Aug. 18, 1925. 1,550,087

G. W. McNEIL

MINING MACHINE

Filed March 14, 1924 4 Sheets-Sheet 1

Fig. 1.

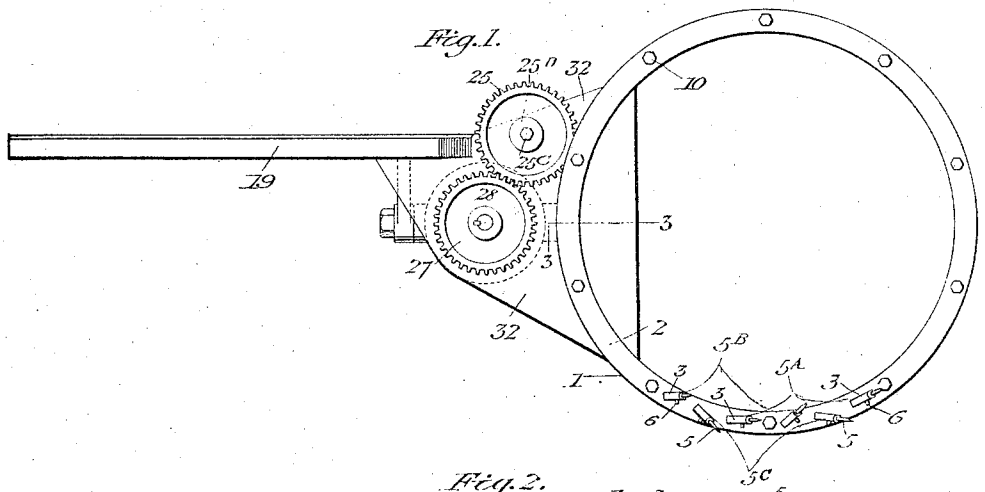


Fig. 2.

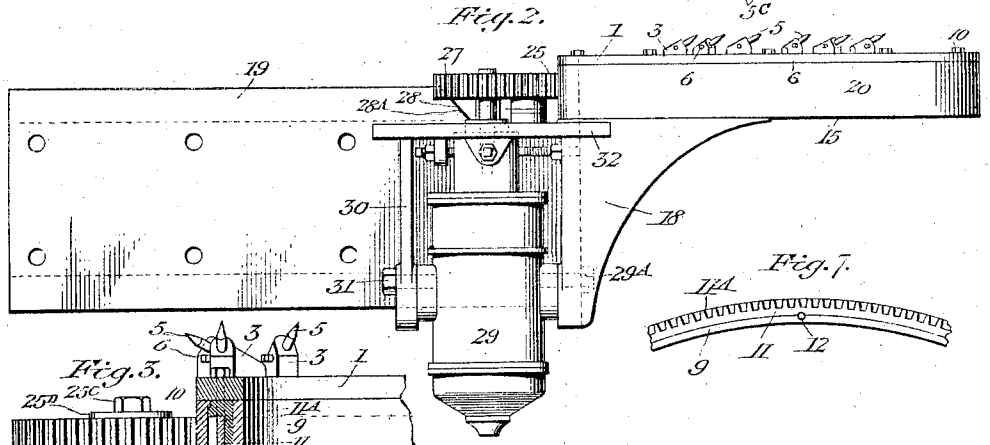


Fig. 7.

Fig. 3.

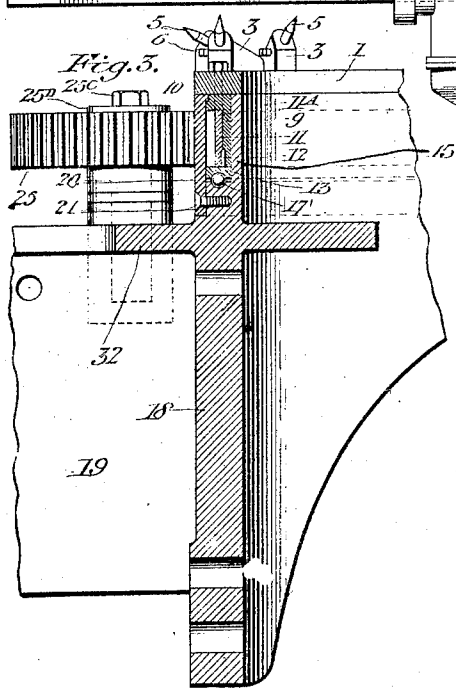
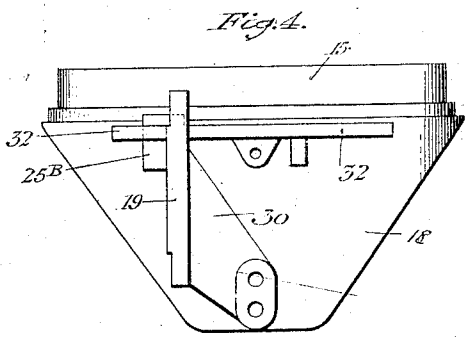


Fig. 4.



