July 21, 1953 A. LÖBBERT 2,646,256

DEVICE FOR DUSTLESS DRILLING IN THE ROCK OF MINES

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Fig. 1

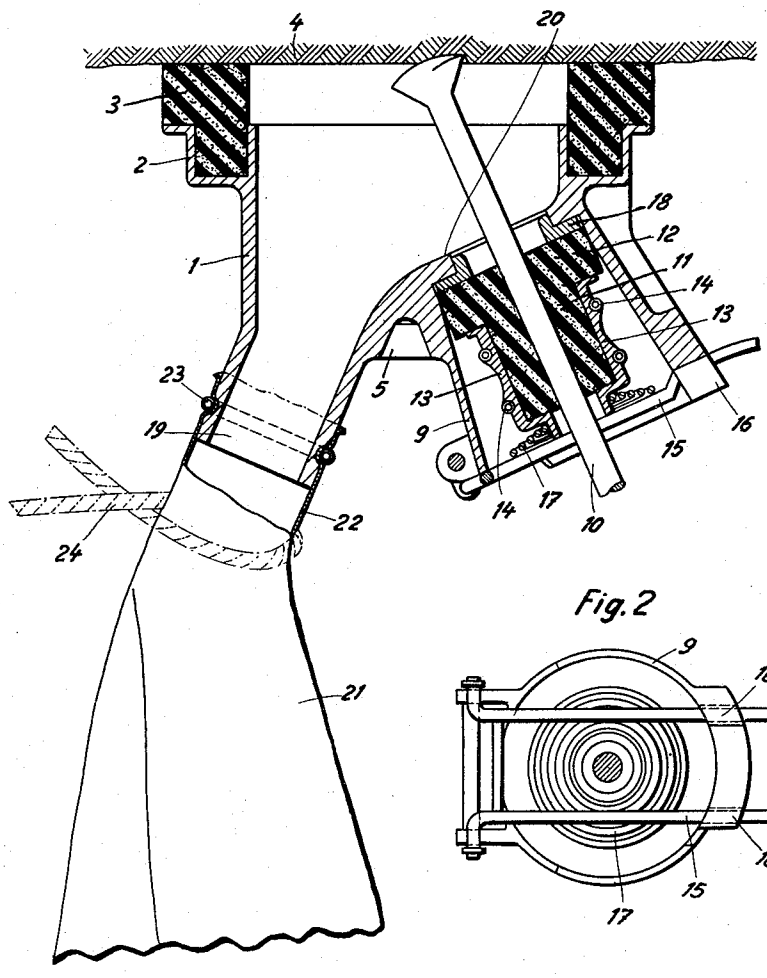


Fig. 2

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Fig. 3

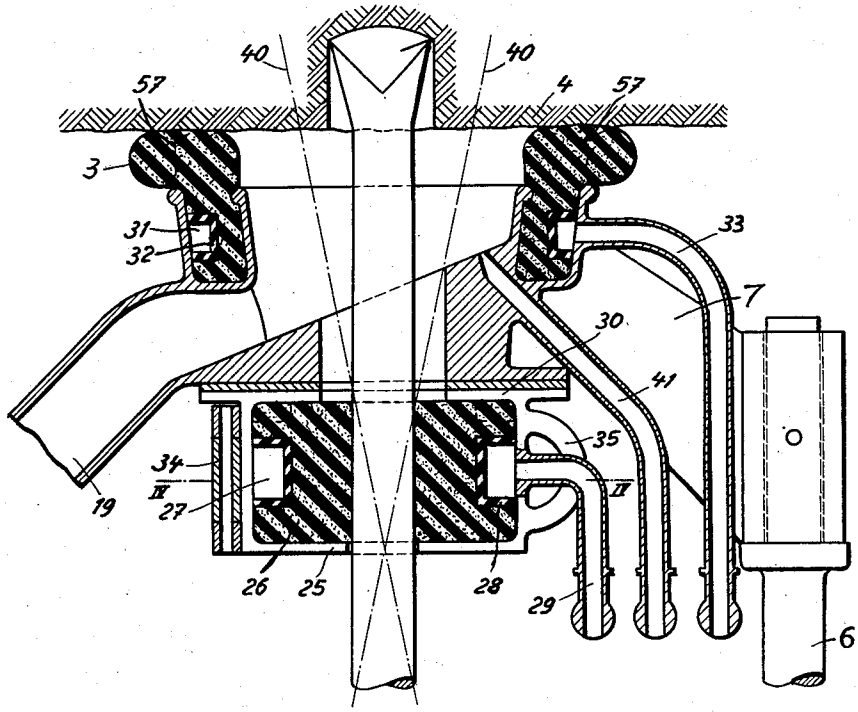


Fig. 5

