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APPARATUS FOR MINING COAL

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Fig. 1.

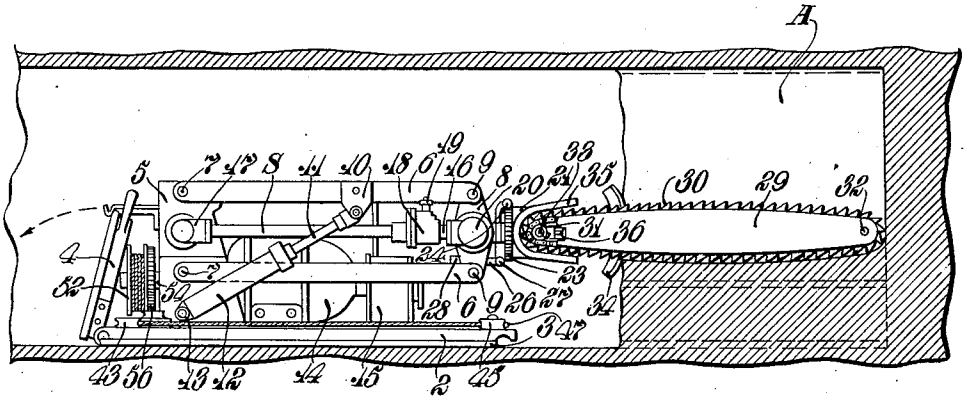
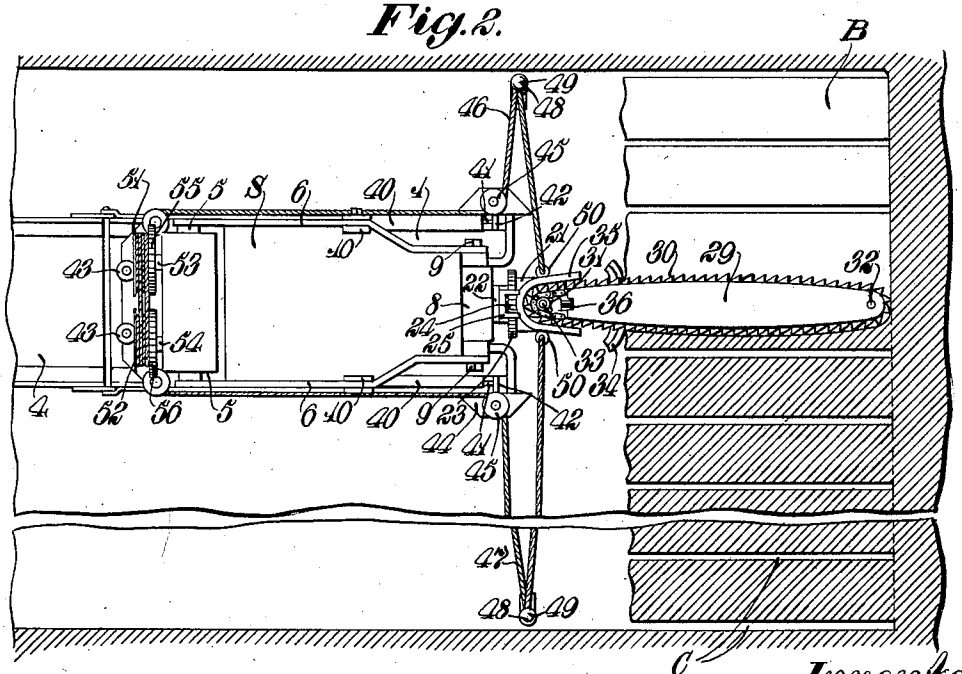


Fig. 2.



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APPARATUS FOR MINING COAL

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45 Claims. (Cl. 262—28)

This invention relates to apparatus for mining coal, and more particularly has reference to improvements in mining apparatus of the so-called "thin kerf" type for cutting very thin slots in the coal face.

