal to that of the crown **40** augmented by twice the axial distance of these crowns from each other. The same relation exists between the crowns **41** and **42**. This latter has a diameter equal to that of the crown **41** augmented by twice the axial displacement x between these two crowns. This distance x is greater than that between the crowns **40** and **41** and is still greater between the crowns **42** and **43**. This latter crown carries a small supplemental tooth **44** serving to diminish the boring load imparted to the crown with the greatest diameter.

In the embodiment shown in Fig. 12 the ends of the cutting edges **45** of the different crowns do not lie on one single circle with its center in the middle of the tool as in Figs. 10 and 11 where the circle **50** is shown in a chain-dotted line, but on two circles **46** and **47** of different diameters. On boring, this trepan removes from the rock a portion having a width equal to the difference of the radii of the two circles. The cutting edges **45** may consist of individual pieces fixed to the remaining part of the trepan and made from harder material than the latter.

If the cavity serves only the conduit of the compressed air or the water under pressure, the fragments discharge along the circumference of the trepan. Such a tool is illustrated in Figs. 13 and 14. This trepan together with its screw connection **61** is made in one steel piece **60**. The cutting edges of the crowns **62** are arranged on concentrical circular arcs and are separated by recesses **63** giving the tool a slender shape. The cavity **64** is cylindrical and serves only for the conduit of compressed air or water under pressure necessary for clearing away the fragments which pass easily through the recesses **63**.

What I claim is:

A mining trepan comprising a body member, a bit member secured to the lower end of said body member, said bit member having a plurality of sets of tooth portions projecting laterally and downward, the tooth portions of each set having cutting edges positioned substantially in a plane extending at a right angle from the longitudinal axis of the trepan, the planes pertaining to different sets being axially spaced and the radial distance of the cutting edges of one set of tooth portions from the longitudinal axis of the trepan being greater than the radial distance of the cuting edges of the set below by substantially the axial distance between their planes, and the axial distance between the planes of the two uppermost sets of tooth portions being smaller than that between the planes of the other sets.

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