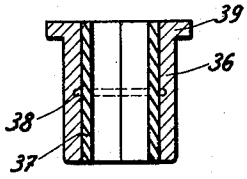


Fig. 6

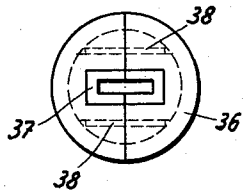
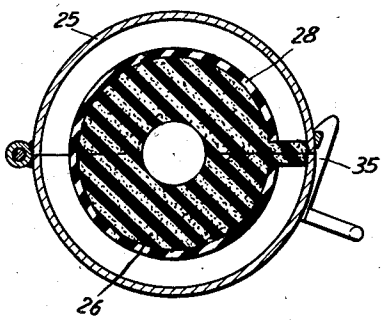


Fig. 4



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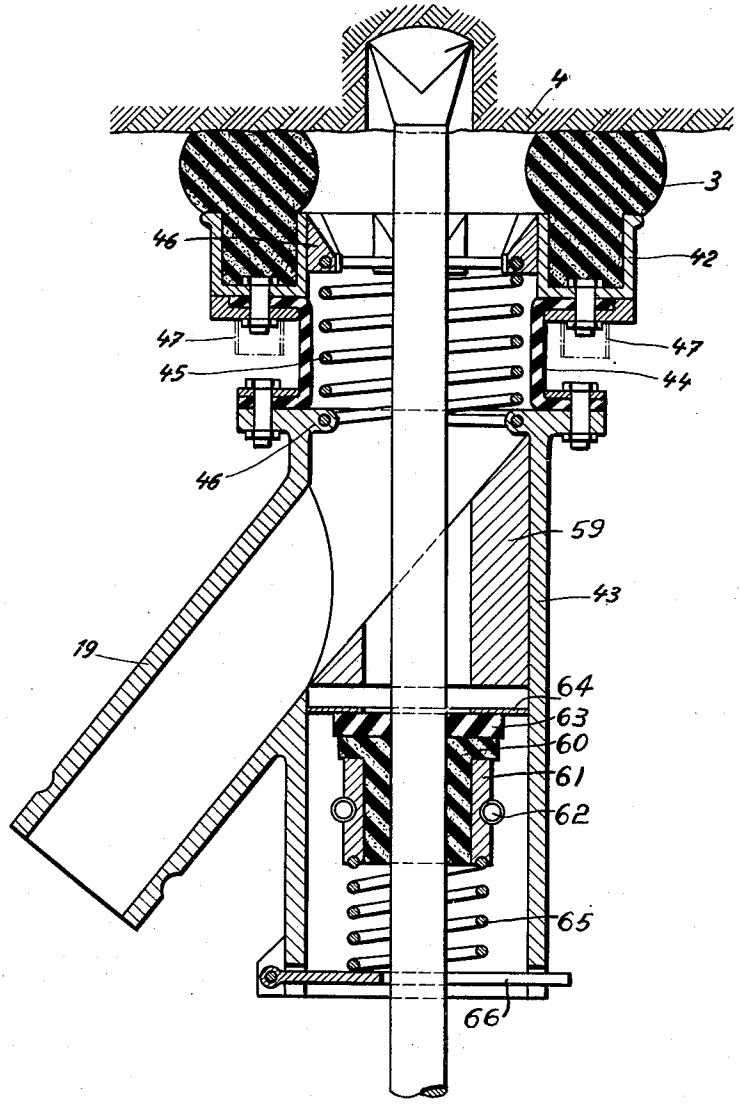
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DEVICE FOR DUSTLESS DRILLING IN THE ROCK OF MINES

