Jan. 31, 1939. W. NOBLE 2,145,272

DUST COLLECTING MEANS

Filed April 27, 1935 4 Sheets-Sheet 1

Fig. 1.

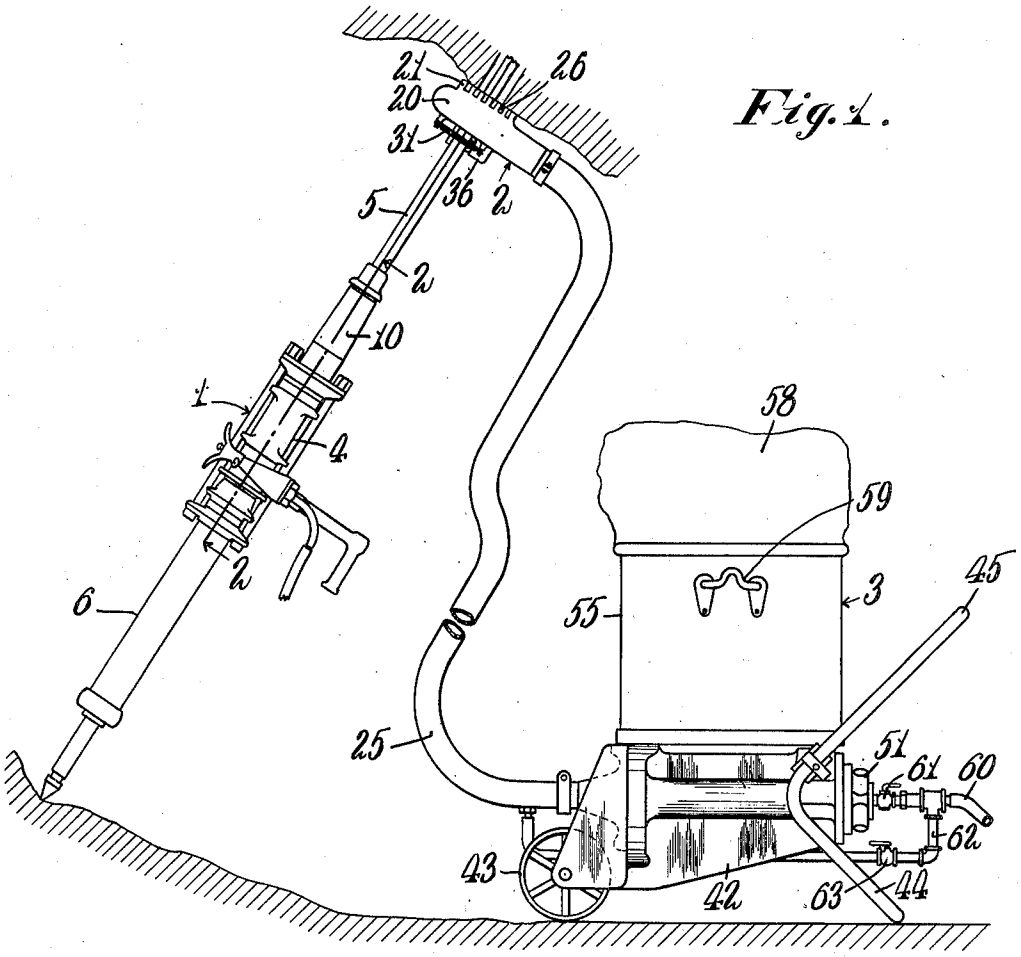
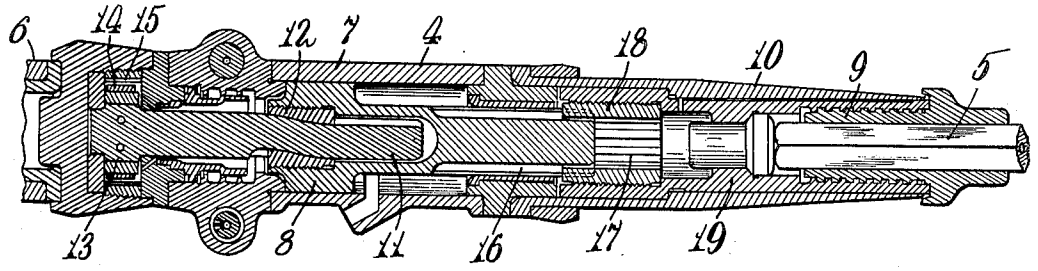


Fig. 2.



Inventor:
Warren Noble
by Louis A. Wilson.
Atty.

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DUST COLLECTING MEANS

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Fig. 3.