An object of this invention is to provide an improved coal mining apparatus. Another object is to provide an improved coal mining apparatus having improved adjustable supporting means for the slot cutting devices. A further object is to provide an improved adjustable supporting means for the slot cutting devices whereby slots may be cut in the coal face either horizontally or vertically and in any desired location between the mine roof and mine floor and between the ribs. Yet another object of this invention is to provide an improved coal mining apparatus having an improved bottom supporting structure for slidably supporting the apparatus for movement over the mine floor and having supported thereon improved parallel motion supporting and adjusting structure for the slot cutting devices. Still another object is to provide an improved mining apparatus of the type slidable on its bottom over the mine floor and having its main base reciprocable on its bottom support and having improved elevating mechanism in the form of a linkage mounted on the main base for adjusting the coal cutting devices. Still another object is to provide in a mining apparatus of the above character improved means for elevating and depressing the linkage elevating mechanism for the coal cutting devices, together with improved means for feeding the apparatus both during the cutting operation and movement of the apparatus about the mine. A still further object of this invention is to provide an improved mining apparatus of the flexibly-fed, floor cutter type slidable over the mine floor and having improved adjustable slot cutting devices. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

This application is a division of my application Ser. No. 568,596, filed October 13, 1931.

In the accompanying drawing there is shown for purposes of illustration one form which the invention may assume in practice.

In this drawing,—

Fig. 1 is a side elevational view of the illustrative embodiment of the improved coal mining apparatus.

Fig. 2 is a plan view of the coal mining apparatus shown in Fig. 1.

In this illustrative embodiment of the invention there is shown a coal mining apparatus of the flexibly fed, floor cutter type generally designated S, comprising a main base 1 which is reciprocably mounted upon longitudinal ways 2 associated with a skid plate 3 and having a hinged platform 4 attached to the rearward end thereof. The main base 1 supports substantially the entire mechanism of the coal mining apparatus. It is provided with upright side portions 5 to which are pivotally attached pairs of parallel links 6, 6 at the pivot points 7. The outer ends of the pairs of links 6, 6 are joined by the cutter head support 8 pivotally connected thereto, as at 9. The mid-portions of the upper links 6 are provided with arms 10 which pivotally engage the piston rods 11 of a pair of hydraulic cylinders 12, the latter arranged at the sides of the base and being pivotally attached to the upright frame portions 5 at their lower ends at 13. Consequently, when pressure fluid is admitted to the hydraulic cylinders 12 the links 6, 6 and the cutter head support 8 will be swung upward or downward, the links cooperating to form a parallel motion linkage for adjustably supporting the cutting devices.

The main base 1 is provided with a motor 14 having a magnetic starting box 15. The motor 14 transmits power through appropriate mechanism to a drive shaft 16 running substantially parallel to the links 6, 6. The drive shaft 16 is provided with a swinging connection 17, whereby it receives power from the motor 14 regardless of its position, and is also provided with a clutch 18 shifted by a clutch lever 19 to connect or disconnect the drive shaft 16 from the cutter mechanism hereinafter described. Beyond the clutch 18, the drive shaft 16 continues, through another swinging connection 20, through appropriate mechanism, to the cutting devices.

The cutter head 21 is joined to the cutter head support 8 by the connecting arm 22 and is rotatable relatively thereto about a longitudinal axis at right angles to the axis of the swinging connection 20, and this head is rotated by means of a worm gear 23 secured to the cutter head and engaged by a worm 24 mounted in the yoke arm 25 attached to the cutter head connection 21 (Fig. 2). The parallel motion linkage, as it is swung relative to the base, maintains the cutter head axis always parallel to a common straight line extending longitudinally of the main base.

The connecting arm 22 pivotally engages the cutter head support 8 on a horizontal axis running through the center of the jointed connection 20 and is tiltable relatively thereto by means

of a piston rod 26 pivotally secured thereto as at 27. The piston rod 26 is mounted in a hydraulic cylinder 28, whereby it is moved in or out, thereby tilting the cutter head 21 up or down relative to the cutter head support 8 around the above mentioned horizontal axis, and as a result the angle in altitude of the head axis may be changed at will.

