

June 26, 1956

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2,751,718

ROCK DRILL GRINDERS

Filed Sept. 10, 1951

3 Sheets-Sheet 1

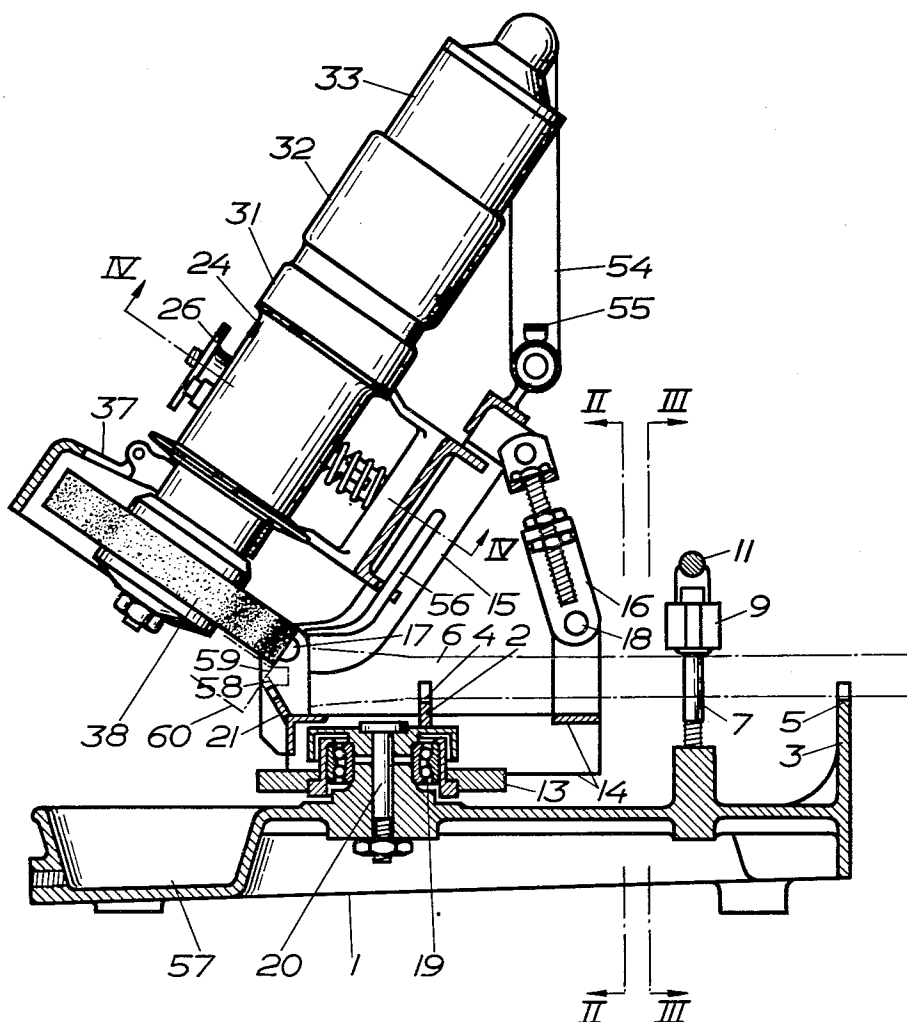


Fig. 1

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3 Sheets-Sheet 2

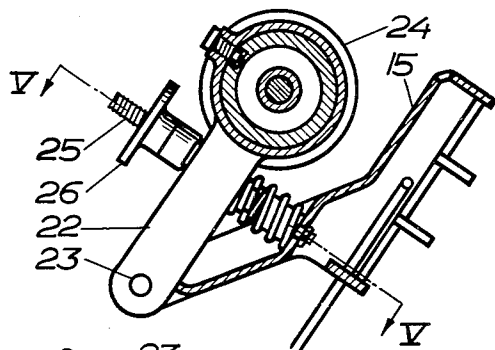


Fig. 4

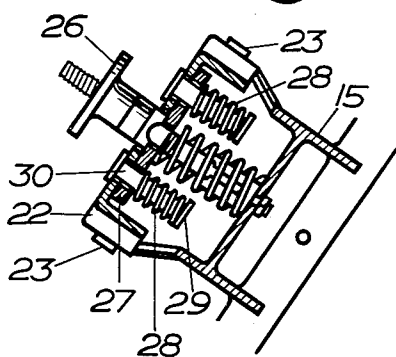


Fig. 5

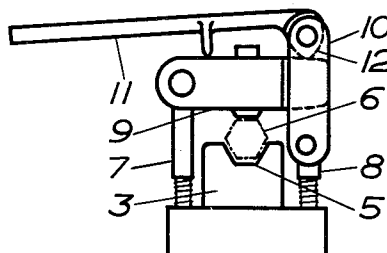


Fig. 3

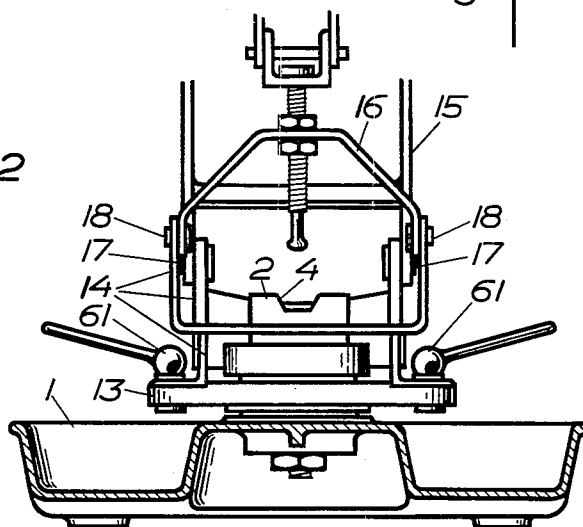


Fig. 2

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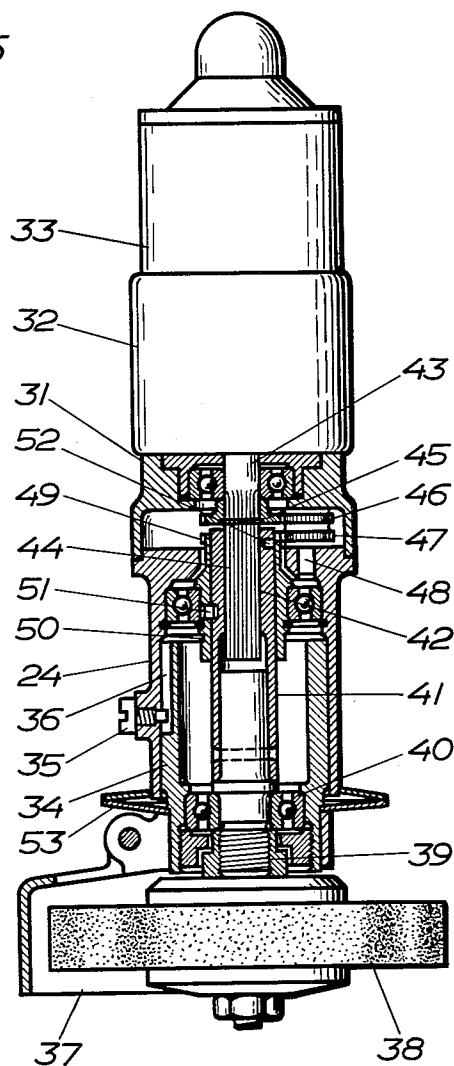
H. H. FALKMAN ET AL
ROCK DRILL GRINDERS

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3 Sheets-Sheet 3

Fig. 6



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1

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ROCK DRILL GRINDERS

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13 Claims. (Cl. 51—32)

This invention relates to rock drill grinders, and particularly to grinders for sharpening chisel type rock drill bits. One object of the invention is to provide a simple and rigid grinder which may be operated by non-skilled workers and which is fit for use in tunnels in rock, in mines, or in other similar working places. A further object of the invention is to provide a grinder in which the peripheral surface of a grinding wheel is used for grinding and in which said grinding wheel is worn very evenly. A still further object is to provide a grinder which is cheap in manufacture and in which conventional portable grinding machines may be incorporated with no or small alterations. For these and other purposes we provide a rock drill grinder comprising a substructure, a device for clamping a rock drill steel in substantially horizontal position, a frame mounted to swing on said substructure on an axis forming an angle with the longitudinal axis of said drill steel, said swinging axis being an axis of a surface of revolution including a cutting end face of the drill steel, means for mounting a rotary grinding wheel on said frame so as to grind along said surface, and means for imparting to said grinding wheel a reciprocating movement in the direction of a generatrix of the grinding surface of said wheel.

