Dec. 19, 1961 C. F. OSGOOD 3,013,784

ADJUSTABLE CUTTER HEAD MECHANISM FOR MINING MACHINES

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FIG. 1.

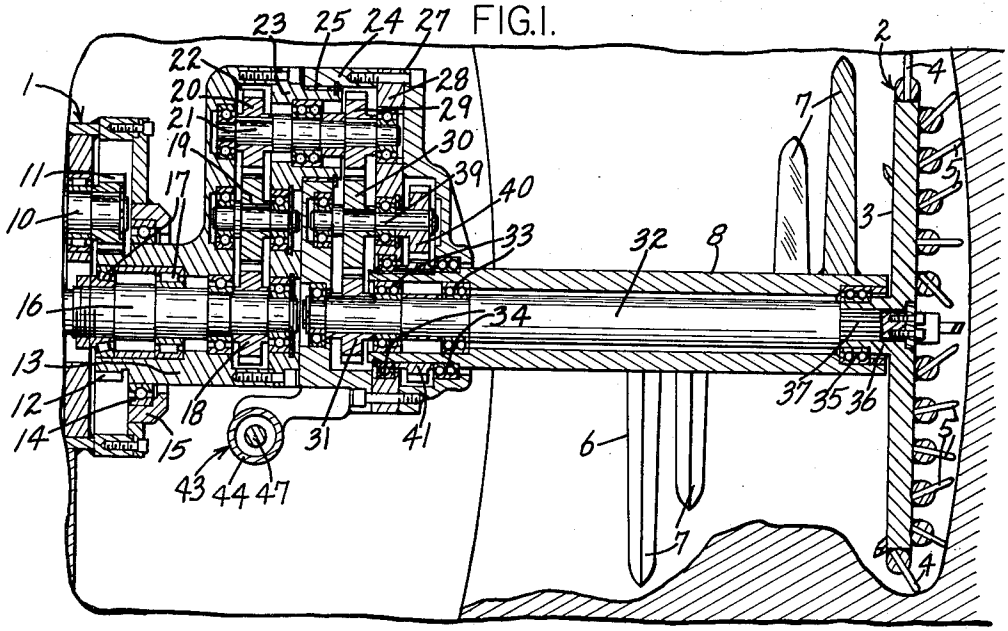


FIG. 2.

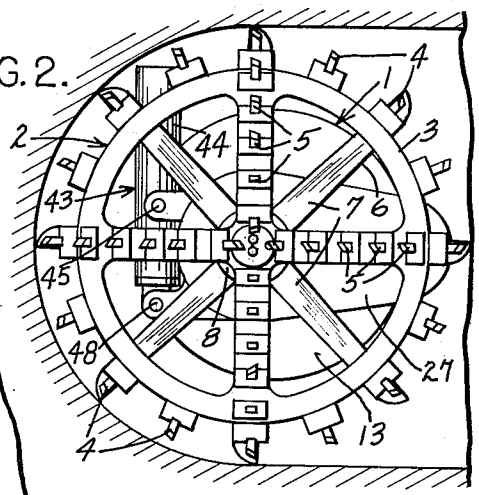
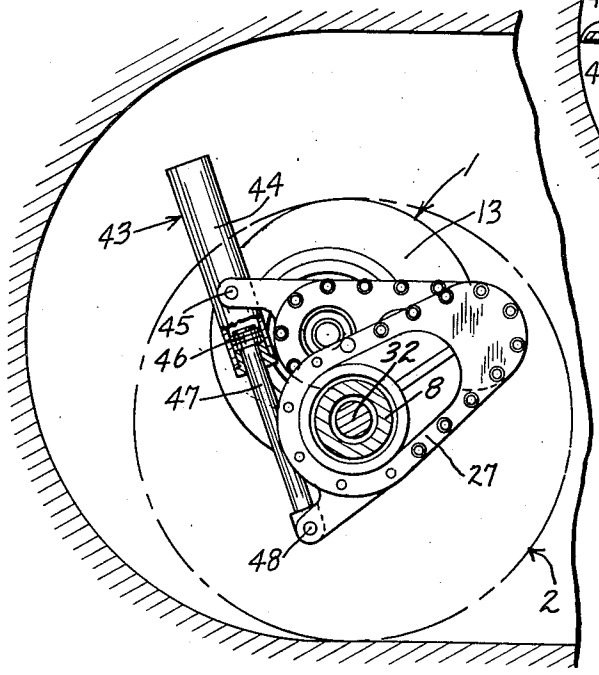


FIG. 3.