Inventor:

By George W. McNeil

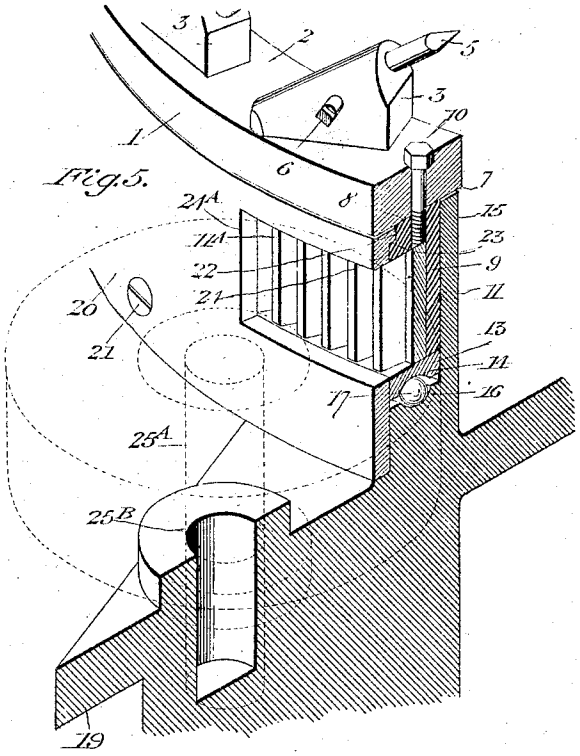
H. S. Bailey Attorney.

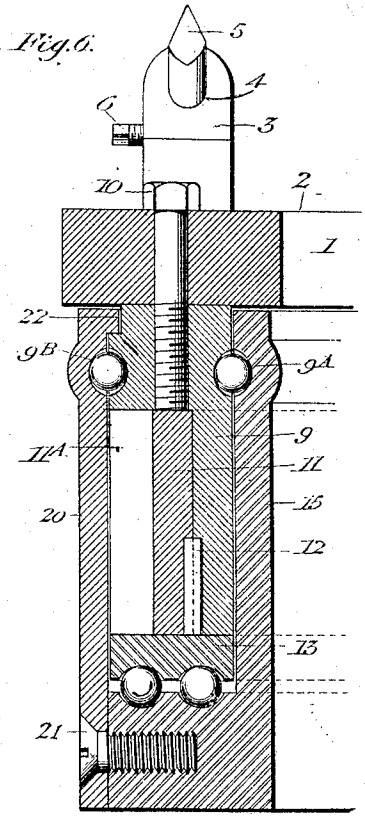
Aug. 18, 1925. 1,550,087

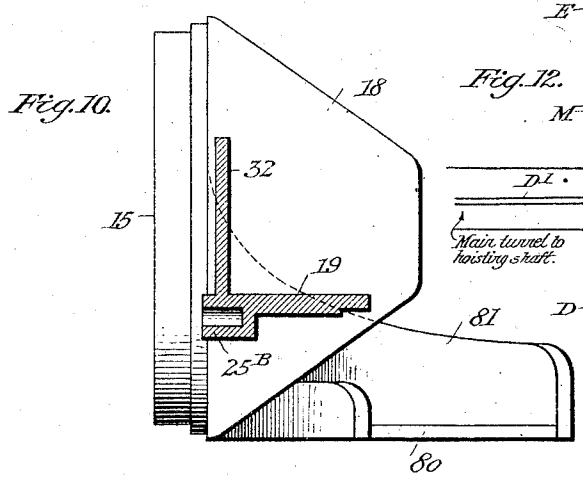
G. W. McNEIL

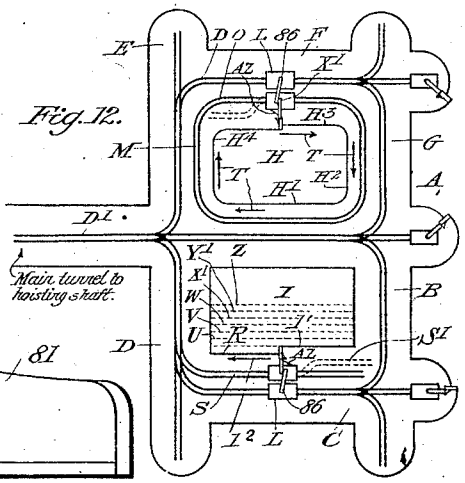
MINING MACHINE

Filed March 14, 1924 4 Sheets-Sheet 2









Inventor

George W. McNeil.

By H. S. Bailey. Attorney.

Aug. 18, 1925. 1,550,087

G. W. McNEIL

MINING MACHINE

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Fig. 8.