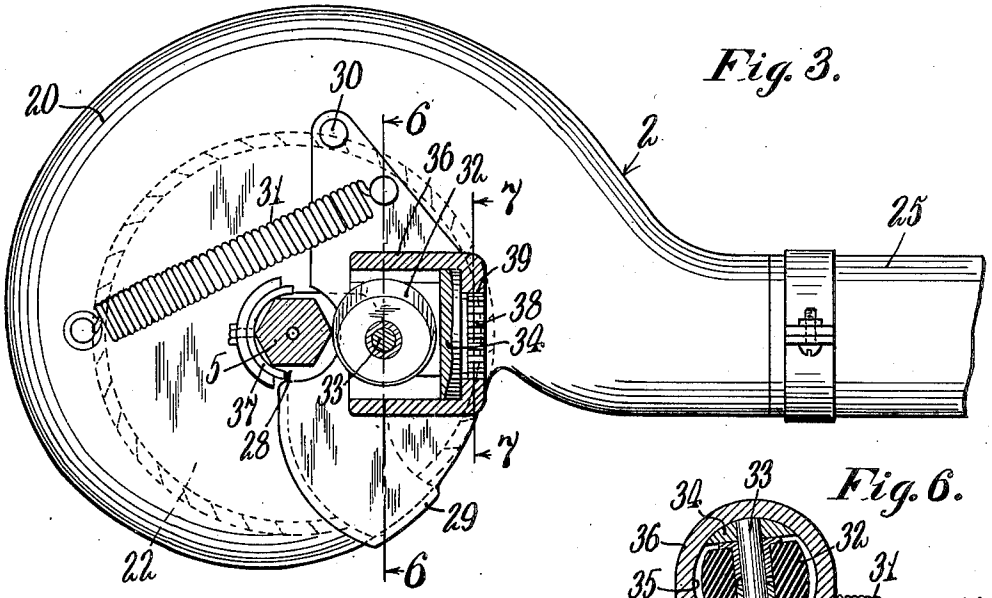


Fig. 6.

Fig. 4.

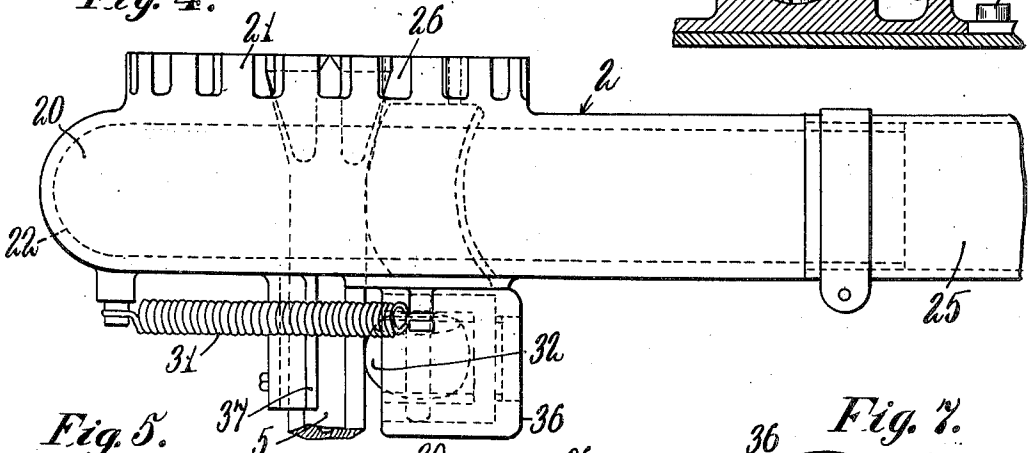


Fig. 5.

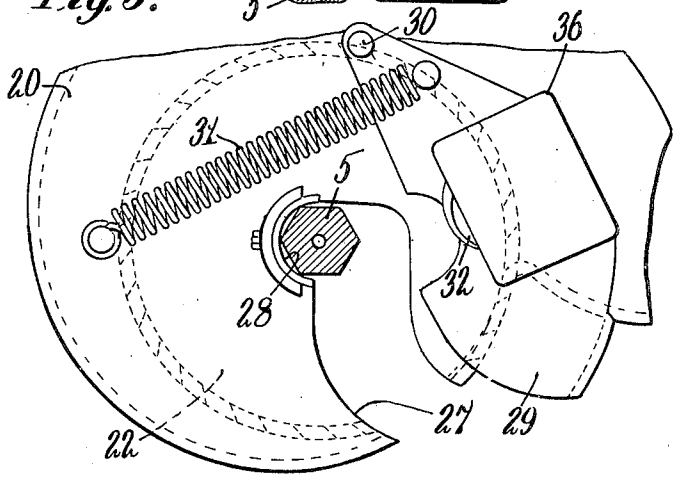
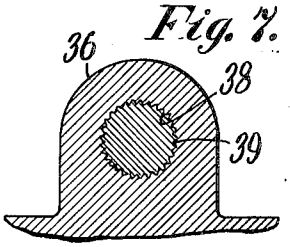


Fig. 7.



Inventor:
Warren Noble
By Annis A. Merwin.
Atty.

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DUST COLLECTING MEANS

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Fig. 11.

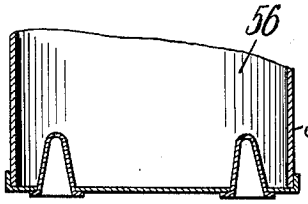


Fig. 8.