In the accompanying drawings one embodiment of a rock drill grinder incorporating the invention is illustrated by way of example, it being understood, however, that this embodiment is by no means limiting of the invention which may be varied in several different ways within the scope of the claims. Fig. 1 is a side view and partial section of a rock drill grinder embodying the invention. Fig. 2 is a partial end view and section on line II—II of Fig. 1 illustrating a frame structure for carrying a grinding machine viewed from behind. Fig. 3 is a section on line III—III of Fig. 1 and illustrates a device for clamping a rock drill steel. Fig. 4 illustrates a swinging bracket for mounting the grinding machine partially in section on line IV—IV of Fig. 1. Fig. 5 is a section on line V—V of Fig. 4, and Fig. 6 illustrates on a somewhat larger scale a side view and partial longitudinal section of the grinding machine illustrated in Fig. 1.

The rock drill grinder illustrated in the drawings is intended for grinding the cutting end faces of rock drill steels having chisel type bits. The illustrated grinder consists of a bedplate 1 forming a substructure on which a swingable frame carrying a grinding machine is mounted and which is provided with a device for clamping a rock drill steel in substantially horizontal position. Obviously the clamping device for the drill steel may be arranged separately from the bedplate on a bench or the like.

The illustrated clamping device comprises two supports 2, 3 provided on the bedplate 1 and having in their upper portions recesses 4, 5 formed for receiving the profile of a drill steel 6 which may, for instance, have hexagonal cross section. Between the supports 2, 3 a clamping device including an eccentric is provided for clamping the drill steel 6, indicated in chain dotted lines, to the supports. The clamping device comprises two bolts 7 and 8 screwed

2

into the bedplate 1. The upper end of the bolt 7 forms a journal for a lever 9 which may be swung down over the drill steel 6 resting on the supports, as illustrated in Fig. 3. At the upper end of the bolt 8 a U-clamp 10 is mounted so that it may be swung over the free end of the arm 9 which may then be clamped down by means of a lever 11 journaled in the clamp 10 and carrying an eccentric 12. When drill steels of various dimensions are to be ground the bolts 7 and 8 may be raised or lowered by unscrewing or screwing down the bolts in the bedplate. The bolts are provided with screw threads of different pitch so that the arm 9 and the eccentric 12 may be adjusted in desired positions.

The frame swingable on the bedplate 1 consists of a disc 13, a frame section 14 of angle irons carried by said disc, a swinging section 15, and an extensible section 16. The sections 15 and 16 are pivotally mounted on horizontal pins 17 and 18, respectively. The disc 13 is swingably mounted on a ball bearing 19 surrounding a bolt 20 provided in the bedplate and the frame 13—16 may consequently be swung around said bolt 20. As obvious from Fig. 2 the frame section 14 may be adjusted on the disc 13 in the longitudinal direction of the drill steel in order to change the radius of the surface ground by the grinding machine. A pair of wing screws 61 serve to clamp the frame section 14 on to the disc 13, said screws being secured in the disc 13 and extending through slots in the frame section 14 extending parallel to the drill steel. The geometric axis of the bolt 20 is also the axis of a surface of revolution a part of which includes one end face of the drill bit. By adjustment of the length of the frame section 16 the grinding wheel may be set in such a manner that a desired angle is obtained between the two end faces of a chisel type drill bit. A stop plate 21 is provided on the frame section 14 and the drill steel is pushed forward to engage said stop when inserted in the grinder.

The inclined frame section 15 carries a swingable bracket 22 which is journaled on bolts 23 and swingable in a plane perpendicular to the plane in which the frame section 15 is movable relative to the disc 13. The bracket 22 carries a bearing housing 24 forming an intermediate portion of a grinding machine. The frame section 15 carries a screw 25 swingably mounted thereon and said screw extends through the bracket 22 and carries a hand wheel 26 at the free end of the screw. A hub portion of the wheel 26 rests on a yoke 27 interposed between the bracket 22 and springs 28 resting with their opposite ends on flanges 29 on bolts 30 secured in the bracket 22 as illustrated in Fig. 5. The wheel 26 serves to adjust the distance between the axis of the grinding machine and the frame section 15 and, consequently the position of the grinding wheel relative to the surface to be ground, and the springs 28 then produce the necessary grinding pressure and provide a safety factor against operation with excessive grinding pressure.