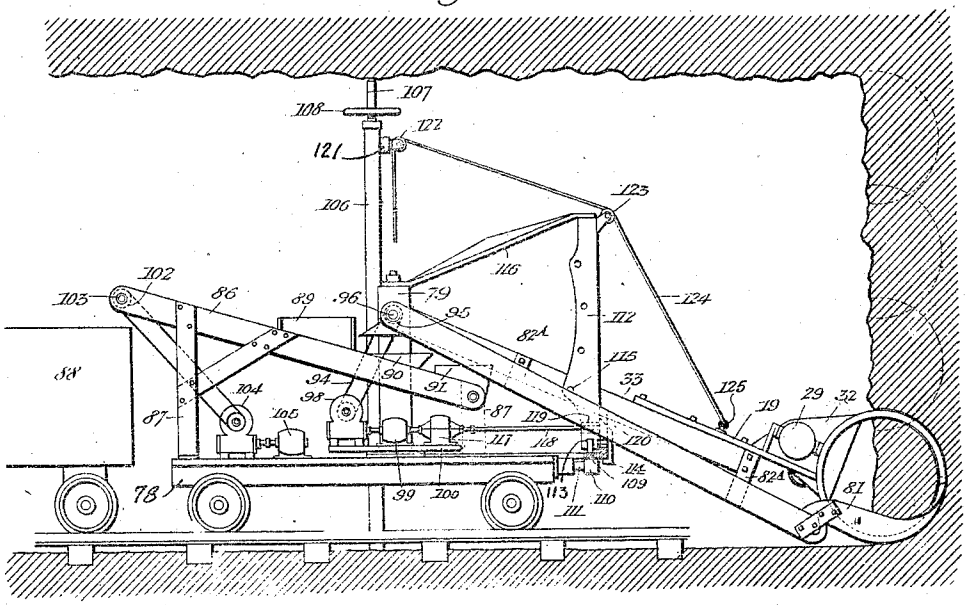
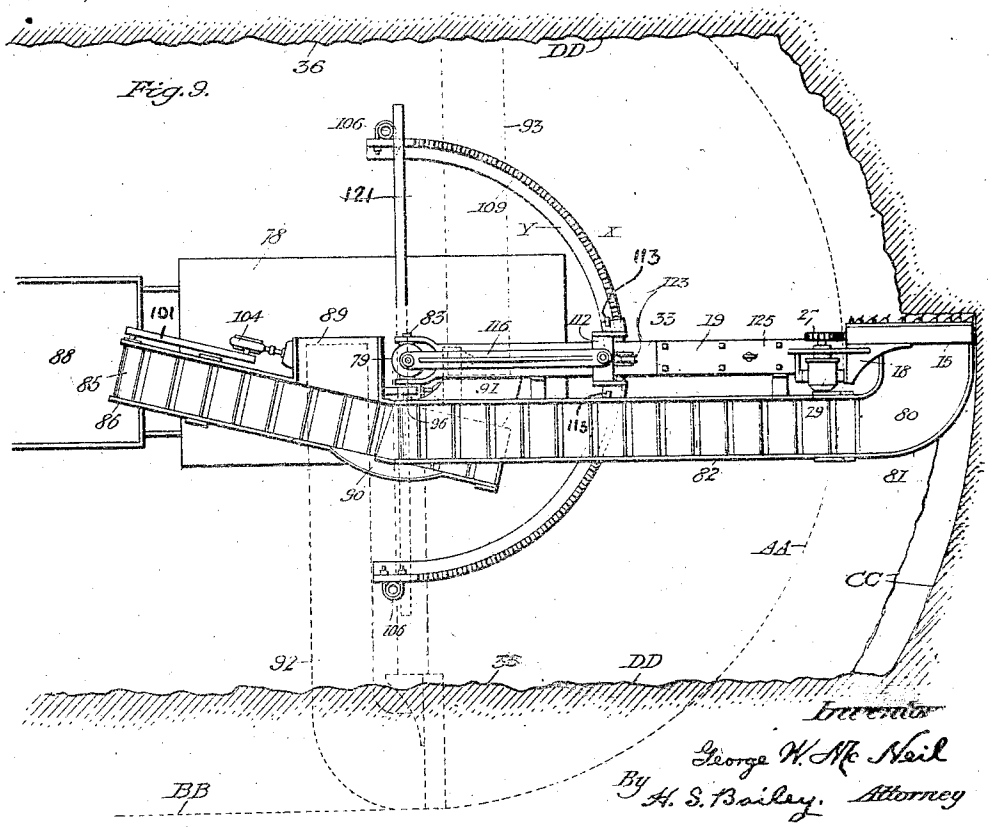


Fig. 9.



Inventor

George W. McNeil

By H. S. Bailey. Attorney

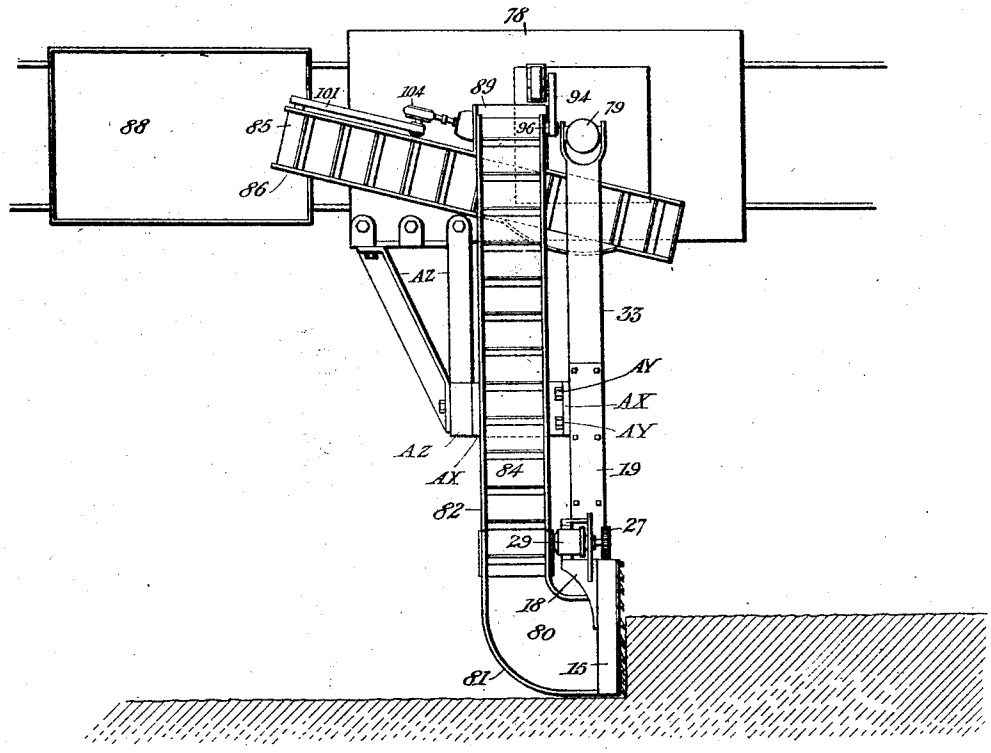
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G. W. McNEIL

MINING MACHINE

Filed March 14, 1924 4 Sheets-Sheet 4

Fig. II.