The cutter head 21 is provided with an elongated cutter blade 29 having a power driven endless cutter chain 30 orbitally movable about the margin thereof by a sprocket 31 at the inner end and supported by a sprocket mounted on the shaft 32 at its outer end. This cutter blade is relatively thin and long whereby a narrow slot may be cut relatively deep into the seam of coal. The sprocket 31 is mounted upon a shaft 33 which is operatively connected through appropriate mechanism, by way of the drive shaft 16, the swinging connections 17 and 20, and the clutch 18, to the motor 14. Accordingly, when the motor 14 is in operation, and the clutch 18 is engaged, the cutting teeth 30 pursue an orbital path around the cutter blade 29 along the marginal edge of the latter. The cutter blade is provided with a depth stop 34 engageable with the coal face, whereby the depth of the slit may be regulated, and with a guard 35 housing the rear portion of the saw chain to protect the operator from injury by the cutting teeth 30. The cutter blade 29 is provided with an adjustment 36 for taking up slack in the cutting teeth 30.

The main base 1 is provided with a pair of hydraulic cylinders 40, 40 mounted thereon, one at each side thereof, and provided with piston rods 41 secured to the ways 2 as at 42. Consequently, when pressure fluid is admitted to the hydraulic cylinders 40, 40, the main base 1 is reciprocated longitudinally relative to the ways 2. In this manner the cutter blade 29 may be fed longitudinally into the coal face. The main base 1 is provided with guide pulleys 43 (Fig. 2) and the ways 2 are provided with flanges 44 which carry guide pulleys 45. The guide pulleys 43 and 45 serve to guide flexible feeding cables 46 and 47 which pass over pulleys 48 mounted on vertical anchor jacks 49, and are secured at their ends to rings 50 (Fig. 2) on the sides of the cutter head 21. The opposite ends of the flexible feeding cables 46 and 47 are wound upon cable drums 51 and 52, respectively, mounted upon parallel, longitudinally extending, horizontal shafts 53 and 54 at the rearward end of the machine. The shafts 53 and 54 carry gears 55 and 56 which engage appropriate gearing and other mechanism transmitting power thereto from the motor 14. As a result, when the motor 14 is rotated, the cable drums 51 and 52 are likewise rotated so that one of the cables 46, 47 is drawn in while the other cable is paid out, thereby moving the entire machine bodily in a lateral direction over the mine floor (Fig. 2). In this way a horizontal slot is cut, as shown in Fig. 2. It will be obvious that a similar result would be obtained by omitting the anchor rings 50 (Fig. 1) and anchoring the cables 46, 47 directly to the anchor jacks 49 instead of continuing them over pulleys to the anchorage rings 50 on the cutter head 21.

It will be noted that I have provided a coal mining machine which is capable of cutting vertical slots A, as shown in Fig. 1, by means of the hydraulic cylinders 12 and the links 6; or horizontal slots B, as shown in Fig. 2, by means of the flexible feeding cables 46, 47 and the associated mechanism; or the longitudinal incisions C, as shown in Fig. 2, by reciprocating the main frame 1 upon the ways 2 through the action of the hydraulic cylinders 40.

For cutting the vertical kerfs A the cutter blade 29 is entered near the roof of the mine and then lowered by the linkage mechanism 6 to cut said vertical kerfs successively and from the roof to the floor of the mine chamber, as illustrated in Fig. 1. The horizontal slots B are then formed by entering the cutter blade of the machine S into the wall of coal adjacent one side of the mine chamber, and then feeding the machine laterally to the other side of the chamber by the flexible feeding ropes 46, 47. This will be apparent upon inspection of Fig. 2, and it will be noted that the cutter blade 29 at this time is positioned at right angles to its position for cutting the vertical slots. Horizontal slots may be inserted in the coal at any desired elevation between the mine roof and the mine floor by rotating the head 21 to move the cutter blade 29 into a horizontal cutting position, and operating the hydraulic cylinders 12 to swing the parallel motion linkage 6, thereby to raise or lower the cutter head 21. The head may be rotated into the vertical cutting position shown in Fig. 1, and the parallel motion linkage 6 is then employed for swinging the cutter blade in a vertical plane. The hydraulic cylinders 40 are employed for moving the cutter blade in a longitudinal direction with respect to the skid to insert a longitudinal incision in the coal face. These and other uses and advantages of the improved coal mining machine will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is 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 a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a main base reciprocable on said skid guideway, means for reciprocating said main base on said guideway relative to said skid, elevating mechanism comprising a vertically swingable arm structure pivotally mounted at its rear end on the rearward portion of said main base and overlying the latter, a vertically disposed kerf cutter supported on the forward extremity of said arm structure, means for driving said kerf cutter, and means for swinging said arm structure vertically about its pivot to move said kerf cutter in an arcuate path about the arm structure pivot axis to cut a vertical kerf.