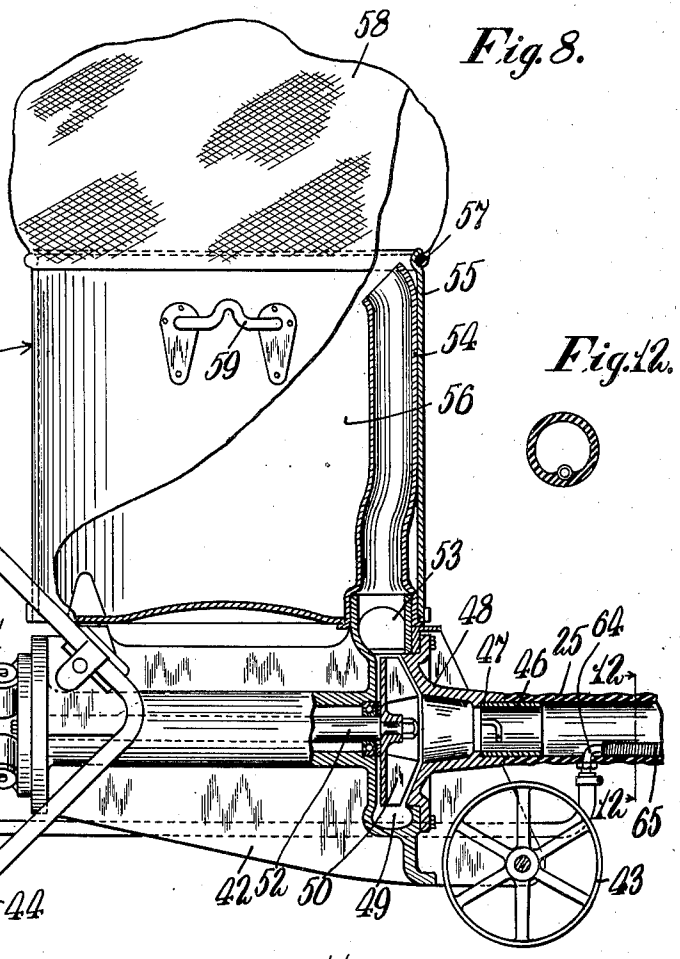


Fig. 12.

Fig. 13.

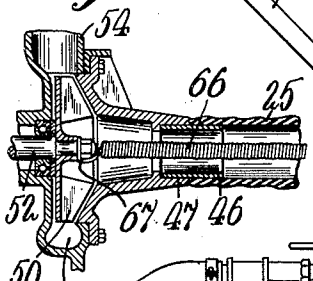


Fig. 9.

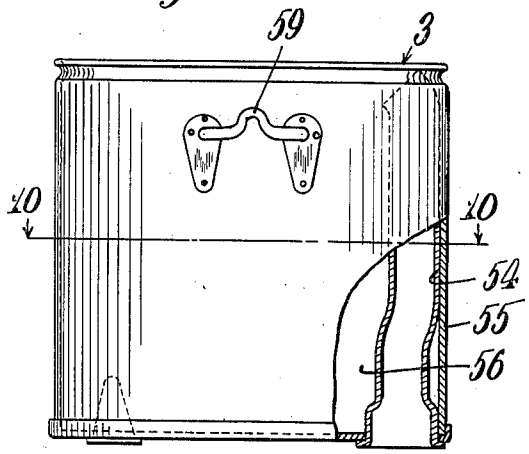
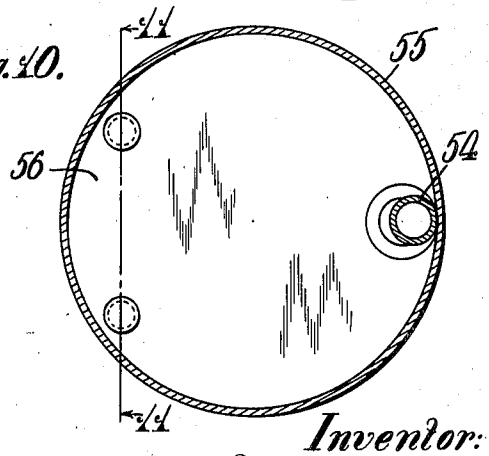


Fig. 10.



Inventor:
Warren Noble
By Louis A. Maxon.
Atty.

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DUST COLLECTING MEANS

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Fig. 14.

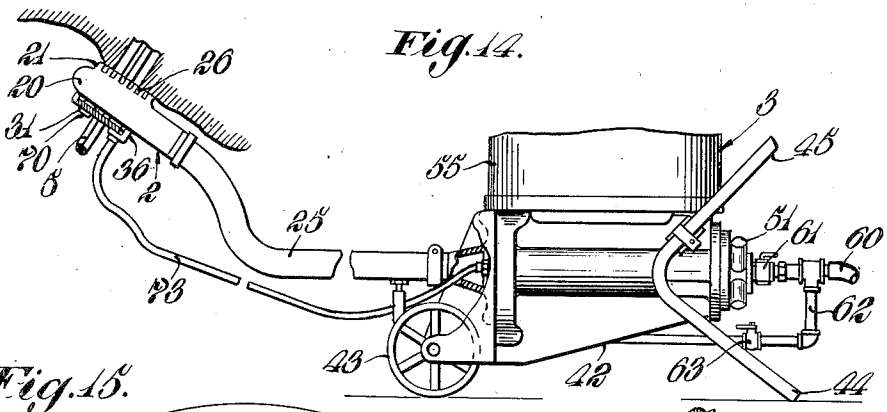


Fig. 15.