Inventor

George W McNeil

By H. S. Bailey, Attorney.

Patented Aug. 18, 1925. 1,550,087

UNITED STATES PATENT OFFICE.

GEORGE W. McNEIL, OF DENVER, COLORADO.

MINING MACHINE.

Application filed March 14, 1924. Serial No. 699,294.

To all whom it may concern:

Be it known that I, GEORGE W. McNEIL, a citizen of the United States of America, residing at the city and county of Denver, and State of Colorado, have invented a new Mining Machine, of which the following is a specification.

My invention relates to a new method of extracting coal from coal veins, and its automatically operating rotary coal cutting and core making and discharging ring mechanism and its core conveying and car loading mechanism, and its different methods of operation, and the objects of my invention are:—

First: To provide a rotating ring-shaped coal cutter for use in cutting solid coal from the breasts of coal veins in coal mining tunnels and from pillars of coal, parallel with their walls and without in any manner or at any time resorting to blasting operations.

Second: To provide a rotating coal cutting ring that is arranged to be swung from one side of a tunnel to the opposite side, and arranged and adapted to be fed into the breast of the tunnel a predetermined distance, and also arranged to be moved in a segment of a circle across the breast of the vein of coal in the tunnel, and from the floor to the roof of a tunnel.

Third: To provide an endless traveling coal cutter that cuts a groove into the solid breasts or pillars of coal in the tunnels of coal mines in such a manner as to form a core of coal, either in a solid piece or in separated pieces that fall behind the cutter as it advances into the solid breast of the pillar of coal; and a curved member on the cutter for guiding the core pieces away from the breast or pillar of solid coal as the cutter cuts forwardly through it, and to provide a suitable conveying means in the tunnel for receiving the coal from its guiding-way means and conveying it beyond the rear of the coal cutter's operating means and forwardly feeding car, and discharging it into coal hauling cars.

Fourth: To provide a track running car in the center of a coal mining tunnel, provided with a power driven pivotally swinging arm arranged to be swung in an arc of a circle or in a segment of a circle from one side wall of a tunnel to its opposite side wall, and to be raised from the floor of the tunnel to the roof of the tunnel and then lowered again to the floor of the tunnel, and provided with a power driven ring or endless shaped coal cutter arranged to be fed into the vein or coal and cut a groove therein and release core pieces therefrom that fall through the ring-shaped cutter behind it as it is swung around from one side wall of the tunnel to the other, and to cut away the vein of coal by a succession of semi-circular shaped recesses of about three-quarters or more of a circle in depth, one above the other, from the floor of the tunnel to its roof, the said semi-circular recesses being cut into the coal close enough to each other vertically one above the other to practically cut away the breast of the vein from the bottom or floor to the top or roof of the tunnel.

Fifth: To provide means for cutting solid coal from breasts and pillars of coal in coal mining tunnels by which coal can be reduced from its solid, thick veins to manhandling lumps of coal without the danger and expense of blasting operations, and to provide means for cutting it crosswise of tunnels from side wall to side wall.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1 is a side view of the improved coal cutter, only a portion of the cutting bit being shown.

Figure 2 is a plan view of the same.

Figure 3 is an enlarged sectional view on the dotted line 3—3 of Figure 1.

Figure 4 is an end view of the cutter supporting ring, the cutting mechanism being removed.

Figure 5 is a sectional perspective view of a portion of the cutter, the same being in a horizontal position.

Figure 6 is a sectional view—full size—through the cutter, illustrating a slight modification of the arrangement shown in Figure 5.

Figure 7 is a bottom view of a portion of the ring gear and its stiffening ring.

Figure 8 is a side view showing one manner of supporting and operating the cutter.

Figure 9 is a plan view of Figure 8.

Figure 10 is an end view of the support for the cutter ring and showing a coal receiving and guiding plate formed thereon.

Figure 11 is a plan view of the machine as arranged for cutting coal in a straight

line parallel with the wall of the tunnel, and showing the abutment for the cutter's supporting arm.

Figure 12 is a diagrammatic plan view of a group of tunnels driven in a coal vein to leave pillars or blocks of coal between them, and shows the application of my coal cutting mechanism to two different methods of cutting down the walls of the pillars or blocks of coal by feeding my coal cutting mechanism along and parallel to the walls of the pillars or blocks of coal.

Similar letters of reference refer to similar parts throughout the several views.

Referring to the drawings:

Figure 3 shows a diametrical section through the center of my ring-shaped coal cutter, and in this sectional view the numeral 1 designates the cutter ring, which comprises a solid cast iron flat ring, preferably about three-quarters of an inch thick by about one and five-eighths of an inch wide, and having cast on one of its outside surfaces 2, preferably thirty projecting lugs 3, that project at an upward angle of preferably sixty-five degrees, each of which is provided with a coal cutting bit receiving aperture 4, in which a coal cutting pointed bit 5 is placed and is secured therein by a set screw 6.

The bit-holding lugs 3 and their bits 5 are divided into three groups 5^A, 5^B and 5^C. The center lines of the group of cutters 5^A, lie in planes tangent to a cylindrical surface intermediate between the inner and outer perimeters of the ring 1; the cutters of the group 5^B extend inward over the inner perimeter of the ring 1 and the cutters of the group 5^C extend outward over the outer perimeter of the ring 1.