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FIG4.

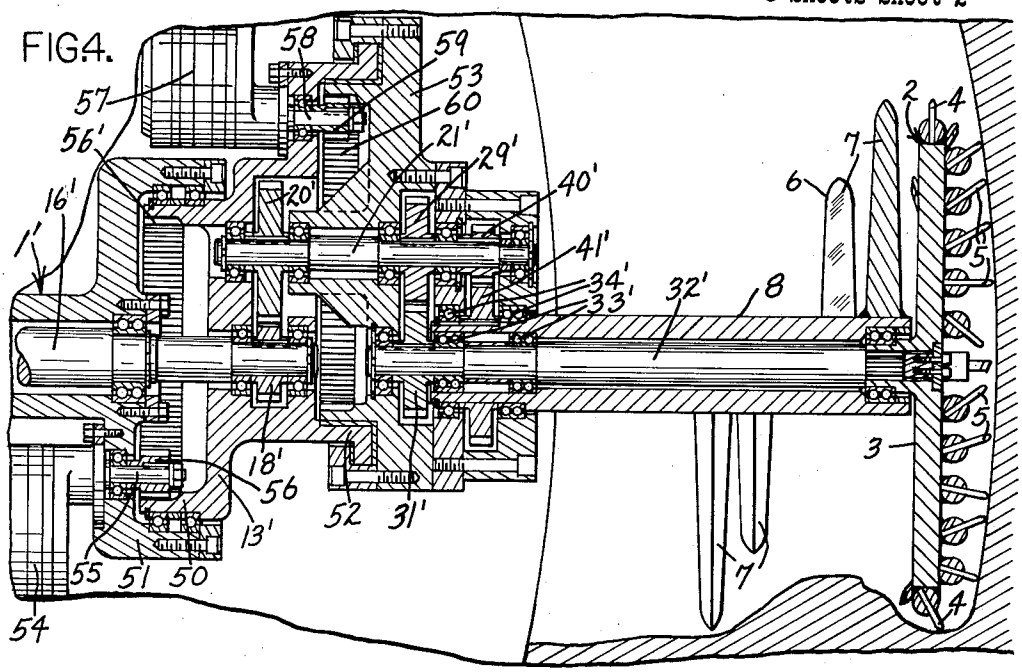
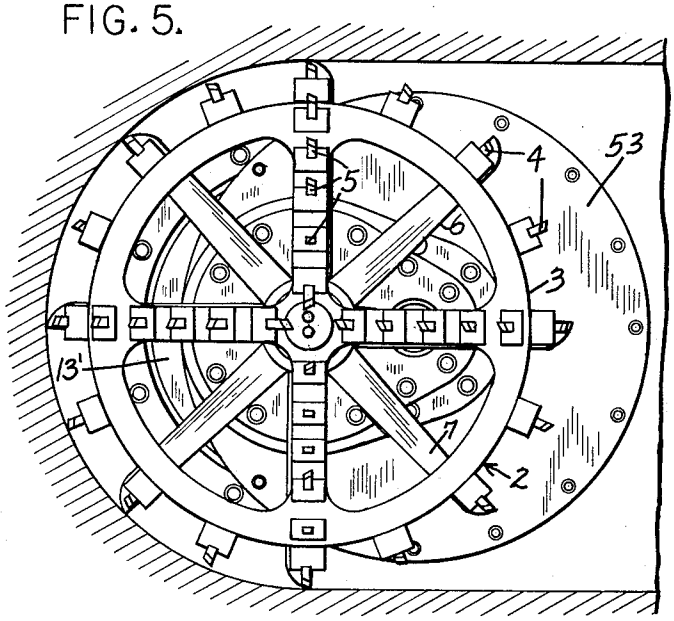


FIG. 5.



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FIG. 6.