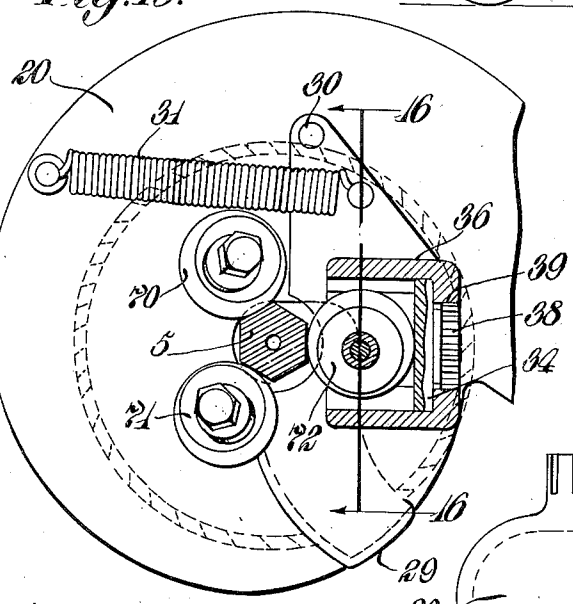


Fig. 16.

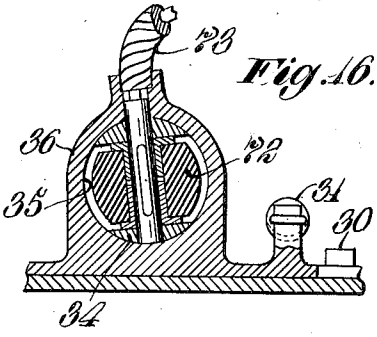


Fig. 18.

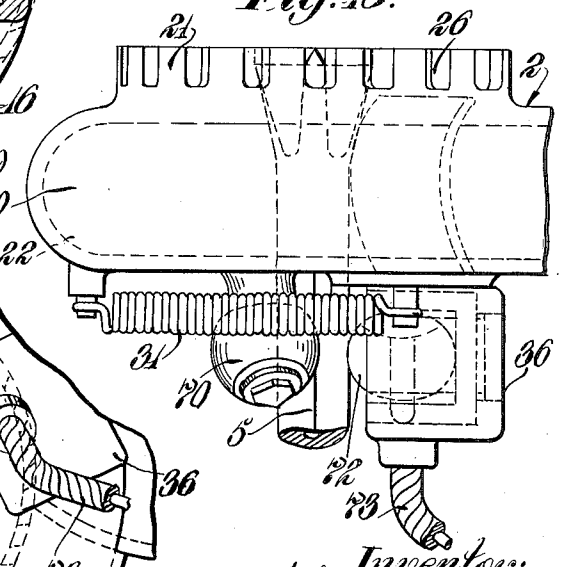
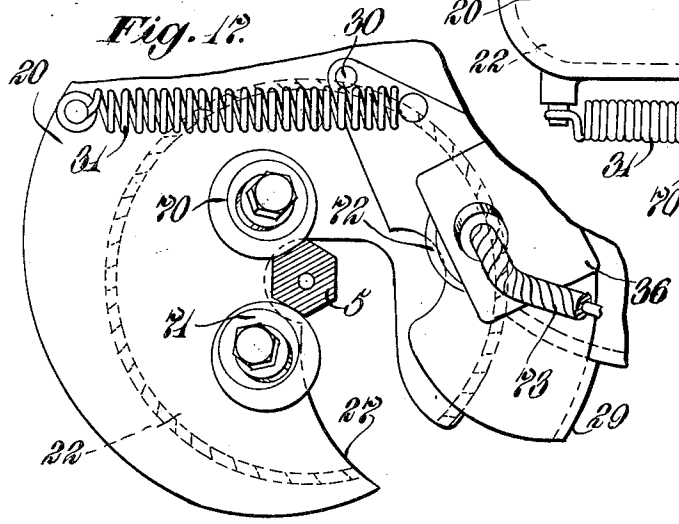


Fig. 17.



Inventor:
Warren Noble.
by Louis A. Waxson.
Atty.

Patented Jan. 31, 1939

2,145,272

UNITED STATES PATENT OFFICE

2,145,272

DUST-COLLECTING MEANS

Warren Noble, Michigan City, Ind., assignor to Sullivan Machinery Company, a corporation of Massachusetts

Application April 27, 1935, Serial No. 18,632

14 Claims. (Cl. 255—50)

This invention relates to dust-collecting means, and relates more particularly to improvements in dust-collecting means especially designed for use with a hammer rock drill for removing the dust from the mouth of the drill hole.