Consequently, each third coal cutting bit and its supporting lugs 3 in the circumferential center of the ring point straight ahead, and each second row of coal cutting bits points inwardly, and the other third circumferential rows of coal cutting bits point outwardly, and as the cutter ring is rotated, they cut a groove in the breast of the coal vein of from about two inches to about four inches wide, depending on how far out from the lugs 3 the points of the coal cutting bits are set.

The bottom side 7 of this cutter ring rests against and is bolted to the outside end surface 8 of a gear stiffening ring 9, to which it is secured by bolts 10, a number of which are used around the circumference of this cutter ring. To the side of this gear stiffening ring, a gear ring 11 is secured by dowel pins 12. This gear ring 11 is provided with a circumferential row of gear teeth 11^A. These two rings 9 and 11 rest on the outside surface of a rotating ball race ring 13, the inside surface of which is provided with a semi-circular shaped ball receiving recess or race track 14.

The gear stiffening ring and the gear ring are encased on one side by an L-shaped stationary ring 15, the inner end of which is provided with a semi-circular ball race recess 16, and between this ball race 16 and the ball race recess 14 in the race ring 13, a row of balls 17 is placed that extend end to end around the circumference of these rings 13 and 15 and form a ball bearing between these rings.

And the ball race ring 13, together with the gear ring 11 and the gear stiffening ring 9 and the cutter ring 1 with its coal cutting bits 5 rotates around the stationary ring 15 on the ball bearing 17.

This stationary ring 15 extends from a right angles projecting flange portion 18 that forms a part of the supporting frame 19 of my rotary coal cutting ring, and a ball bearing 9^A can be placed at its outer end if desired, as shown in Figure 6.

On the outside of the gear ring 11 a thin, flat ring 20 is secured to the inner L part of the stationary ring by screw driven screws 21 at its inner end, while its outer end is provided with an inwardly projecting circumferential flange 22 that fits into a circumferential stepped shoulder 23 formed in the edge 24 of the gear stiffening ring 9; and the parts that rotate on the ball bearing 17 are encased between the stationary ring 15 and the thin, flat ring 20; and they are held within their enclosing casing rings 15 and 20 against the ball bearing 17 by the circumferential shoulder 23, the stationary ring 15 and the circumferential flange 22.

The stationary ring 15 is cast integral with the flange 18, and it is of the same peripheral form as the ring 15, and projects at right angles from its edge and extends around its circumferential edge to points diametrically opposite the center of it.

The flat ring 20, which, of course, is stationary, as it is secured to the stationary ring 15, is provided with a hole 24^A through it adjacent to one end of the flange 18 of the supporting frame 19, through which the teeth of a pinion 25 project into mesh with the teeth 11^A of the gear ring 11, and a ball bearing 9^B can be formed at its outer end if desired, as shown in Figure 6.

This gear toothed pinion 25 is supported by and rotates on a shaft 25^A that is supported in a hub 25^B that is cast on the side of the supporting frame 19. A cap screw 25^C is threaded into the shaft, and a washer 25^D is placed between the cap screw and the hub of the pinion.

This pinion meshes with and is driven by a gear 27 that is mounted on a taper shaft 28 that is provided with a straight portion on which a bushing 28^A is mounted. The taper end of this shaft 28 fits into the end of an electric motor 29 that is connected to

a supply of electric current, and it is bolted on one side of it to the side of the flange 18 by a bolt 29A, and on its opposite side to a standard 30 by a bolt 31.

The standard 30 projects from the frame 19 that projects rearwardly from and is formed integral with the flange 18, and it is provided with side stiffening ribs 32 that extend to the opposite side portions of the flange 18.

This rearwardly extending plate 19 is arranged and adapted to be bolted to an arm 33 that is driven by a power operated mechanism to swing in a segment of a circle at the breast of the coal vein from the right hand side wall 35 of the tunnel to its opposite side 36, as shown in Figure 9.

My round coal cutting and core forming rotating ring is best adapted to horizontally swinging reciprocal movements, and is arranged to cut coal and form a large core when fed from the right hand side wall of a tunnel to its left hand side wall, as I have illustrated and described it, and it swings through the breast of a vein of coal in an arc or a segment of a circle movement, making substantially a full semi-circular swing from the right hand side wall to the left hand side wall of the tunnel, as shown in Figure 9, and it is moved into and against the coal as fast as it will cut the coal away by a power operated mechanism, which I will presently describe, means being provided for raising and lowering the coal cutting ring into the different positions in the height of the tunnel at which these swinging cuts are made.

I illustrate three cuts in a tunnel eight feet high. This is what I am making now with the ring I have in practical use, but a larger ring could be used that would cut down the entire face of the breast or pillar of coal in the tunnel in two cuts across it.

My invention contemplates also two or more coal cutting rings, one above the other, all arranged to cut out cores either directly above each other or in a progressive order, in which the lower coal cutting ring cuts its core first, the second coal cutting ring immediately after and, if desired, overlapping the first, and the others in the same order; or, if desired, they can be placed a little distance apart, preferably not more than the full diameter of the ring. Each one of them also may be provided with an independent core conveyor to convey and dump core pieces into the same cars on the same track, or into different cars on the same track or on other tracks, or in different cars on other tracks, the coal cutting rings and conveyors where two or more are used all being preferably mounted on the same motor car, as illustrated herein, and operated practically simultaneously together.

I have not illustrated this arrangement, as the operative mechanism and the coal cutting rings would be the same, but they would be made stronger, and the coal cutting rings would be simply made duplicates of the one that is illustrated and described and that I am now using.