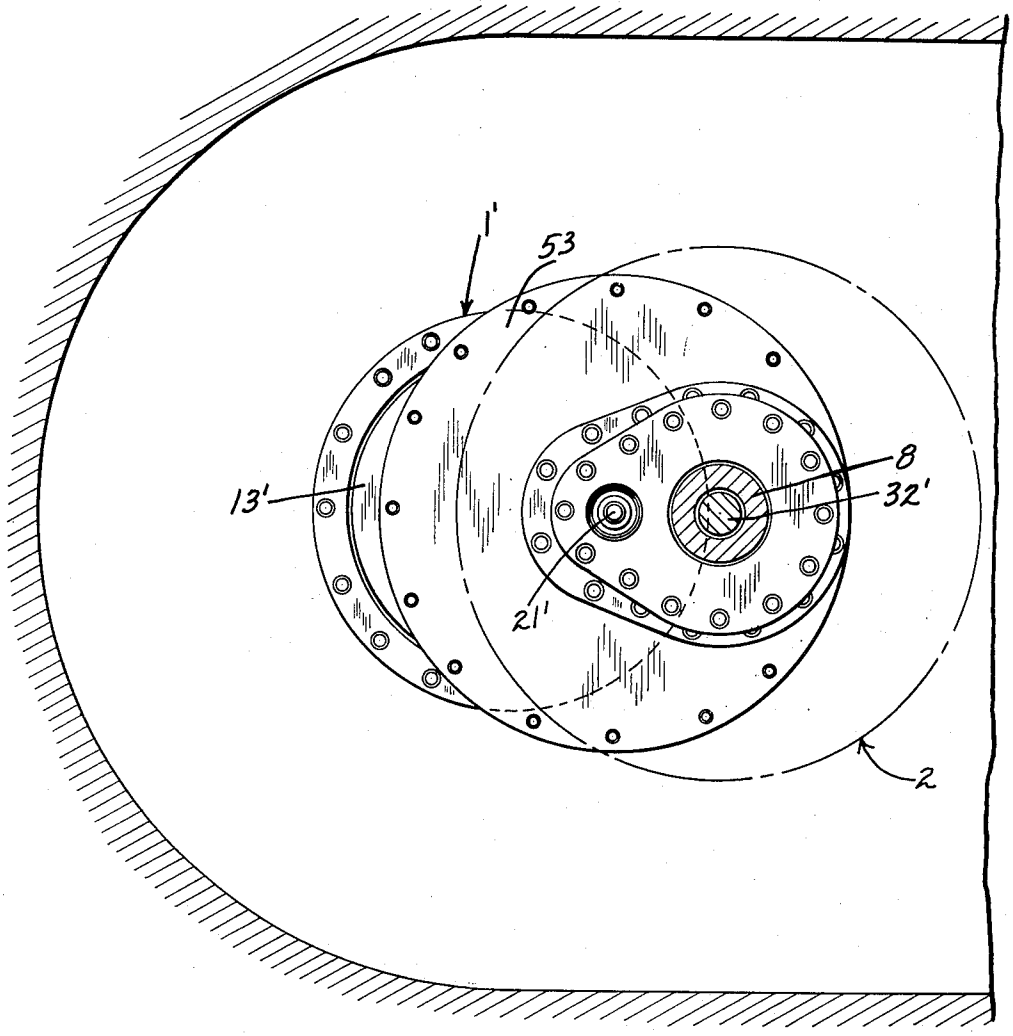


FIG. 7

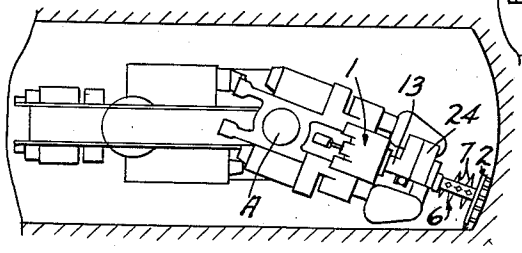
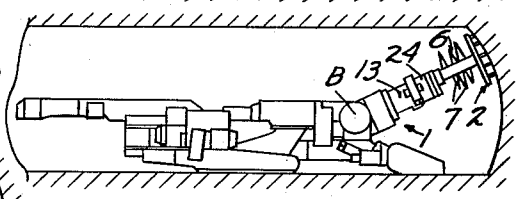


FIG. 8



INVENTOR:

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ADJUSTABLE CUTTER HEAD MECHANISM FOR MINING MACHINES

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Filed Dec. 16, 1957, Ser. No. 703,099
4 Claims. (Cl. 262—9)

This invention relates to mining machines and more particularly to an adjustable cutter head mechanism for machines for dislodging mineral from a solid mine vein.

The present invention consists of improvements over the machine disclosed in the A. Lee Barrett Patent No. 2,776,809, owned by the same assignee as the present invention. The rotary drilling, core cutting and core breaking head of the patent has no means whereby it may be adjusted to dislodge mineral from mine veins of varying heights, and, in the present invention, the head may be readily adjusted to operate through a relatively wide range of operating heights to suit different mining conditions.