An object of this invention is to provide an improved dust-collecting means especially designed for use with a hammer rock drill for removing the dust created by the drill bit from the mouth of the drill hole. Another object is to provide an improved dust-collecting device associated with the rock drill and having embodied therein means actuated by an element of the rock drill for maintaining the dust-collecting device in operative relation with respect to the mouth of the drill hole. A further object is to provide an improved dust-collecting means whereby the dust-collecting device is maintained in operative dust-collecting relation by means actuated by an element of the drill steel rotation means. A further object is to provide an improved dust-collecting means wherein the dust-collecting device is mounted on the body of the drill steel and embodying means actuated by the rotary motion of the drill steel for holding the dust-collecting device in operative relation with respect to the drill hole. Another object is to provide in a dust-collecting means of the above character improved means for attaching the dust-collecting device to the rock drill steel whereby said device may be readily attached to the drill steel without necessitating the removal of the drill steel from the drill hole or from the rock drill. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

The invention, from one aspect, may comprise a dust receiver having an opening through which the drill steel of a rock drill extends, the receiver preferably in the form of a dust hood having a suction line connected to the dust-receiving chamber for conducting the dust from the hood to a suitable receptacle, and embodying means mounted on the dust hood and engaging the drill steel and actuated by the rotative motion of the drill steel for always maintaining the dust hood in proper dust-receiving relation with respect to the mouth of the drill hole. The means for maintaining the dust hood in dust-receiving relation with the mouth of the drill hole may comprise a wear plate mounted on the dust hood and engaging one side of the drill steel and an opposed roller journaled on the dust hood and inclined with respect to the drill steel so that the rotation of the steel always urges the roller in a forward direction outwardly along the drill steel to move the dust hood to its dust-receiving position, although if desired the wear plate may be replaced by one or more rollers so that the tendency to move the dust hood outwardly along the drill steel is even more definite. Although the roller or rollers, in a preferred form of the invention, are idly journaled on bearings on the dust hood, and are rotated and perform their dust-hood-advancing function by virtue of the positive rotation of the drill steel, power roller drive may be substituted. For example, a friction roller may be driven by power, as through a flexible shaft. Obviously, if a plurality (desirably two, to form a triangular arrangement) of slanting rollers be mounted on the dust hood and replace the wear plate, this resulting triple-roller arrangement will provide an even more definite feeding action, irrespective of the mode in which relative steel and roller rotation is effected.

In the accompanying drawings there are shown for purposes of illustration one form and a modification which the invention may assume in practice.

In these drawings,

Fig. 1 is a view in side elevation of the illustrative form of the improved dust-collecting means showing the same associated with a hammer rock drill of the stoper type,

Fig. 2 is a view in longitudinal section taken substantially on line 2—2 of Fig. 1, showing details of the rock drill structure,

Fig. 3 is a bottom plan view of the improved dust hood, parts being shown in section to illustrate structural details,

Fig. 4 is a side elevational view of the improved dust hood,

Fig. 5 is a fragmentary view similar to Fig. 3, showing the slot closure gate in its open position,

Fig. 6 is a detail sectional view taken on line 6—6 of Fig. 3,

Fig. 7 is a detail sectional view taken on line 7—7 of Fig. 3,

Fig. 8 is a view partially in side elevation and partially in vertical section showing the dust-separating unit,

Fig. 9 is a detail view showing the dust-receiving tank,

Fig. 10 is a cross sectional view taken on line 10—10 of Fig. 9,

Fig. 11 is a detail sectional view taken on line 11—11 of Fig. 10,

Fig. 12 is a detail sectional view taken on line 12—12 of Fig. 8,

Fig. 13 is a view showing a modified form of dust-agitating means,

Fig. 14 is a fragmentary view similar to Fig. 1 showing a modified form of construction,

Fig. 15 is a bottom plan view, partially broken away, of the dust hood shown in Fig. 14,

Fig. 16 is a detail sectional view taken substantially on line 16—16 of Fig. 15,

Fig. 17 is a view similar to Fig. 15, with parts broken away, showing the slot closure gate in its open position,

Fig. 18 is a side elevational view, partially broken away, of the dust hood shown in Fig. 15.