My invention contemplates broadly any power receiving and transmitting mechanism for exerting the side pressure against the cutting rings that is necessary to keep them feeding constantly forward into the coal; and while a number of different mechanisms can be made and employed for this purpose, I preferably use the following mechanism and construct it in the following manner:—

I employ a motor car or truck 78 on which is pivotally mounted a vertical standard 79 to which one end of the arm 33 which carries the coal cutter ring 15 is pivotally connected. The ring 15 has secured thereto, or formed thereon, a guide plate 80, which is adapted to receive the core cut by the ring and direct it away from the breast of the tunnel in a rearward direction. This guide plate 80, as shown in Figures 8 and 9, extends from the ring 15 at right angles, for a short distance, and then curves around until it points rearward, and its outer marginal edge is formed with a vertical flange 81, with which the end of the core engages, as the ring cuts its way through the coal, portions of the core being broken off as they engage the curved flange 81, and are moved around and away from the breast by succeeding pieces of the core

The rearwardly projecting end of the guide plate 80, is secured to one end of a conveyor frame 82, which extends back parallel with the cutter ring supporting arm 33, and is rigidly secured to it by brackets 82A so as to move with the said arm 33, and its rear end is in axial line with the pivot 83, that secures the arm 33 to the standard 79. A conveyor 84 is mounted in the frame 82, which receives the lumps of coal from the guide plate 80 and carries them rearwardly, and deposits them upon a second conveyor 85 which is mounted in a frame 86, which is supported upon upright standards 87, which are bolted to the car. The conveyor 85 deposits the coal in a coal car 88, which is run on the same track as the car 78, and is positioned below the rear end of the said conveyor 85. As the cutter travels in the arc of a circle, the rear end of the conveyor 84 must also travel in an arc over the conveyor frame 86, which is stationary; and for this reason, the conveyor frame 86 is provided with chutes 89, 90 and 91, which will guide the coal falling from the conveyor 84 onto the conveyor 85, at all positions of the said conveyor 84 as it swings around from right to left. The chute 89 guides coal to the conveyor 84, when the conveyor stands in the position shown by

the dotted lines 92; the chute 91 acts when the conveyor 84 stands in the position shown by the dotted lines 93, and the chute 90 acts during the intermediate positions of the chute 84, as it travels from the extreme right to the extreme left of its swinging movement.

The conveyor 84 is operated by a belt 94 which passes around a pulley 95 on a roller 96 around which the upper end of the belt 84 passes, and the belt 94 passes around a pulley 97 on the slow speed shaft of a speed reducer 98 which is operated by an electric motor 99; the speed reducer and motor being mounted on a horizontal platform 100 which is supported upon and moves with the pivoted standard 79.

The conveyor 85 is operated by a belt 101, which passes around a pulley 102 on a roller 103, around which the upper end of the said conveyor 85 passes; and the belt 101 also passes around a pulley on a speed reducer 104, which is operated by an electric motor 105.

The cutter is swung in an arc from right to left in the following manner: A vertical column 106 is rigidly secured between the floor and roof of the tunnel, on each side of the truck 78, the columns being of a common type, and comprising a tubular member having a pin 107 threaded into one of its ends, the pin having rigidly mounted thereon, a hand wheel 108, by turning which the pin 107 is screwed into contact with the roof of the tunnel, thereby forcing the opposite end of the column in rigid engagement with the floor of the tunnel.

To the columns 106, are secured in any suitable manner, preferably by U-bolts, as shown, the ends of a semi-circular rack bar 109, which is L-shaped in cross section, as shown in Figure 9 to provide vertically projecting teeth X and a horizontal track portion Y. The center portion of this rack bar is provided with a depending hub 110, which is pivotally mounted on a pin or stub shaft 111, which is secured upon the front end of the truck 78. This arrangement constitutes a three point suspension for the rack bar 109, which enables the same to be maintained on a horizontal plane, even though the truck may tip slightly either to one side or the other, due to unevenness of the track on which the truck runs.

A vertical support or standard 112, is supported on the track Y of the rack bar, and this standard comprises side members having rollers 113 in their lower end which travel upon the said track Y, the said lower end being also formed with hook portions 114 which engage the under side of the rack bar as shown.

The arm 33, which supports the cutting ring 15, passes between the side members of the standard 112, and may be supported in any one of four positions from the lowest to the highest position of the cutting ring, by a pin 115, which passes through holes in the side members of the said standard 112 and through a hole in the supporting arm 33, and the standard is supported at its upper end by a brace 116, which is secured at one end to the top of the standard 112, and at its opposite end to the top of the pivoted standard 79, which is supported on the truck.

The electric motor 99, a speed reducer 117, the shaft of which is coupled to a shaft 118, the outer end portion of which passes between the side members of the standard 112 and is mounted in a bearing 119 supported by said side members, and the outer end of this shaft carries a pinion 120, which meshes with the teeth X of the semi-circular rack bar 109, and by this means the cutting ring is moved forward through the coal breast at a predetermined speed which is proportioned to the cutting power of the ring.

A bar 121 connects the upper ends of the two columns 106, and a pulley 122 is mounted centrally of the length of this bar, and a similar pulley 123 is mounted on the top of the standard 112. A cable 124 is secured at one end to a ring 125, which is secured to the plate 19 which forms an integral part of the cutting ring 15, and this cable passes over the pulleys 122 and 123, and may be drawn upon to lift the arm 13, either manually or by suitably applied power means.

From the above description, taken in connection with Figures 8 and 9, the manner of supporting the coal cutting ring and of moving it forward through an arc of a circle, will be readily understood, and the moving and supporting mechanism, in combination with the guide plate 80 and conveyors 84 and 85, provides an improved manner of cutting away the coal breast at different levels, and automatically conveying the coal thus cut away from the tunnel breast, thereby enabling the work to be continuously carried on, and thus greatly increasing the supply in a given period, over the supply for the same period under present methods.