2. In a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a main base reciprocable on said skid guideway, means for reciprocating said base on said guideway relative to said skid, elevating mechanism comprising a vertically swingable arm structure mounted on said main base, a kerf cutter supported on said arm structure and adjustable into horizontal and vertical cutting positions, means for driving said kerf cutter, means for swinging said arm structure vertically about its pivot to move said kerf cutter, when the latter is in vertical cutting position, to cut a vertical kerf and to adjust said

kerf cutter, when the latter is in horizontal cutting position, into parallel horizontal planes at different elevations, and means for feeding the apparatus bodily laterally over the mine floor to move said kerf cutter when the latter is in horizontal cutting position, to cut horizontal rectilinear kerfs in any of aforesaid horizontal planes.

3. In a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a main base mounted on said skid for reciprocation on said skid guideway, means for reciprocating said main base on said guideway relative to said skid, elevating mechanism comprising a vertically swingable arm structure pivotally mounted at its rear end on the rearward portion of said main base and overlying the latter, a horizontal kerf cutter supported on the forward extremity of said arm structure, means for swinging said arm structure vertically about its pivot to move said kerf cutter into horizontal cutting planes at different elevations, means for driving said kerf cutter, and means for tilting said kerf cutter about a horizontal axis relative to said arm structure into cutting planes inclined with respect to the horizontal.

4. In a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a main base reciprocable on said skid guideway, a kerf cutter supported on said main base, flexible feeding means for feeding the apparatus bodily laterally over the mine floor to effect horizontal rectilinear cutting feed of said kerf cutter transversely across the coal face, said feeding means including a power operated feed operating member on said base and a cooperating flexible feeding element, guiding means for said flexible feeding element including a guiding element on said skid, and means for effecting relative reciprocation between said skid and base to vary the location of said guiding element relative to said base, said flexible feeding element being extensible from said feed operating member about said guiding element to an extraneous abutment located at the rib.

5. In a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a main base reciprocably mounted on said skid guideway, a kerf cutter supported on said main base and adjustable relative thereto into horizontal and vertical cutting positions, means for reciprocating said main base back and forth along said skid guideway to effect rectilinear sumping and withdrawal movements of said kerf cutter when the latter is in said vertical cutting position, and means for feeding the apparatus bodily laterally over the mine floor for effecting horizontal rectilinear feed of said kerf cutter transversely across the coal face when said kerf cutter is in said horizontal cutting position.

6. In a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a main base reciprocably mounted on said skid guideway, a kerf cutter supported on said main base and adjustable relative thereto into horizontal and vertical cutting positions, means for adjusting said kerf cutter, when the latter is in aforesaid horizontal cutting position, into horizontal cutting planes at different elevations relative to said main base, means for reciprocating said main base back and forth along said skid guideway to effect rectilinear sumping and withdrawal movements of said kerf cutter when the latter is in said vertical cutting position, and means for feeding the apparatus bodily laterally over the mine floor for effecting rectilinear horizontal feeding of said kerf cutter transversely across the coal face when the latter is in any of aforesaid horizontal cutting positions.

7. A coal mining machine comprising a main base, a skid plate slidably arranged relative to said main base, a motor mounted on said main base, winding drums mounted at one end of said main base, a parallel motion linkage secured to and overhanging said main base, and coal cutting devices secured to the outer end of said linkage.

8. A coal mining machine comprising a main base, a skid plate slidably arranged relative to said main base, a motor mounted on said main base, winding drums mounted at one end of said main base, a parallel motion linkage secured to an upright member mounted on said main base near one end thereof and overhanging said main base, and coal cutting devices secured to the outer end of said linkage and driven by said motor.

9. In combination, in a hydraulic control system for a coal mining machine of the floor cutter type slidable on its bottom over a mine floor, a coal cutting device, means for operating said coal cutting device, a hydraulic cylinder for horizontally moving said coal cutting device to feed the latter in an endwise direction, a hydraulic cylinder for vertically moving said coal cutting device to feed the latter in a vertical direction, and a hydraulic cylinder for tilting said coal cutting device about an axis transverse to its length into angularly related cutting planes, tilting by said last mentioned cylinder effecting cutting device tilt relative to the hydraulic cylinder which effects vertical movement of the cutting device.