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Fig. 7



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DEVICE FOR DUSTLESS DRILLING IN THE ROCK OF MINES

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Fig. 8

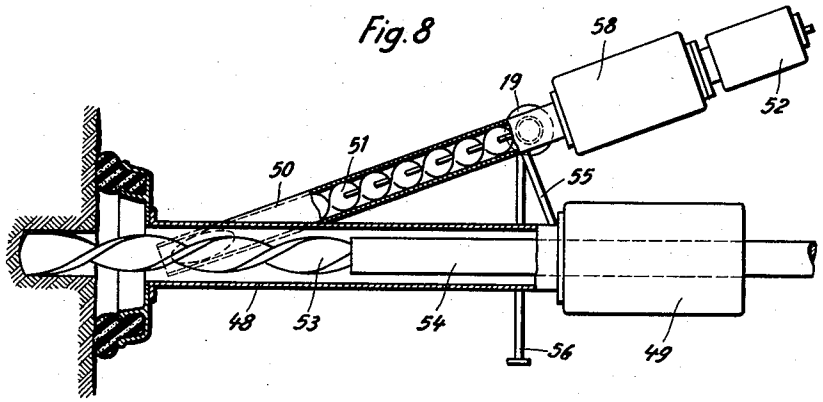


Fig. 9

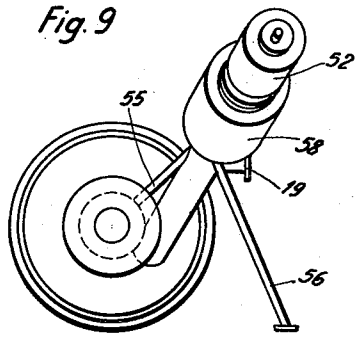
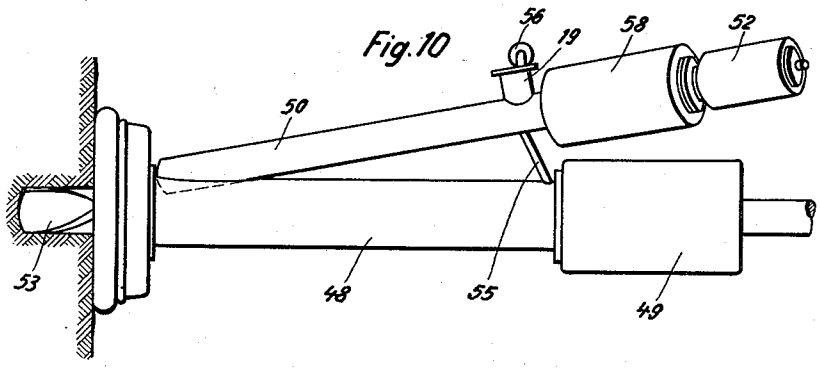


Fig. 10



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UNITED STATES PATENT OFFICE

2,646,256

DEVICE FOR DUSTLESS DRILLING IN THE ROCK OF MINES

Anton Löbbert, Utfort uber Moers, Germany

Application August 17, 1949, Serial No. 110,688
In France September 26, 1946

2 Claims. (Cl. 255—50)

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This invention relates to drilling operations in the rock of mines and is especially directed to a device for dustless drilling, hereinafter called the cap, which is applied to the face of the rock and provided, in addition to the drill, with means for the dustless collection and removal of the drillings.