An object of this invention is to provide an improved adjustable head mechanism for a mining machine. Another object is to provide an improved adjustable mounting for a rotary drilling, core cutting and core breaking head. Another object is to provide an improved adjustable head mounting whereby the head may revolve about its own axis and as it revolves about its own axis concurrently orbitally about a parallel axis to suit different operating conditions. A further object is to provide an improved adjustable head mounting whereby the axis of head rotation may be adjusted toward and from a parallel axis while parallelism is maintained and may be rigidly held in adjusted position. Other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there are shown for purposes of illustration two embodiments which the invention may assume in practice.

In these drawings:

FIG. 1 is a central longitudinal horizontal section taken through an adjustable head mechanism of a preferred illustrative embodiment of the invention.

FIG. 2 is a front end view, on a somewhat reduced scale, of the improved head mechanism shown in FIG. 1.

FIG. 3 is a transverse vertical section showing the head mechanism of FIG. 2 in its position of maximum adjustment.

FIG. 4 is a section similar to FIG. 1 showing a head mechanism constructed in accordance with another illustrative embodiment of the invention.

FIG. 5 is a front end view of the improved head mechanism shown in FIG. 4.

FIG. 6 is a sectional view similar to FIG. 3 showing the head mechanism of FIG. 5 in its position of maximum adjustment.

FIG. 7 is a plan view and FIG. 8 is a side view of the mining machine in different operating positions in a mine, and respectively showing the vertical and horizontal pivots for the adjustable head mechanism.

The improved adjustable head mechanism is for illustrative purposes shown incorporated in a mining machine of the type disclosed in Patent No. 2,776,809, above referred to, which includes a mobile base carrying a boom-like support or swingable frame pivoted to swing both in vertical and horizontal planes respectively about vertical and horizontal axes A and B, as shown in FIGS. 7 and 8. In the patent, the mobile base carries a turntable on which the boom-like frame is pivotally mounted and the boom-like frame may swing horizontally with the turntable and in vertical planes relative to the turntable.

Evidently, the head mechanism of the present invention may be mounted in various other manners, whereby the head mechanism may be moved both horizontally and vertically during its operation.

In the preferred embodiment of the invention shown in FIGS. 1 to 3 inclusive, the boom-like frame or swingable support is designated 1, and the improved adjustable head mechanism carried thereby is generally designated 2. The head mechanism may be similar to that disclosed in a copending application of A. Lee Barrett, Serial No. 574,528, now Patent No. 2,836,408, also owned by the assignee of the present invention, and comprises a circular disk cutter 3 carrying peripheral cutter bits 4 and front face cutter bits 5, whereby the head may drill axially into the mineral of a mine vein or may move arcuately laterally to cut a kerf or slot located inside the working face to form a projection or core of mineral. Arranged coaxially with and rearwardly of the rotary disk cutter is a rotary core breaker 6 comprising radial breaker arms 7 secured to a tubular cylindric hub 8, and this core breaker revolves at a speed much slower than the rotative speed of the disk cutter, so that a substantial projection or core of mineral may be formed before it is broken off or dislodged by the breaker arms, all in the manner fully disclosed in the patent above referred to.

The driving means for the head mechanism may assume various forms but herein, for illustrative purposes, the boom-like frame carries conventional motor means for driving a shaft 10, and keyed to this shaft is a spur pinion 11 meshing with and driving a spur gear 12, the latter being secured to the hub of a rotary frame or support 13 journaled in a bearing 14 carried by a detachable head plate 15 secured to the boom frame. Coaxial with and extending axially through the hub of the rotary frame 13 is a shaft 16 arranged in parallelism with the shaft 10 and likewise driven by the motor means on the boom. The shaft 16 is suitably journaled within the boom-like frame and supports spaced bearings 17 which supplement the bearing 14 in the journaling of the rotary frame on the boom. Keyed to the shaft 16 is a spur gear 18 driving through an intermediate spur gear 19, a spur gear 20 keyed to a shaft 21 suitably journaled within the rotary frame 13 and arranged in parallelism within the shafts 10 and 16. The rotary frame 13 has a chamber 22 containing the spur gears 18, 19 and 20 and closed by a detachable head plate 23.

The head mechanism 6 is, for illustrative purposes, carried by an adjustable support 24, although, evidently, the head may be adjusted in transverse planes with respect to the rotary frame 13 in various other manners. Herein the head plate 23 is provided with a cylindric projection carrying a suitable bearing 25 and the adjustable support comprises a swinging frame or arm 27 pivotally supported on this bearing projection, as shown in FIG. 1. The arm pivot is coaxial with the shaft 21 and this shaft at its forward end is journaled within a suitable bearing supported by a plate 28 forming a portion of the swingable mounting.