10. A mining machine comprising a skid plate, a main base reciprocable relative thereto, elevating mechanism comprising a linkage mounted on said main base, cutting devices supported on said linkage and adjustable relative thereto into horizontal and vertical cutting planes, a power source, means operated by said power source for operating said cutting devices, means operated by said power source for elevating and depressing said linkage to cause said cutting devices to cut a slot in a vertical plane, and feeding devices operable to effect bodily movement of said skid plate and said cutting devices mounted thereon to cut a slot in a horizontal plane.

11. In a mining machine, a base, a frame guided for longitudinal movement thereon, a linkage mounted on said frame in overlying relation thereon to swing relative thereto about a pivot located at the rear end of said frame, a vertical kerf cutter supported on said linkage, and means for moving said frame longitudinally relative to said base.

12. In a mining machine, a base having a longitudinal guideway, a frame reciprocably mounted on said base guideway, a linkage pivotally mounted on said frame in overlying relation thereon to swing upwardly relative to said frame about a pivot located at the rear end of said frame, a vertical kerf cutter supported on said linkage, and means for reciprocating said frame along said base guideway.

13. In a mining machine, a base adapted to rest upon and slide in any direction over a mine floor, a linkage mounted on said base in overlying relation thereon and adapted to swing up-

wardly relative to said base about a pivot located at the rear end of said base, kerf cutting devices supported on said linkage, means comprising hydraulic cylinders for raising and lowering said linkage relative to said base to move said kerf cutting devices into cutting planes at different elevations, and a power source mounted on said base and drivingly connected with said cutting devices.

14. In a mining machine, a base adapted to rest upon and slide in any direction over a mine floor, a linkage mounted on said base in overlying relation thereon and adapted to swing upwardly relative to said base about a pivot located at the rear end of said base, cutting devices adapted to cut a vertical slot supported by said linkage, a power source mounted on said base and drivingly connected with said cutting devices, and hydraulic cylinders between said linkage and said base to feed said cutting devices in a vertical direction to cut a vertical slot.

15. In a mining machine, a base, a linkage mounted at its rear end on the rearward portion of said base and adapted to swing upwardly relative to said base, cutting devices pivotally supported on said linkage, means comprising a hydraulic cylinder for tilting said cutting devices relative to said linkage to move said cutting devices into angularly related cutting planes with respect thereto, and means comprising hydraulic cylinders for raising and lowering said linkage relative to said base.

16. A mining machine comprising a main base, a skid plate slidably arranged relative to said main base, a motor on said main base, a linkage secured to and overhanging said main base and including link elements straddling said motor, and a cutter secured to the outer end of said linkage and driven by said motor.

17. A mining machine comprising a main base, a skid plate slidably arranged relative to said main base, a motor on said main base, a linkage secured to upright members mounted on the main base at its opposite sides near one end thereof and overhanging said main base, said linkage including parallel link elements straddling said motor, and a cutter bar secured to the outer end of said linkage and having cutting elements driven by said motor.

18. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor, an arm structure pivotally mounted on said skid to swing in a vertical direction relative thereto, a horizontal plane cutter carried at the outer extremity of said arm structure and having cutting elements movable in a horizontal orbit about the margin of said cutter, and means for swinging said arm structure relative to said skid to move said cutter into horizontal cutting planes at different elevations.

19. In a mining machine, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto, a kerf cutter carried at the outer extremity of said arm structure, means for swinging said arm structure relative to said base to move said kerf cutter into horizontal cutting planes at different elevations, means for moving said arm structure longitudinally relative to said base to effect rectilinear sumping and withdrawal movements of said kerf cutter, and means distinct from said last mentioned means for feeding the machine bodily laterally over the mine floor to move said kerf cutter relative to the material to be cut in any of aforesaid horizontal cutting planes.