In this illustrative construction, as shown in the drawings, 1 designates a hammer rock drill of the stoper type, 2 the dust-collecting device, and 3 the dust-separating means. The rock drill 1 is of an ordinary construction comprising a hammer motor 4 for percussively actuating and rotating a rock drill steel 5 and having a pneumatic feed leg 6 for feeding the drill steel toward the work during the drilling operation. The hammer motor comprises a cylinder 7 having a piston chamber containing a reciprocatory hammer piston 8 provided with a striking nose for delivering, through a usual tappet, impact blows to the shank of the drill steel 5. The drill steel shank is supported within a chuck 9 rotatably mounted within a front chuck housing 10. As is usual in rock drills of the type disclosed, means is provided for effecting rotation of the drill steel 5 as the latter is percussively actuated, comprising a spirally grooved rifle bar 11 having a sliding interlocking connection with a rifle nut 12 fixed within the hammer piston 8, and this rifle bar is secured to a pawl carrier 13 carrying usual spring-pressed pawls 14 engaging the teeth of a ratchet ring 15 fixed within the rearward end of the hammer motor. As the hammer piston moves forwardly to strike its blow on the drill steel shank, the pawls 14 of the pawl carrier 13 slip over the teeth of the ratchet ring 15, and as the piston moves rearwardly on its return stroke the pawls engage the ratchet teeth to hold the rifle bar 11 against rotation, and as a result the hammer piston is given a rotary movement. The rotary piston motion is transmitted to the drill steel through straight grooves 16 formed on the piston nose and having sliding interlocking connection with straight vanes 17 formed on a chuck nut 18 fixed within a rotatable chuck sleeve 19 which carries the drill steel chuck 9. It is accordingly evident that as the drill steel 5 is percussively actuated it is at the same time rotated. The drill steel 5 may be provided in a usual manner with an axial bore through which pressure fluid may flow from the forward end of the piston chamber through the piston nose grooves 16 past the lands 17 of the chuck nut, and through the tappet, to expel the dust created by the drill bit from the drill hole in a well-known manner.

Now referring to the improved dust-collecting means, it will be noted that the same herein includes a dust hood 20 of generally circular shape having a circular flange or rim 21 adapted to rest against the working face in a position surrounding the mouth of the drill hole. The hood 20 is provided with a dust chamber 22 for receiving the dust expelled from the drill hole, and this chamber is connected through a flexible suction hose 25 to the dust-separating unit 3 as shown in Fig. 1. The flange or rim 21 is slotted at 26 to provide passages through which atmospheric air may flow freely and in unrestricted volume past the rim to the dust chamber 22 as a suction is created by the separating means 3 within the hose 25. This suction, created by the separating unit 3 within the hose 25, draws the dust expelled from the drill hole into the dust chamber, the suction at the same time drawing in atmospheric air through the rim slots 26. The air-entrained dust in the chamber 22 and hose 25 is drawn into the dust separator 3 in a manner to be presently described.

To enable ready attachment of the dust hood 20 to the drill steel body without removing the drill steel from the drill hole or from the rock drill chuck, there is provided in the hood casing an arcuate open-sided slot 27 communicating at its inner end with an opening 28 formed centrally within the hood 20 and through which the drill steel extends. The open side of this slot 27, when the hood is placed in position on the steel body, is closed by a gate 29 pivoted at 30 on the hood body, and urged toward its closed position by a coiled spring 31. When the gate 29 is closed there is formed centrally through the hood an opening through which the drill steel extends with the hood closely embracing the steel body.

The improved means for maintaining the dust hood in position against the working face with the slotted hood rim 21 surrounding the mouth of the drill hole, comprises a friction roller 32, preferably composed of rubber, held in yielding frictional contact with the steel body by the gate spring 31, and this roller is journaled on a bearing pin 33 supported by an adjustable member 34. The member 34 is of cylindrical form and is rotatably mounted in a bore 35 formed in a cylindrical boss 36 integral with the gate 29. The axis of the roller is so inclined with respect to the axis of drill steel rotation that as the drill steel rotates the roller tends to climb up the steel, at all times yieldingly forcing the hood into its proper dust-collecting position with respect to the hole mouth. An arcuate wear plate 37, secured to the hood casing and fixed to the wall of the central hood opening 28, provides a shoe slidingly engaging the side of the steel body opposite from the roller. The roller bearing pin 33, as above pointed out, is supported within an adjustable member 34, and this member 34 is provided with a serrated projection 38 fitting a serrated socket 39 formed in the boss 36, and by this serrated projection the pin supporting member 34 may be adjusted with respect to the gate boss to vary the inclination of the roller axis with respect to the axis of rotation of the drill steel.

The dust-separating unit 3 comprises a truck frame 42 mounted on a pair of wheels 43 and having an adjustable leg 44 attached to the frame and providing a handle portion 45 whereby the separator unit may be readily wheeled from place to place. The suction hose 25, as shown in Fig. 8, is connected by a detachable coupling 46 within an opening 47 formed within a detachable head plate 48 secured to the frame 42. This head plate 48 forms a closure for a suction chamber 49, within which there is arranged a suction fan 50. Carried by the frame 42 is a motor 51, herein preferably of the pressure-fluid-actuated type, having its power shaft 52 connected to the fan 50 for driving the latter. The dust sucked from the hose 25 by the fan 50 is discharged from the chamber 49 through a discharge passage 53 connected by a conduit 54 to the upper end of a dust-receiving tank 55. This tank has