Again, referring to the head drive, it will be noted that keyed to the shaft 21 is a spur gear 29 driving through an intermediate gear 30, a spur gear 31, the latter in turn keyed to the rear end of a longitudinal shaft 32 extending centrally through the tubular hub 8 of the rotary core breaker. This shaft is journaled in spaced bearings 33 supported within the rear portion of the tubular hub 8, and the latter is journaled within spaced bearings 34 supported within the swingable arm 27. The forward end of the shaft 32 is journaled within an outer bearing 35 likewise supported within the tubular hub 8, and the disk cutter 3 has a hub 36 keyed at 37 to the forward portion of the shaft 32. From the foregoing, it is evident that

the rotary disk cutter may be driven through the spur gearing above described at a relatively high drilling and core cutting speed. The intermediate gear 30 is keyed to a shaft 39 suitably journaled within the swingable arm, and also keyed to this shaft is a spur gear 40 meshing with and driving a spur gear 41 secured to the rear portion of the rotatable breaker hub 8, so that the core breaker may be driven at a speed substantially slower than the speed of rotation of the disk cutter.

The means for swinging the supporting arm 27 about its pivot to move the head axis out of coaxial relation with the shaft 16 may assume various forms but, herein, for illustrative purposes, may comprise an extensible power device 43 desirably in the form of a hydraulic jack having a double acting fluid cylinder 44 pivotally mounted at 45 on a bracket integral with the rotary frame 13. Reciprocable in this cylinder is a piston 46 having its piston rod 47 pivotally connected at 48 to lugs integral with the outer portion of the swingable arm 27. Thus, when fluid under pressure is properly supplied to the fluid cylinder, the piston may be moved within the cylinder to effect swinging of the arm 27 either inwardly or outwardly above its pivot relative to the rotary frame 13 to move the head axis into and out of alignment with the axis of rotation of the rotary frame. By trapping liquid within the cylinder at opposite sides of the piston, the swinging arm 27 may be locked in adjusted position with respect to the rotary frame 13. In FIG. 2, the head mechanism is shown with its axis of rotation aligned with the axis of rotation of the rotary frame 13 so that at that time the head mechanism may turn only about its own axis. By suitably operating the hydraulic jack 43, the arm 27 may be swung outwardly about its pivot to move the axis of head rotation into positions of parallelism with the axis of rotation of the rotary frame 13, so that the head axis may move orbitally about the axis of rotation of the rotary frame 13. In FIG. 3, the head mechanism in its position of maximum adjustment is shown. Thus, the head mechanism may be adjusted to cut and dislodge mineral in mine veins of varying heights.

In the modified embodiment of the invention shown in FIGS. 4 to 6 inclusive, a rotary frame 13' has a circular portion 50 journaled on bearings supported within a circular forward portion 51 of the boom-like frame 1'. The rotary frame 13' has a circular bearing portion 52 offset laterally with respect to the circular portion 50, and a rotary head frame 53 is rotatably mounted on the offset circular portion to turn about an axis parallel with the axis of rotation of the rotary frame. The drilling and core cutting head 2 and the rotary core breaker 6 are journaled on the rotary head frame 53 to revolve about an axis parallel with the axis of rotation of the head frame. The drive gears for the head and core breaker may be essentially the same as those of the other embodiment, and the gears and shafts are designated by primed reference numerals, as shown in FIG. 4, and the disk-like head 3 may be rotated through this gearing at a relatively high drilling and core cutting speed, while the rotary core breaker may be driven at a relatively slow core breaking speed. The rotary frame 13' is, in this instance, driven by a conventional hydraulic motor 54 mounted on the boom and whose shaft 55 drives a spur pinion 56 meshing with an internal gear 56', the latter being secured to the rotary frame 13'. The rotary head frame 53 is driven by a similar hydraulic motor 57 mounted on the rotary frame and whose shaft 58 drives a spur pinion 59 meshing with and driving an internal gear 60 secured to the rotary head frame 53.

From the foregoing, it will be evident that the rotary frame 13' may be rotated by the motor 54 to effect rotation of the entire head mechanism about the axis of rotation of the rotary frame 13'. The motor 57 may be operated to rotate the head frame 53 about a parallel axis relative to the rotary frame 13' to move the axis of the head mechanism about the axis of rotation of the rotary frame, thus to bring the axis of head rotation into positions of parallelism with the axis of the rotary frame so that the axis of head rotation may move orbitally about the rotary frame axis. By trapping liquid within the motor 57 or by the provision of interlocking gears, the rotary head frame 53 may be locked in adjusted position.