20. In a mining machine, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto, a cutter head mounted on the outer extremity of said arm structure to rotate relative thereto, a kerf cutter carried by said cutter head and adjustable with said head about the head axis into different cutting planes, means for moving said arm structure and cutter head longitudinally relative to said base to effect rectilinear sumping and withdrawal movements of said kerf cutter, and means for swinging said arm structure in a vertical direction about its pivot to move said cutter head axis into horizontal positions at different elevations with respect to said base.

21. In a mining machine, a portable base, a support mounted on said base to slide horizontally relative thereto, an arm structure pivotally mounted on said sliding support to swing in a vertical direction relative thereto, a plane kerf cutter carried at the outer extremity of said arm structure, and means for swinging said arm structure relative to said support to move said kerf cutter into horizontal cutting planes at different elevations.

22. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor, a parallel motion arm structure pivotally mounted at its rear end on the rearward portion of said skid to swing in a vertical direction relative thereto, a plane kerf cutter carried at the outer extremity of said arm structure, means for swinging said arm structure relative to said skid to move said kerf cutter into parallel cutting planes with respect thereto, and means for moving said arm structure in a direction longitudinally of said skid to effect rectilinear sumping and withdrawal movements of said kerf cutter.

23. In a mining machine, a portable base supported for movement over the mine floor, a parallel motion arm structure pivotally mounted on said base to swing in a vertical direction relative thereto, a kerf cutter carried at the outer extremity of said arm structure, means for swinging said arm structure relative to said base to move said kerf cutter into parallel cutting planes with respect thereto, means for moving said base in an endwise direction relative to the mine floor to effect rectilinear sumping and withdrawal movements of said kerf cutter, and means distinct from said endwise moving means for moving the machine bodily laterally over the mine floor to move the kerf cutter laterally relative to the material to be cut to effect cutting in any of aforesaid cutting planes.

24. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor, a parallel motion arm structure pivotally mounted at its rear end on the rearward portion of said skid to swing in a vertical direction relative thereto, a plane kerf cutter carried at the outer extremity of said arm structure, means for swinging said arm structure relative to said skid to move said kerf cutter into parallel cutting planes with respect thereto, and means for adjusting said kerf cutter into a cutting plane perpendicular to aforesaid parallel cutting planes.

25. In a mining machine, a portable base supported for movement over the mine floor, a parallel motion arm structure pivotally mounted on said base to swing in a vertical direction relative thereto, a plane kerf cutter carried at the outer extremity of said arm structure, means for swinging said arm structure relative to said base to move said kerf cutter into parallel horizontal

cutting planes with respect thereto, means for moving said base in an endwise direction relative to the mine floor to effect rectilinear sumping and withdrawal movements of said kerf cutter, means separate from said endwise moving means for feeding the machine bodily laterally over the mine floor to move the kerf cutter laterally relative to the material to be cut in any of aforesaid parallel horizontal cutting planes, and means for adjusting said kerf cutter into a cutting plane perpendicular to aforesaid cutting planes.

26. In a mining machine, a portable base, a cutter head rotatable on a horizontal axis, a kerf cutter carried by said cutter head, means for adjusting said cutter head in a vertical direction relative to said base to move the head axis into horizontal positions at different elevations, said kerf cutter being swingable with said head into different cutting positions about the head axis in any elevated positions of said head with respect to said base, and means for moving said cutter head and adjusting means therefor longitudinally relative to said base to effect rectilinear sumping and withdrawal movements of said kerf cutter.

27. In a mining machine, a portable base, a cutter head rotatable about a horizontal axis, a kerf cutter carried by said cutter head, means for adjusting said cutter head in a vertical direction relative to said base to move the head axis into horizontal positions at different elevations, said kerf cutter being swingable with said head into different cutting positions about the head axis in any elevated positions of said head with respect to said base, means for moving said cutter head and adjusting means therefor longitudinally relative to said base to effect rectilinear sumping and withdrawal movements of said kerf cutter, and means separate from said last mentioned means for feeding the machine bodily over the mine floor to move said kerf cutter into the material to be cut.