The grinding machine consists of the bearing housing 24 mentioned hereinabove at one end of which a gear housing 31, a motor 32, and an overspeed governor 33 are provided. In the bearing housing 24 a cylindrical sleeve 34 is axially displaceable but locked against rotation by a screw 35 engaging an axial groove 36 in the sleeve 34. The sleeve 34 carries a guard plate 37 for a cylindrical grinding wheel 38 secured on a spindle 39 which by means of a bearing 40 is mounted in the sleeve 34. The spindle 39 of the grinding wheel carries a sleeve 41 on its inner end which is secured on the shaft 39 and provided with internal splines as indicated at 42. The motor 32 has a shaft 43 which is provided with external splines 44 fitting and engaging the internal splines 42 of the sleeve 41. The shaft 43 carries a toothed ring 45 secured on the shaft end engaging a toothed rim 46 of an intermediate gear having a further toothed rim 47

3

the number of teeth of which may differ, for instance by one tooth, from the number of teeth of the rim 46. The intermediate gear is mounted on an intermediate shaft 48 and the teeth of the rim 47 engage teeth 49 formed on a sleeve 50 which is rotatable but locked against axial displacement in the bearing housing 24. The sleeve 50 is provided with a lug 51 engaging a closed or continuous helical groove 52 in the sleeve 41, which is secured to the shaft 39 of the grinding wheel. A flexible bellows 53 connects the bearing housing 24 and the guard plate 37 of the grinding wheel and prevents dust from getting into the driving gear of the grinding wheel.

The grinding wheel is driven by the motor 32 through the shaft 43 and the splines 44, 42 with the same number of revolutions as the motor. Simultaneously, the motor drives the sleeve 50 over the gearing 45, 46, 47, 49 with a number of revolutions which differs only slightly from the number of revolutions of the grinding wheel. A slow relative turning motion is consequently obtained between the sleeve 41 and the sleeve 50 causing the lug 51 to move in the groove 52 and spindle 39 and the grinding wheel to carry out a slow reciprocating axial motion. In the illustrated embodiment the motor 32 is supposed to be a compressed air motor to which compressed air is supplied through a conduit 54 controlled by a main valve 55. The compressed air motor 32 may, however, naturally be replaced by an electric motor or other motor or driving mechanism and the invention is quite independent of the type of motor or of the provision of a motor in the device at all as long as the necessary driving power is in one way or the other supplied to the shaft 43. At 56 a water tube is provided through which water is supplied to the grinding wheel at the grinding point. 57 indicates a channel formed in the bedplate 1 for collecting and leading away water and grit.

The rock drill grinder above described operates in the following manner:

When a drill steel 6 is to be ground on the cutting end faces 58, 59 the drill steel is placed in the recesses 4, 5 on the supports 2, 3 and moved towards the stop plate 21 and is then retracted a short distance and clamped by means of the clamping device 7—11, as obvious from Figs. 1 and 3. Upon turning of the hand wheel 26 the grinding wheel 38 is moved into contact with the upper end face 59. By further turning of the hand wheel 26 the feeding depth of the grinding wheel, i. e. the total depth to which the grinding wheel is fed during the operation, is set. During the setting of the hand wheel the yoke 27 is pressed down but the grinding wheel 38 and the bracket 22 remain in a position defined by contact between the grinding wheel 38 and the end face 59. The feeding pressure of the grinding wheel is determined by the strength of the springs 28 and the operator cannot, by turning the hand wheel 26 too far, increase the feeding pressure to an unacceptable value. When the grinding wheel has been set, compressed air is admitted to the motor 32 by depressing the main valve 55. The grinding wheel is then rotated and carries out a comparatively slow reciprocating movement in an axial direction between the position illustrated in full lines in Fig. 1 and the position illustrated with chain dotted lines at 60 in Fig. 1. Simultaneously, the operator swings the frame 14—16 with the grinding machine sideways back and forth around the bolt 20 so that the whole cutting end face 59 of the drill steel is ground. As soon as the grinding of the end face 59 is finished the grinding machine is stopped, the handle 11 is loosened and the drill steel is turned 180°. Thereafter, the other end face 58 is ground in the same way as above described. The hand wheel 26 should in the meantime be adjusted only so much as is necessary with regard to the wear of the grinding wheel during grinding of the end face 59.