My invention also contemplates the cutting away of the wall of coal in a straight line parallel with the face and height of the wall of coal, and I arrange it to accomplish this purpose as follows (see Figure 12):—

Assuming that the tunnels A, B, C, D, E, F and G have been driven with my coal cutting mechanism and that the pillars or blocks of coal H and I have been standing, and it is desired to cut them down with my coal cutting mechanism, I proceed in the following manner:

I employ the same coal cutting ring and its operating mechanism and also its supporting track running car 28, but I attach an arm AX to the arm 33 by the bolts AY.

This arm AX extends down and underneath the conveyor and a slight distance beyond its opposite side from the arm 33, as shown in Figure 11, and when the arm 33 is swung to stand at right angles to the truck, the said arm AX is adapted to bear against a bracket AZ, which is removably secured to and is stationary on the car and is long enough above and below the car to be engaged by the said arm AX, in all of the vertical cutting positions of the coal cutting ring between the floor of the tunnel and its roof. This arm AX and the bracket AZ are only used when cutting out cores from the walls of pillars of coal parallel to the lengths, and consequently they are not on the car 28 or on the arm 33 when cutting tunnels into the vein of coal. Thus the arm 33, through the medium of the arm AX has a solid abutment bearing against the said bracket AZ, independently of the conveyor, when the coal cutting ring is cutting out cores along and parallel with the walls of the pillars.

The rear end 86 of the conveying mechanism is extended at right angles to the track in position to discharge the cores or core materials of coal into coal cars L either on the main track D^1 or other tracks laid close to the pillars of coal, especially for the cars to run on.

Tracks M are then laid parallel with all of the four walls H^1, H^2, H^3 and H^4 entirely around the pillar H, but only along the lower side wall R of the pillar of coal I.

I illustrates two different methods of cutting down pillars or blocks of coal in this Figure 12, each of which operates as follows:—

The track M on which my coal cutting mechanism is mounted extends all around the four walls of the pillar H, and my coal cutting mechanism and its car travels on this track in the direction of the arrows T, and continuously cuts away all four sides of the pillar H as it moves entirely around it with a steady, forward movement until the pillar H is cut entirely away, allowing for stops only between shifts and for occasionally removing the dull coal cutting bits and replacing them with sharp coal cutting bits. Pillars are left in coal mines that employ what is called the tunnel and chamber system of mining, and the pillars left standing in driving the tunnels are made of various dimensions, ranging from about twenty to several hundred feet square.

On the lower pillar I, the track S only extends along the lower wall I^1 of the pillar I, and my coal cutting mechanism feeds forward on this track in the direction of the arrow I^2. When cutting away the wall I^1 of the pillar I, and when at the end of its cut, it is run backwards over the track S^1, which I illustrate at the rear of the cutting mechanism in dotted lines. The track S^1 in dotted lines is the track S moved over towards the wall I^3 far enough to allow the coal cutting machine 15 to take a new cut along the wall I^3, and the dotted line U and other successive parallel cuts V, W, X^1 Y^1 and Z are made until the pillar I is cut down.

After the cutting mechanism has been moved back to the point S^1 of the dotted track, which now becomes a full track and the main track upon which the cutting machine has to run to make a new cut, then the opposite end of the track S has to be moved up alongside of the wall so that the cutting mechanism can make a straight movement straight across the wall I^1; and this movement of the track at each end alternately has to take place between each cut, and it can be easily done with pinch or crow bars, as only narrow gauge lightweight coal car tracks and their sleepers are used in the mines and the car is very easily and quickly slid over, and it only has to be moved the distance equal to the depth the cutting ring is set to cut into the wall of coal, which is about thirty inches.

This reciprocal switchback system of cutting down pillars of coal requires less trackage than the continuously forward moving and cutting system shown around the pillar H, as time is lost in moving the coal cutting mechanism on the track S^1 backward. When I say a complete cut around the pillar H, I mean the cutting out of the entire faces of the walls all around the pillar, which takes four core cutting out trips across each wall, as shown in Figure 11, consequently the tracks do not have to be moved in towards the walls if only one machine is used in cutting the walls down; but if four coal cutting machines are used, either following right back of each other or each one is used along each of the four walls, then the entire wall from the floor to the roof is cut out when these four machines make a complete circle of the pillar H.

The car 78 that supports my coal cutting mechanism of either of these systems is provided with a forwardly feeding slip clutch movement mechanism by which a feeding speed of from about five to ten or more feet per minute of the cutting ring into the coal can be given to the coal cutting ring. This feeding mechanism can be operated by the electric motor 105, or another electric motor can be placed on the car and used for this purpose through a system of worm or other speed reducing gearing that can be connected to the rear axle of the car. I do not deem it necessary to illustrate such gearing, inasmuch as other commonly used methods for feeding the car forward can be employed and also for running it backwards faster than it feeds forward. Consequently

it can be seen that very large areas of coal in the form of pillars can be cut down by feeding the coal cutting ring and the supporting mechanism straight ahead and parallel with the face of the walls of said pillars, as well as by cutting coal out from the breasts of walls of coal in driving tunnels into coal veins.