28. In a mining machine, a portable base supported for movement over the mine floor, a plane kerf cutter, adjustable supporting means on said base for adjusting said kerf cutter into horizontal cutting positions at different elevated positions relative to said base, means carried by said supporting means for adjusting said kerf cutter into horizontal and vertical cutting positions, means for moving said base in an endwise direction relative to the mine floor to effect rectilinear sumping and withdrawal movements of said kerf cutter, means for adjusting said supporting means relative to said base for moving said kerf cutter, when in said vertical cutting position, in a vertical plane to cut a vertical kerf, and means for feeding the machine bodily laterally over the mine floor, when said kerf cutter is in its horizontal cutting position, to move said cutter horizontally to cut a horizontal kerf.

29. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor, a plane kerf cutter, means for adjusting said kerf cutter into either a vertical or a horizontal cutting plane, means for feeding the kerf cutter bodily longitudinally relative to said skid and to swing said kerf cutter in its plane when said cutter is in its vertical cutting position to effect rectilinear sumping, vertical swinging and rectilinear withdrawal movements thereof to cut a vertical kerf, and means for moving the skid laterally over the floor when said kerf cutter is in its horizontal cutting position to cut a horizontal kerf.

30. In a mining machine, a portable base, a cutter head rotatable about a horizontal axis extending longitudinally of the machine, a kerf cutter carried by said cutter head for adjustment with said head about the head axis into different cutting planes, means for elevating said cutter head relative to said base to move said kerf cutter into parallel horizontal cutting planes with respect to said base while the head axis always remains horizontal and parallel to a common straight line, means for moving said elevating means and cutter head longitudinally relative to said base to effect rectilinear sumping and withdrawal movements of said kerf cutter, and means separate from said last mentioned means for feeding the machine bodily laterally over the mine floor to effect horizontal rectilinear cutting feed of said kerf cutter in any of aforesaid horizontal cutting planes.

31. In a mining machine, a portable base, a cutter head rotatable about a horizontal axis extending longitudinally of the machine, a kerf cutter carried by said cutter head for adjustment with said head about the head axis into different cutting planes, means mounted at the rear end of said base for elevating the head relative to said base to move said kerf cutter into parallel horizontal cutting planes while the head axis always remains horizontal and parallel to a common straight line, adjusting means for tilting said cutter head to incline the head axis with respect to the horizontal to move said kerf cutter into cutting planes inclined with respect to the horizontal, and means for feeding the machine bodily laterally over the mine floor to effect horizontal rectilinear cutting feed of said kerf cutter in any of aforesaid horizontal and inclined cutting planes.

32. In a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a frame mounted on said skid to move longitudinally along the skid guideway, a cutter head mounted on said frame for rotation about a horizontal axis, a kerf cutter carried by said cutter head and rotatable therewith about the head axis into horizontal and vertical cutting positions, means for driving said kerf cutter and rotating said cutter head, means for moving said frame longitudinally along the skid guideway forwardly and rearwardly to effect rectilinear sumping and withdrawal movements of said kerf cutter, means for swinging said kerf cutter, when the latter is in vertical cutting position, in an arcuate path to make a vertical swinging cut, and means for feeding the apparatus bodily laterally over the mine floor, when said kerf cutter is in horizontal cutting position, to effect horizontal lateral feed of said kerf cutter to make a horizontal cut.

33. In a mining apparatus, a portable base movable over the mine floor, a cutter head rotatable about a horizontal axis, an adjustable supporting structure on said base for moving said cutter head into different elevated positions relative to said base, a kerf cutter carried by said cutter head and rotatable therewith about the head axis into horizontal and vertical cutting positions, means for driving said kerf cutter and rotating said cutter head, means for moving the base bodily in an endwise direction forwardly and rearwardly relative to the mine floor to feed the kerf cutter to effect rectilinear sumping and withdrawal movements thereof, means for adjusting said supporting structure, when said kerf cutter is in vertical cutting position, to feed the

kerf cutter in a vertical plane to cut a vertical kerf and for moving the kerf cutter, when the latter is in horizontal cutting position, into parallel horizontal cutting planes at different elevations with respect to said base, and means for moving the base bodily laterally across the mine floor, when said kerf cutter is in horizontal cutting position, to feed the kerf cutter laterally to make a horizontal cut.