The rock drill grinder above described and illustrated in the drawings should only be considered as an example.

4

and the details of the invention may be modified in different ways within the scope of the claims. Instead of using a grinding machine having an intermediate portion 24 of special design, other known forms of standard portable grinding machines may be used. Also the reciprocating movement of the grinding wheel may be effected along desired paths corresponding to the desired profile of the end face of the drill bit to be ground.

What we claim is:

1. A grinder of the character described comprising a substructure, means for clamping a drill in fixed position with respect to said substructure, a frame mounted to swing on said substructure about an axis common with the axis of a surface of a revolution including a cutting end face of said drill, a rotary grinding machine having a grinding element, a bracket for carrying said grinding machine, said bracket being mounted to swing on said frame to swing said machine toward and away from said end face, adjustable abutment means for establishing a predetermined limit position of said bracket in a direction toward said end face and spring means interposed between said abutment means and said bracket for moving said bracket and said machine toward said abutment means, said spring means being operative to limit the value of the force with which the grinding element is applied to said end face.

2. A grinder as defined in claim 1 in which the axis on which said frame is mounted is normal to the axis of the clamped drill and in which said bracket is mounted to swing said grinding machine so that the axis of the rotary grinding element of the machine moves parallel to itself toward and away from said end face.

3. A rock drill grinder comprising a substructure, a device for clamping a rock drill steel including means for supporting a rock drill steel in fixed position with the longitudinal axis of the drill steel substantially in a horizontal plane, a frame mounted to swing on said substructure on an axis forming an angle with respect to said plane, said swinging axis being an axis of a surface of revolution including the cutting end face of the drill steel, means for mounting a rotary grinding wheel and a motor in driving connection therewith on said frame so as to grind along said surface and means for imparting to said grinding wheel a reciprocating movement in the direction of a generatrix of the grinding surface of said wheel, said frame and mounting means and grinding wheel and motor having a common center of gravity disposed adjacent said swinging axis.

4. A rock drill grinder comprising a substructure, a device for clamping a rock drill steel including means for supporting a rock drill steel in fixed position with the longitudinal axis of the drill steel substantially in a horizontal plane above said substructure, a frame mounted to swing on said structure on an axis constituting an axis of a surface of revolution including a cutting end face of the drill steel turned upward from said substructure, means above said supporting means for mounting a rotary grinding wheel to rotate and reciprocate on said frame and so as to grind along said surface, a motor for driving said grinding wheel, motion transmitting means for transmitting the rotary motion of said motor to a rotary motion of the grinding wheel and permitting axial displacement of the grinding wheel relative to the motor, a cam surface on said motion transmitting means forming a continuous helical curve, and a rotary member driven by the motor with a number of revolutions differing from the number of revolutions of the grinding wheel and locked against axial displacement and engaging said cam surface and causing the member carrying the cam surface to reciprocate upon rotation relative to said member.

5. A rock drill grinder comprising a substructure, a device for clamping a rock drill steel including means for supporting a rock drill steel in fixed position with the longitudinal axis of the drill steel substantially in a horizontal plane, a frame mounted to swing on said

5

substructure on an axis forming an angle with respect to said plane, said swinging axis being an axis of a surface of revolution including a cutting end face of the drill steel, a housing mounted on said frame, a grinding wheel and spindle mounted for rotation and axial reciprocation in said housing, a motor for driving said grinding wheel and spindle, a sleeve on said spindle having internal splines, a shaft driven by said motor having external splines engaging said internal splines, a cam surface on said sleeve forming a continuous helical curve, a second sleeve mounted for rotation but locked against axial displacement in the housing, means on said second sleeve engaging said cam surface and causing the sleeve carrying the cam surface to reciprocate upon rotation of the second sleeve relative to the first sleeve, gearing for transmitting rotary motion from the motor to the second sleeve for driving the second sleeve with a speed differing slightly from the speed of the grinding wheel thereby causing the grinding wheel to reciprocate slowly in the direction of a generatrix of the grinding surface simultaneously with the rotary motion.