The device is equipped with packing means for the drill, which are elastically pressed against the shaft of the drill at the place where it enters the cap, and also with sealing means adapted to snugly fit around the drill-hole when the drilling work is going on.

The object of the invention is to provide a cap of the aforesaid type which is so devised that, in spite of the movements of the drill during the drilling work, a snug and perfect fit of its packing and sealing means at the drill and at the drill-hole is reliably guaranteed, and which, in addition to that, is adapted for dry drilling in such a way that the drillings are removed from the device without the formation of dust, whereby, however, the invention is not confined to dry drilling only.

In order to obtain that the drillings are caught up by and removed from the device in a satisfactory manner, i. e. without the formation of dust, it is necessary that the packing and sealing means are so devised that the snug fit of the latter around the shaft of the drill and around the drill hole is at no time affected by the movements of the drill. The aforesaid requirements have not been fulfilled by any of the devices employed hitherto for the purpose in question, and that is why it has been impossible up to this time to do dry-drilling without the formation of dust, although the elimination of dust is a necessity sine qua non to prevent silicose, a disease caused by the presence of mineral dust. Until now the formation of dust has caused particular difficulties in steep drilling, as in work of this kind the formation of dust could not be prevented by the admission of water to the drill-hole, because of the downflow of the water upon the miner working underneath the drill-hole.

All of the known constructions used for the purpose in question are either of the totally rigid type, or are trying to achieve the desired result of collecting and removing the dust by means of a spherical and loosely adjustable bowl, or with the aid of an elastic mass interposed between the dust-collecting contrivance and the face of the rock, whereby, however, the necessity of providing the drill with snugly fitting sealing means at the place where it enters the dust-collecting means, has been completely neglected.

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In other devices, in which the dust-collecting contrivances are rigidly applied to the face of the rock, the drill is arranged in a somewhat more elastic way. However, the adaptability of these arrangements is limited to the rotary movements of the drill and to the shifting movement of the latter in the feed direction, or to some lateral displacements of the drill, while no or insufficient attention has been given to the unavoidable oscillatory movements of the drill, with the result that no tight fitting closure is produced and that the dust is not successfully prevented from escaping from the collecting means after having been caught up in them.

Contrary to this the packing means of the invention are so devised and so arranged that they are from all sides elastically pressing against the shaft of the drill, so that the drill and the packing means surrounding it can radially oscillate in all directions in such a way that a snug and tight fit of the packing means around the drill is at all times reliably guaranteed, and that the proper operation of the entire device is in no way interfered with by the movements of the drill.

Additional features and advantages of the invention will be understood from the following detailed description taken in connection with the accompanying drawings. However, it is to be understood that the invention is not confined to any strict conformity with the drawings, but may be changed or modified, so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings, in which similar numerals of reference indicate corresponding parts in all of the several figures,

Fig. 1 is an elevational sectional view of the cap;

Fig. 2 is a bottom view of the projecting portion on the right side of Fig. 1, containing the packing means through which the drill extends into the cap;

Fig. 3 is an elevational view, partly in section, of a cap provided with packing and sealing means operated with the aid of compressed air;

Fig. 4 is a horizontal cross-section through the packing means on line IV—IV of Fig. 3;

Fig. 5 is a central longitudinal section through a sleeve slipped onto drills of rectangular (instead of circular) cross-section;

Fig. 6 is a top view of the sleeve illustrated in Fig. 5;

Fig. 7 is an elevational sectional view of a cap consisting of an upper portion adapted to be pressed against the face of the rock, and a lower

portion containing the packing means for the drill;

Fig. 8 is a diagrammatical illustration of a cap adapted for operation in horizontal position, showing the construction of the drill and of the conveying means for the drill-dust;

Fig. 9 is a diagrammatical illustration of the side of the cap at which the drill is introduced into it;

Fig. 10 is a longitudinal view of the cap of Fig. 8, showing the outer appearance of the device.