In FIG. 5, the rotary head mechanism is shown in low height position with its axis of rotation aligned with the axis of the rotary frame 13', while in FIG. 6, the axis of head rotation is shown in its maximum position of parallel adjustment with respect to the rotary frame. By rotating the head frame 53, the head axis may be moved to a diametrically opposite position with respect to the position shown in FIG. 5, so that a mine vein of maximum height may be cut and dislodged.

Since the method of operating the mining machine to effect axial drilling and lateral core cutting and core breaking functions is fully disclosed in the above mentioned Barrett patent, it is deemed unnecessary to include herein a full description of such a mode of operation. As described in the Barrett patent, the head mechanism may be sumped in with an axial boring action at one rib and thereafter may be swung arcuately across the working face to effect its core forming and core breaking functions. When the opposite rib is reached, the head may be again sumped in and thereafter moved arcuately in the opposite direction across the face.

In both embodiments, liquid under pressure may be supplied to the hydraulic motor or motors on the rotating head mechanism from any suitable source in any known manner as, for example, through fluid conduits means (not shown) extending axially through the central drive shaft on the boom in a manner similar to that disclosed in the C. F. Ball Patent No. 2,801,094, also owned by the assignee of the present invention. A conventional control valve mechanism on the machine may control the operation of the motor or motors as desired.

As a result of this invention, an improved adjustable head mechanism is provided for a mining machine for cutting and dislodging the mineral of mine veins of varying heights. By the provision of the adjustable mounting for the rotary head, the axis of head rotation may move orbitally about a parallel axis and the orbital paths may be varied in size to suit varying operating conditions. The structure disclosed is relatively simple and rugged in design, well suited to meet the demands of service. Other advantages of the invention will be clearly apparent to those skilled in the art.

While there are in this application specifically described two forms which the invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be 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. In combination, a rotary drilling and dislodging head having drilling and dislodging means and movable axially to effect its boring function and laterally to effect its dislodging function, a swingable support, an adjustable pivotal mounting for said head comprising a rotary frame journaled on said support and means on said rotary frame for moving the head axis into and out of alignment with the axis of rotation of said rotary frame to vary the range of operating movement of said head, said head movable axially to drill a hole in the mineral of a mine vein and thereafter movable laterally to dislodge the mineral irrespective of the position of said head axis relative to said axis of said rotary frame, and driving means extending through the pivotal head mounting and along said axes of said frame and head for rotating said head in all operating positions thereof.

2. In a mining machine, a non-rotatable support, a rotatable frame mounted on said support to rotate relative thereto, a swinging arm pivotally mounted on said rotat-

able frame to swing relative thereto about the axis parallel to the axis of rotation of said frame, means for swinging said arm about its pivot relative to said rotatable frame, a rotary drilling and dislodging head mounted at the outer portion of said arm to revolve about an axis parallel with said pivotal axis of said arm and having drilling and dislodging means adjustable upon swinging adjustment of said head through a wide range of operating positions to dislodge mineral from mine veins of varying heights, a prime mover on said support, and driving means connected to said prime mover and to said head and extending along said parallel axes for rotating said head in all operating positions of said head.

3. In a machine of the character disclosed, a non-rotatable support, a rotatable cutter head, pivotal mounting means on said support for adjusting said head through a wide range of parallel positions including a position wherein the head axis is aligned with the longitudinal axis of said support, means operable to effect adjustment of said pivotal mounting means and for maintaining any selected position of adjustment of said head, and means for driving said head including driving connections extending through said pivot of said mounting means and along the axes of said support and said head.

4. In a mining machine, a supporting structure comprising a pivoted boom swingable vertically and horizontally, a rotary boring and dislodging head carried by said boom and movable axially to effect its boring operation and laterally to effect its dislodging operation, an adjustable supporting structure carried by said boom for adjusting said head to bring its axis of rotation between a position in coincidence with the longitudinal axis of said boom and a position in parallelism with said boom axis, said adjustable supporting structure including a head supporting member turnable laterally relative to said boom about an axis parallel with said boom axis, and means disposed rearwardly of said adjustable supporting structure for rotating said head and including a driving element journaled on said boom, a driving element axially aligned with said parallel axis and cooperating driving elements having their axes aligned with said boom and head axes respectively.

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