6. A rock drill grinder comprising a substructure, a device for clamping a rock drill steel including means for supporting a rock drill steel in fixed position with the longitudinal axis of the drill steel substantially in a horizontal plane, a frame mounted to swing on said substructure on an axis constituting an axis of a surface of revolution including a cutting end face of the drill steel, a rotary grinding machine, a bracket for carrying said grinding machine mounted to swing on said frame for swinging the grinding machine towards and away from said end face, and means for adjusting said bracket in various swung out positions on said frame.

7. A grinder as defined in claim 6 in which the bracket is journaled on the frame to swing on a shaft parallel to the axis of rotation of the grinding element of the grinding machine.

8. A rock drill grinder comprising a substructure, means for supporting a rock drill steel with its longitudinal axis substantially in a horizontal plane, a frame mounted to swing on said substructure on an axis forming an angle with respect to said plane, said swinging axis being an axis of a surface of revolution including a cutting end face of the drill steel, means for mounting a rotary grinding wheel and a motor in driving connection therewith on said frame so as to grind along said surface, said frame and mounting means and grinding wheel and motor having a common centre of gravity disposed substantially on said swinging axis, and means for imparting to said grinding wheel a reciprocating movement in the direction of a generatrix of the grinding surface of said wheel.

9. A grinder comprising a substructure, a bracket on said substructure for mounting a rotary grinding wheel and a motor in driving connection therewith to move with its rotary axis parallel to itself to and from a work piece intended to be ground, compression spring means for limiting the force with which said grinding wheel is pressed against said work piece, whereby the grinding pressure is limited to a predetermined value, and adjustable means for setting a limit for the parallel displacement of the grinding wheel towards the work piece to define the depth of the cut to a predetermined value.

10. A grinder comprising a substructure, a bracket swingable on an axis on said substructure, means for mounting a rotary grinding wheel and a motor in driving connection therewith on said bracket with the axis of rotation of said grinding wheel parallel to said swinging axis of the bracket, spring means for limiting the force with which said grinding wheel is pressed against a work piece, whereby the grinding pressure is limited to a predetermined value, and adjustable means for setting a limit for said swinging of the grinding wheel parallel to itself towards the work piece to define the depth of the cut to a predetermined value.

11. A rock drill grinder comprising a substructure, 75

6

means for releasably supporting in fixed position a rock drill steel with its longitudinal axis substantially in a horizontal plane above said substructure, a frame mounted to swing on said substructure on an axis normal to said plane, said swinging axis constituting an axis of a conical surface including a cutting end face of the drill steel turned upwards from said substructure, means above said supporting means for mounting a rotary grinding wheel and a motor in driving connection therewith on said frame so as to grind along said surface and so that said motor is situated substantially on the same side as the drill steel of a plane perpendicular to the drill steel through the contact point between said grinding wheel and the drill steel, and means for imparting to said grinding wheel a reciprocating movement in the direction of generatrix of the grinding surface of said wheel.

12. A rock drill grinder comprising a substructure, a device for clamping a rock drill steel including means for supporting said steel in fixed position with its longitudinal axis in a substantially horizontal plane, a frame mounted to swing on said substructure on an axis constituting the axis of a surface of revolution including a cutting end face of the drill steel, a rotary grinding machine, a bracket for carrying said grinding machine mounted to swing on said frame for swinging the grinding machine toward and away from said end face, and means for adjusting said bracket in various positions on said frame, said last mentioned means comprising adjustable screw means anchored in said frame, an abutment movable toward and away from said bracket in accordance with the adjustment of said screw means for limiting the swinging movement of the bracket in one direction, and spring means interposed between said abutment and said bracket and acting to swing the bracket toward the abutment and defining the value of the feed pressure exerted by the grinding wheel of said grinding machine.

13. A rock drill grinder comprising a substructure, means for releasably supporting in fixed position a rock drill steel with its longitudinal axis substantially in a horizontal plane, a frame mounted to swing on said substructure to an axis normal to said plane, said swinging axis constituting an axis of a conical surface including a cutting end face of the drill steel, means for mounting a rotary grinding wheel and a motor in driving connection therewith on said frame so as to grind along said surface, means for imparting to said grinding wheel a reciprocating movement in the direction of a generatrix of the grinding surface of said wheel, means for swingably mounting said grinding wheel and motor as a unit on said frame toward and away from the said cutting end face of the drill steel, and means for yieldably holding the grinding wheel in grinding contact with said end face with predetermined maximum pressure.

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