Referring now to the drawings in detail, the reference numeral 1 denotes the cap provided with an annular recess 2, in which the sealing means 3 is arranged, which may consist of sponge rubber or the like, and which is forced against the face of the rock with the aid of a pressure column operated by means of compressed air. In the construction illustrated in Fig. 1 the pressure column engages the cap at 5, while in the form of invention shown in Fig. 3 the pressure column 6 acts upon the cap through the intermediary of the pressure member 7. In the modification pictured in Fig. 7 the cap is provided with the coupling members 47 by means of which the cap is secured to a fork-shaped pressure member of the pressure column.

In Fig. 1 the cap has been provided with a laterally projecting portion 9 through which extends the drill 10 and in which the packing means 11 for the shaft of the drill have been arranged. These packing means consist of sponge rubber and the longitudinal section of these packing means is of T-shaped conformation. The T-flange 12 of the packing means faces the opening through which the drill extends into the cap, while the sleeve-like stem of the packing means is surrounded by two pressure members 13, which with the aid of the elastic rings 14 are pulled against the packing means 11 and thereby force the packing means against the shaft of the drill 10. The packing means may be cut, in axial direction, into two halves, so that they can conveniently be arranged around the shaft of the drill.

Rotatably secured to one side of the free end of the projecting portion 9 is the fork-shaped member 15, whose free ends engage in the slots 16 when the member 15 is moved into locking position. Interposed between the fork 15 and the members 13 is a spring 17, which is bearing against the underside of the fork and urges the members 13 and the packing means 11 embraced by them against the opening through which the drill 10 extends into the cap. The flange 12 of the packing means bears against a steel plate 18 of particularly wear-resisting material surrounding the opening through which the shaft of the drill extends into the cap. The plate 18 prevents the cap from being damaged by the shocks of the drill, if the latter, during the drilling work, should come in contact with the edges of the opening through which it extends.

For the removal of the drill-dust the invention provides the outlet branch 19. The bottom 20 of the cap is of inclined formation toward the outlet branch 19, so that the drill-dust automatically flows into it and thus is removed from the cap.

Attached to the outlet branch 19 is a bag 21, which preferably should be of paper, and which may be provided with a neck-portion 22, so that it fits snugly around the outlet branch after having been slipped onto it. The neck portion 22 may be secured in position around the outlet branch 19 by means of a tensioning ring 23, which, after the neck portion has been slipped onto the branch is pushed over the neck portion and made to engage in a circular groove provided in the outlet branch for that purpose. The tensioning ring may be of rubber or the like.

It is further advisable to provide the paper bag with suitable closing means, which may consist of a cord 24, as indicated in dash lines in Fig. 1. As soon as the paper bag is filled with drill dust it is removed from the branch and transported to a suitable storing place for the dust.

In the modification illustrated in Figs. 3 and 4 the construction of the cap has been somewhat simplified. Here the cap is provided at the cap-bottom with a casing 25 in which as packing means for the drill a rubber sponge 26 has been arranged. These packing means can be vulcanized to the cylindrical walls of the casing and have been provided with an outer annular groove 27 equipped with a rubber strip 28. It is further possible to provide the casing at its upper portion, as indicated in dotted lines, with an annular collar, which above the annular groove 27 engages the rubber sponge 26, and acts as a sealing counter-support when the compressed air is pressing against the rubber packing. Secured to the casing 25 is a connecting branch 29 which connects the annular groove 27 with a source of compressed air.

It is also feasible to arrange in the annular groove a rubber hose, having one of its ends connected to the connecting branch 29, while its other end terminates at the latter. In this case it is not necessary to vulcanize the packing means to the casing, nor will the annular collar be needed then.

The compressed air in the channel 27, acting in all directions forces the rubber sponge against the shaft of the drill 10 and against the upper wall 30 of the casing 25, which constitutes the counter-support for the packing means which is secured to the bottom of the casing. When during the drilling operations the drill is performing oscillatory or axial reciprocating movements, such movements will not be transmitted to the cap and will not interfere with the proper functioning of the packing means at the shaft of the drill and at the counter-support, because of the elastic construction of the rubber sponge.