a dust-receiving chamber 56, and fixed by a ring 57 to the upper end of the tank is a cloth hood 58 through which the air from the tank is discharged to atmosphere. The tank 55 has handles 59 and may be readily removed from the frame 52 to facilitate removal of the collected dust therefrom. Pressure fluid is supplied to the motor 51 through a supply hose 60 controlled by a valve 61. Means is provided for agitating the heavy particles of dust which might collect at the bottom of the suction hose, comprising a branch pipe connection 62 leading from the supply pipe 60 and having a control valve 63. This pipe connection 62 communicates at 64 with a conduit 65 extending a comparatively short distance within the suction hose, the conduit having a series of longitudinally spaced openings through which pressure fluid is discharged to the passage in the suction pipe 25, this pressure fluid agitating the heavy particles of dust collected in the suction pipe, thereby to facilitate dust removal. In the modified form of construction shown in Fig. 13, the means for agitating the heavy particles of dust collected within the suction hose comprises a flexible element 66, herein preferably in the form of a short piece of coiled spring arranged within the suction hose and connected at 67 to the fan drive shaft 52. As the fan 50 is driven the free inner end of the agitating spring 66 is whipped around within the suction hose, thereby to agitate the heavy particles of dust therein.

In the modified form of dust hood shown in Figs. 14 to 18, inclusive, the wear plate has been supplanted by slanting guide rollers and the roller for moving and holding the hood in dust receiving relation with respect to the mouth of the drill hole is power driven through connections driven by the motor of the dust separator unit. In this illustrative construction a pair of guide rollers 70 and 71 are preferably journaled on axes inclined with respect to the drill steel axis, on the bottom of the hood casing; these rollers taking the place of the wear plate 37 shown in Fig. 3, and providing means supplementing the power driven roller for moving the dust hood outwardly along the drill steel into engagement with the working face at the mouth of the drill hole. The drive roller 72, which takes the place of the roller 32 of the form of the invention above described, is yieldingly held in frictional contact with the drill steel by the coil spring acting between the pivoted gate 29 and the hood casing, and therefore, the three rollers 70, 71 and 72, due to their triangular arrangement, engage the drill steel at three equally spaced points. To afford means for moving the dust hood along the drill steel into proper dust-receiving relation with respect to the mouth of the drill hole and for holding the hood in such position independently of any rotative motion of the drill steel, the roller 72 is power driven, and the roller driving means in this instance comprises, as shown in Figs. 14 and 16, a flexible transmission shaft driven in a suitable manner from the power shaft 52 of the motor 51 for driving the suction fan 50 of the dust separator unit. In this instance the adjustment of the roller support member 34 may be dispensed with and the rotative axis of the roller 72 may be set at a predetermined angle with respect to the drill steel. The mode of operation of this form of the invention is the same as that above described, except, in this instance, the rotary motion of the drill steel is not relied upon in the moving of the dust hood into and holding the same in dust-receiving position with respect to the drill hole, and the roller 72 is power driven by the motor of the dust separator unit through the flexible shaft unit. Otherwise, this form of the invention is the same as that above described.

As a result of this invention it will be noted that an improved dust-collecting means especially designed to use with a hammer rock drill is provided, whereby the dust created in the drill hole by the drill bit is removed from the hole in an extremely effective manner. It will further be noted that by the provision of the means actuated by the rotary motion of the drill steel of the hammer drill, the dust-collecting hood is always maintained in proper dust-collecting position with respect to the mouth of the drill hole. Other uses and advantages of the improved dust-collecting means will be clearly apparent to those skilled in the art.

While I have in this application specifically described one form and a modification thereof which my invention may assume in practice, it will be understood that this form and modification of the same are shown for purposes of illustration, and that the invention may be further modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. The combination with a rock drill having drill steel actuating means and a drill steel actuated thereby, of a dust-collecting means comprising a dust hood mounted on the drill steel, and dust hood feeding means comprising a friction feeding roller carried by said dust hood and engaging the drill steel and actuated by movement of the latter, said friction roller rotatable by the drill steel to effect feed of the dust hood bodily relative to the drill steel into proper dust-collecting relation with respect to the mouth of the drill hole and to maintain the dust hood in such dust-collecting relation.

2. The combination with a rock drill having drill steel rotation means, of dust-collecting means including a dust hood mounted on the drill steel for receiving the dust expelled from the drill hole, and dust hood feeding means movable bodily with the dust hood and actuated by the rotary motion of the drill steel for feeding said dust hood by such rotary motion bodily relative to the drill steel for maintaining said dust hood in proper dust collecting relation with respect to the mouth of the drill hole, said dust hood feeding means comprising a friction feeding roller engaging the drill steel and rotatable thereby to effect feed of the dust hood bodily relative to the drill steel.

3. In a dust collector for rock drills, a dust receiving hood having an open-sided slot permitting lateral attachment of the hood to a rock drill steel, a gate for closing the open side of said slot, a spring for maintaining said gate closed, and means for feeding the dust hood bodily outwardly relative to the drill steel comprising a steel engaging roller mounted on said gate and actuated by said steel, said spring always urging said roller into frictional engagement with the steel.