My invention also has this advantage over the system of blasting coal commonly in use, in that with the blasting method about fifty per cent of the coal broken down is in fines and the other fifty per cent is in lump coal. With my system only about twenty-five per cent of the coal cut down is in fine coal and seventy-five per cent of it is in lump coal, and inasmuch as lump coal is worth three to four times more than the fines, my system in this respect is far more valuable than when blasting methods are used, because in blasting after the holes are drilled and charged, the men retire from the tunnel and do not re-enter the tunnel until the densest part of the gases and smoke of the explosion have been driven out by suction fans, and consequently considerable time is lost, while in my system the coal cutting machines can be run constantly throughout each twenty-four hours. Furthermore, the vibration imparted to the veins of coal and the ground above them by the explosions of blasting operations is avoided and practically no danger is encountered from the roof of a tunnel caving in, and consequently a very much lighter character of supporting posts can be used, and they can be placed farther apart than they are now placed where the blasting is used for breaking coal down, and also the danger of men getting injured where the blasting of coal is in use is entirely avoided.

A detailed description of the mechanism of my coal cutting ring and of the core conveying and car loading mechanism is not deemed necessary, as all of the practical operative movements of my coal cutting ring and its operative mechanism, both for cutting tunnels in coal veins and for cutting down pillars of coal, have been fully described. There is, however, a feature disclosed in Figure 9 that requires explanation:

The dotted line AA denotes about the smallest tunnel in width that can be cut, and the arm 19 has to be shortened to bring the outside end of the cutting ring back to this dotted line; and the dotted line illustrates a full semi-circular path of the cutting ring across the breast of a vein of coal and would make a tunnel of about twelve feet in width; but much wider tunnels can be cut from about fourteen feet wide up to any width of tunnel that it is practical to make the length of the arm 19 to maintain the practical coal cutting stability of the cutting ring from its supporting car 28; and short arcs of a semi-circle CC; that is, a portion of a full semi-circular path of the cutting ring can be cut out in a narrow tunnel such as is defined by the tunnel walls DD in Figure 9.

While I have fully described my different methods of extracting and cutting down coal in tunnels and pillars and have also fully illustrated and described the preferred construction of my invention, I do not wish to be limited to the construction and arrangement shown, as many changes may be made without departing from the spirit of my invention.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In coal cutting mechanism, a ring-like frame, having a base flange, a rotatable flat ring surrounding said frame and having a surrounding ring gear secured thereon, a ring surrounding said gear and secured to said base flange, a cutter-supporting ring secured upon the outer flat face of said rotatable flat ring, an arm projecting from said ring-like frame, a gear mounted on said arm and meshing with said ring gear and a motor mounted on said arm having a pinion in mesh with said gear.

2. In coal cutting mechanism of the character described, a car having a pivoted element thereon, a bar hinged at one end to said pivoted element to have a vertical swinging movement, a stationary ring on the end of said bar, a rotating gear member provided with a supporting ring member attached to the same, encased in said stationary ring, a coal cutting ring attachable to and detachable from said gear ring and its supporting member, said coal cutting ring being provided with three independent rows of taperingly pointed coal cutting bits divergingly and adjustably positioned to cut grooves in coal of different diameters than the diameter of the coal cutting ring.

3. In coal cutting mechanism, a main stationary ring 15 provided with ball bearings having an annular base at right angles thereto, a circular rotary ring member arranged to removably receive on its outer end a core cutting ring surrounding said main stationary ring and having ball bearings registering with those of said stationary ring, a gear ring attached to and supported by said circular rotating ring and connected thereto to be stiffened by the same, a second stationary band secured to said annular base and forming with said main stationary band a housing for said encased rotary ring member and its ring gear, means for holding said rotating ring and gear members in said housing, an independent individual, and removable coal cutting ring provided with three independent and separate circumferential rows of taperingly pointed coal cutting points, said points ad-

justably supported in sockets arranged in obliquely diverging angles upwardly, inwardly and outwardly from the peripheral surface of said coal cutting ring, a supporting arm extending from said stationary band to an operative swinging or vertical movement mechanism, a driving pinion on said arm in mesh with the said gear ring, an electric motor mounted on said arm having a gear on its driving shaft directly in mesh with the pinion that rotates the gearing of said coal cutting ring.

4. In coal cutting mechanism a main stationary narrow ring shaped member having an annular base flange, a second stationary ring secured to said flange and forming with the first ring a stationary housing, a third ring rotatably mounted and encased in, and protected by said housing, and having a ring gear removably secured thereto, means on the second rotating ring for holding the third ring in the housing, a coal cutting ring removably secured to the outer edge of the said third rotating ring having three independent and separate circumferential rows of coal cutting bits receiving socketed blocks and three independent and separate rows of taper-pointed coal cutting points in said socketed blocks adjustably secured therein to cut grooves in coal of any predetermined width, having an external and an internal diameter respectively greater and less than the corresponding diameter of said coal cutting ring, an arm extending from the main ring and a driving pinion mounted on said arm enmeshed with said ring gear, and an electric motor on said arm, provided with a gear directly enmeshed with, and arranged to rotate with said driving pinion.

5. I coal cutting mechanism a main stationary ring having a base flange provided with a ball race and balls therein, a ring gear supported on said balls, a second ring surrounding said ring gear, and secured to said base flange, a coal cutting ring attachably and detachably mounted on said gear ring and provided with three independent and separate circumferential rows of sharply pointed coal cutting points, arranged to be adjusted upwardly, inwardly and outwardly from the peripheral surface of said coal cutting ring, an arm extending from said main ring, a driving pinion rotatably mounted on said arm and in operative mesh with said ring gear, and an electric motor mounted at the side of said driving pinion having a gear directly enmesh with it and arranged to rotatably drive the gear ring of said coal cutting ring.

In testimony whereof I affix my signature.

GEORGE W. McNEIL.