In the construction of Figs. 3 and 4 the sealing means of the cap at the face of the rock 4 consist again of sponge-rubber. In addition to this the sealing means are forced against the rock with the aid of compressed air, for which purpose the sponge rubber has been provided with an outer annular groove 31, in which a rubber strip 32 is arranged. By means of the connecting branch 33 the annular groove is connected with a source of compressed air.

The casing 25 has been axially divided into two halves, whereby the two halves are hingedly joined together at 34 (see Fig. 4). At the opposite side of the joint 34 the casing has been provided with the locking means 35. The rubber sponge has been vertically cut open on one of its sides, so that it can conveniently be placed around the shaft of the drill.

If the cross-section of the shaft of the drill is not of circular but flat or similar formation it is necessary to provide the shaft with a sleeve 36, as indicated in Figs. 5 and 6. The sleeve 36 is round on its outside, while its inner opening is adapted in shape to the cross-section of the shaft of the drill. A soft inner lining 37 guarantees a snug fit around the shaft. Accurate adjustment of the two halves of the sleeve around the shaft is

obtained with the aid of the pins 38, secured to one of the two halves and engaging in bores of the other half of the sleeve. The upper end of the sleeve is provided with a collar 39 designed to retain the sleeve in the packing means.

The oscillatory movements performed by the drill during the drilling operations are indicated by the dot-and-dash lines 40 in Fig. 3.

The connecting branch 41 may be used as a means for supplying water or lather for the removal of the dust to the cap, unless dry drilling, with a paper bag fastened to the outlet branch 19, is preferred. If the dust is to be removed with the aid of water or lather, a hose instead of the bag should be attached to the outlet branch 19.

In order to facilitate the rotation of the shaft of the drill within the packing means it is advisable to provide the latter at the places at which they are in contact with the shaft with a coat of graphite, or to apply to the shaft a thin film of paraffine or wax by making it pass between suitable application means therefor prior to entering the packing means. If the dust is removed with the aid of water, the water will simultaneously act as a lubricant. But it is also possible to provide the packing means adjacent the shaft with linings of felt interspersed with graphite.

The upper end of the cap may be provided with the distance regulating pins 57, which limit the shifting movement of the cap, via the column 6, toward the face of the rock. The position of the pins 57 has been indicated in dotted lines in Fig. 3. In the construction illustrated in this figure the pressing of the rubber sealing means 3 against the rock is effected with the aid of compressed air.

If the face of the rock or the roof of the mine is not flat but, owing to the formation of the stratum, of angular or step-like shape, it may be advisable to use the form of construction illustrated in Fig. 7. In this form of the invention the cap is subdivided into an upper portion 42 and a lower portion 43, whereby the upper portion with its sealing means 3 is pressed against the rock, while the lower portion is provided with the outlet branch 19, to which the paper bag is attached, and the packing means for the shaft of the drill, whereby the packing means may correspond to those required for the construction of Fig. 1.

The aforesaid two portions of the cap have been joined together with the aid of horizontally in all directions elastic coupling means. This coupling means consists of a piece of rubber hose 44 and of a helical spring 45 positioned in the latter. The upper end of the helical spring passes through four projections 46, provided at the upper portion 42 and the lower end passes through four projections in the lower portion 43.

The lower cap portion 43 is provided with an oblique bottom 59. The packing for the drill comprises two shells 60 of soft material, each of which is disposed in a bearing shell 61. A spring ring 62 presses the shells 61 and the packing shells 60 closely against the shaft of the drill. A rubber gasket 63 is provided above the packing 60 which is pulled over the shaft and rests firmly against the shoulder 64 on the lower cap portion 43. Spring 65 which is biased against the closure fork 66 which may be constructed as shown in Fig. 2 forces the packing against the shoulder 64.