4. In combination, a drill element, hammering means therefor, and means for collecting dust produced by the drilling operation of said drill element including a dust receiver adapted to be positioned at the face adjacent the hole being

drilled, and means for maintaining said receiver against the face including at least one feeding element mounted thereon for rotation on an axis inclined to the axis of the drill element and frictionally engaging the latter, and means for positively relatively rotating said elements.

5. In combination, a drill element, means for percussively actuating the same, a dust collector, and means movable bodily with said dust collector for maintaining the latter in contiguity to the mouth of the hole being drilled including at least one feeding roller element engaging the drill element and rotatable on an axis at an angle to the drill element, and means for effecting relative rotation of said elements by power.

6. The combination with a rock drill having drill steel rotating means and a drill steel rotated thereby for forming a drill hole, of a dust hood mounted on and surrounding the drill steel and relative to which the latter is rotatable, and dust hood feeding means mounted on said dust hood and comprising a feeding element actuated by the rotary motion of the drill steel for moving by such rotary motion said dust hood bodily outwardly along the drill steel into proper dust-receiving relation with respect to the mouth of the drill hole.

7. The combination with a rock drill having means for reciprocating and rotating a drill steel and a drill steel actuated thereby for forming a drill hole, of a dust receiver mounted on and surrounding the drill steel for receiving the dust expelled from the drill hole, said drill steel reciprocable relative to said dust receiver, and dust receiver feeding means mounted on said dust receiver and comprising a feeding element movable relative to and engaging the drill steel and actuated by the rotary motion of the latter for moving by such rotary motion said dust receiver bodily outwardly relative to the drill steel into proper dust-receiving relation with respect to the mouth of the drill hole.

8. The combination with a rock drill having drill steel rotating means and a drill steel rotated thereby for forming a drill hole, of a dust hood mounted on and surrounding the drill steel and relative to which the latter is rotatable and reciprocable, and means mounted on said dust hood and actuated by the rotary motion of the drill steel for moving said dust hood bodily outwardly along the drill steel into proper dust-receiving relation with respect to the mouth of the drill hole, said dust hood moving means including a friction roller journaled on said dust hood and arranged with its axis of rotation inclined with respect to said drill steel, said roller frictionally engaging said drill steel and the rotary motion of said drill steel causing said roller to rotate to effect outward movement of said dust hood as aforesaid.

9. The combination with a rock drill having means for reciprocating and rotating a drill steel and a drill steel actuated thereby for forming a drill hole, of a dust receiver mounted on and surrounding the drill steel for receiving the dust expelled from the drill hole, said drill steel reciprocable relative to said dust receiver, and means mounted on said dust receiver and engaging the drill steel and actuated by the rotary motion of the latter for moving said dust receiver bodily outwardly relative to the drill steel into proper dust-receiving relation with respect to the mouth of the drill hole, said dust receiver moving means including a friction roller journaled on said dust receiver and arranged with its axis of rotation inclined with respect to the drill steel, said roller frictionally engaging said drill steel and the rotary motion of the steel causing said roller to rotate to effect outward movement of said dust receiver as aforesaid.

10. In combination, a drill element, hammering means therefor, and means for collecting dust produced by the drilling operation of said drill element including a dust receiver adapted to be positioned at the working face adjacent the hole being drilled, and means for moving the dust receiver bodily relative to the drill element into engagement with and for maintaining said receiver against the face including at least one element rotatably mounted on the receiver and frictionally engaging the drill element, and means for positively rotating at least one of said elements.

11. In combination, a drill element, means for percussively actuating the same, a dust collector, and means for moving the dust collector bodily relative to the drill element into engagement with and for maintaining the collector in contiguity to the mouth of the hole being drilled including at least one feeding roller element mounted on the collector and engaging the drill element, and means for effecting power rotation of one of said elements.

12. In combination, a drill element, hammering means therefor, and means for collecting dust produced by the drilling operation of said drill element including a dust receiver adapted to be positioned at the working face adjacent the hole being drilled, and means for moving said dust receiver bodily relative to the drill element and for maintaining said receiver against the working face including at least one feeding element mounted thereon for rotation on an axis inclined to the axis of the drill element and frictionally engaging the latter, and means for positively rotating at least one of said elements.

13. In combination, a drill element, means for percussively actuating the same, a dust collector, and means for moving the dust collector bodily relative to the drill element and for maintaining the collector in contiguity to the mouth of the hole being drilled including at least one feeding roller element engaging the drill element and rotatable on an axis at an angle to the axis of the drill element, and means for effecting power rotation of one of said elements.

14. The combination with a rock drill having drill steel rotating means and a drill steel rotated thereby for forming a drill hole, of a dust hood mounted on and surrounding the drill steel and relative to which the latter is rotatable, and dust hood feeding means including a rotatable feeding element mounted to move bodily with said dust hood and maintained in frictional engagement with said drill steel and mounted for rotation on an axis oblique to a line parallel to the drill steel axis for feeding the dust hood into contact with the working face at the mouth of the drill hole on relative rotation between said feeding member and said drill steel, and means for effecting such relative rotation.

WARREN NOBLE.