The upper portion 42 is further provided, beneath the recess, in which the sealing means 3 is arranged, with the coupling members 47, in which engages a fork-shaped pressure member of the pressure column. These coupling members may be secured to a rotatable ring, so that, apart from the turning possibilities provided by the pressure column, the cap can be moved into such a position that the angle of inclination required for the orderly flow of the drill dust into the outlet branch is thereby created.

If the position of the hole to be drilled is not sufficiently inclined for the drill dust to flow out of it by gravity, as will be the case when the drilling takes place close to the floor of the mine, the construction of the cap may be devised as illustrated in Figs. 8 to 10. In this form of the invention the upper portion of the cap, including the sealing means 3, is mounted on a hollow shaft 48, which is of smaller diameter than the upper portion and which, at its opposite end, carries the casing 49 for the packing means through which the drill extends into the hollow shaft 48 and into the upper portion of the cap.

Secured to the hollow shaft 48, in substantially tangential direction thereof, is a discharge pipe 50, in which a screw conveyor 51 is arranged which is working in ascending direction and whose windings may consist of elastic material, such as rubber or the like. Connected to the discharge pipe 50, adjacent the upper end of the screw conveyor 51, is an outlet branch 19 for the attachment of paper bags for the drill dust. Mounted on the free end of the discharge pipe 50 are the packing means 58 for the shaft of the screw conveyor 51, and connected to the upper end of that shaft is a motor 52, which may be of the air turbine type.

The twisted drill 53 is provided with a circular shaft 54, the length of which depends upon the selected length of the twisted drill, i. e. upon the feed length of the drill, so that the circular shaft 54 has to be at least as long as the twisted drill plus the packing means in the casing 49 through which it extends. The length of the hollow shaft 48 depends upon the length of the twisted drill.

The discharge pipe 50 and the hollow shaft 48 are secured together by means of an arm 55. In addition to this the discharge pipe 50 is provided with a supporting member 56, so that the device can be placed in horizontal position on the floor of the mine in order to be applied in this position to the face of the rock.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a device for dustless drilling in the rock of mines, a dust-collecting housing including a rigid portion supported by a standard and provided with elastic sealing means adapted to snugly fit around the drill-hole; an opening in said housing defining a shoulder externally of said housing; a tubular portion projecting from and connected to said dust-collecting housing and surrounding said opening thereof; a cross-member extending across and secured to the free end of said tubular portion; a drill extending through said cross-member and said tubular portion and said opening into said dust-collecting housing; elastic packing means arranged in said tubular portion and adapted to snugly surround said drill; a helical spring arranged in said tubular portion between said packing means and said cross-member and adapted to press said packing means against said shoulder while bearing against said cross-member; and a tubu-

lar stub for the drill-dust connected to said dust-collecting housing, said cross-member being bifurcated and at one end hingedly secured to said tubular portion, and said tubular portion being provided with locking means adapted to releasably secure the free end of said cross-member in locked position.

2. In a device for dustless drilling in the rock of mines, a dust-collecting housing including a rigid portion supported by a standard and provided with elastic sealing means adapted to snugly fit around the drill-hole; an opening in said housing defining a shoulder externally of said housing; a tubular portion projecting from and connected to said dust-collecting housing and surrounding said opening thereof; a cross-member extending across and secured to the free end of said tubular portion; a drill extending through said cross-member and said tubular portion and said opening into said dust-collecting housing; elastic packing means arranged in said tubular portion and adapted to snugly surround said drill; a helical spring arranged in said tubular portion between said packing means and said cross-member and adapted to press said packing means against said shoulder while bearing against said cross-member; and a tubular stub for the drill-dust connected to said dust-collecting housing, said packing being of substantially T-shaped cross-section longitudinally thereof and being provided with lateral pressing members around the stem of said T forcing it against said drill, and the cross-bar of said T constituting the flange of said packing means resting against said shoulder surrounding said opening in said dust-collecting housing.

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