34. In a mining apparatus, a portable base movable over the mine floor, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto, a cutter head mounted on the outer extremity of said arm structure for rotation relative thereto about a horizontal axis, a kerf cutter carried by said cutter head and rotatable with the latter about the head axis into horizontal and vertical cutting positions, means for driving said kerf cutter and rotating said cutter head, means for moving the base bodily forwardly and rearwardly in an endwise direction relative to the mine floor to feed the kerf cutter to effect rectilinear sumping and withdrawal movements thereof, means for swinging said arm structure, when said kerf cutter is in vertical cutting position, to feed the kerf cutter vertically in an arcuate path about the arm structure pivot axis to make a vertical cut and for adjusting said kerf cutter, when the latter is in horizontal cutting position, into parallel horizontal cutting planes at different elevations with respect to said base, and means for moving the base bodily laterally across the mine floor, when said kerf cutter is in horizontal cutting position, to feed said kerf cutter laterally to make a horizontal cut.

35. In a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a main base reciprocable on said skid guideway, means for reciprocating said main base on said guideway relative to said skid, elevating mechanism mounted on said base, a vertically disposed kerf cutter supported by said elevating mechanism, means for driving said kerf cutter, and means for adjusting said elevating mechanism to move said kerf cutter in an arcuate path to cut a vertical kerf.

36. In a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a main base reciprocable on said skid guideway, means for reciprocating said base on said guideway relative to said skid, elevating mechanism mounted on said main base, a kerf cutter supported by said elevating mechanism and adjustable into horizontal and vertical cutting positions with respect thereto, means for driving said kerf cutter, means for adjusting said elevating mechanism to move said kerf cutter, when the latter is in vertical cutting position, to cut a vertical kerf, and for adjusting said kerf cutter, when the latter is in horizontal cutting position, into parallel horizontal planes at different elevations, and means for feeding the apparatus bodily laterally over the mine floor to move said kerf cutter, when the latter is in horizontal cutting position, to cut horizontal rectilinear kerfs in any of aforesaid horizontal planes.

37. In a mining apparatus, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a main base mounted on said skid for reciprocation on said skid guideway, means for reciprocating said main base on said guideway relative to said skid, elevating mechanism mounted on said main base, a horizontal kerf cutter supported by said elevating mechanism, means for adjusting said elevating mechanism to move said kerf cutter into horizontal cutting planes at different elevations, means for driving said kerf cutter, and means for tilting said kerf cutter about a horizontal transverse axis relative to said elevating mechanism into cutting planes inclined with respect to the horizontal.

38. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor, an arm structure pivotally mounted at its rear end at the rearward portion of said skid to swing in a vertical direction relative thereto, a cutter carried at the outer extremity of said arm structure, means for swinging said arm structure relative to said skid to move said cutter into horizontal cutting planes at different elevations, and means for feeding the machine bodily laterally over the mine floor to move said cutter relative to the material to be cut in any of aforesaid horizontal cutting planes.

39. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor, an arm structure pivotally mounted at its rear end at the rearward portion of said skid to swing in a vertical direction relative thereto, a cutter head mounted on the outer extremity of said arm structure to rotate relative thereto about a horizontal axis extending longitudinally of the machine, a plane kerf cutter carried by said cutter head and adjustable with said head about the head axis into horizontal and vertical cutting planes, and means for swinging said arm structure vertically about its pivot to move the cutter head axis into horizontal positions at different elevations.

40. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor, said skid having a longitudinal guideway, a frame mounted on said skid guideway for longitudinal movement therealong, means for moving said frame along said skid guideway, an arm structure pivotally mounted on said movable frame to swing in a vertical direction relative thereto, a cutter carried at the outer extremity of said arm structure, means for swinging said arm structure relative to said frame to move said cutter into horizontal cutting planes at different elevations, and means for feeding the machine bodily laterally over the mine floor to move said cutter relative to the material to be cut in any of aforesaid horizontal cutting planes.

41. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor, said skid having a longitudinal guideway, a frame mounted on said skid for movement longitudinally along said guideway, means for moving said frame along said skid guideway, an arm structure pivotally mounted on said frame to swing in a vertical direction relative thereto, a cutter head mounted on the outer extremity of said arm structure to rotate relative thereto about a horizontal axis extending longitudinally of the machine, a plane kerf cutter carried by said rotatable head and adjustable with said head about the head axis into horizontal and vertical cutting planes, and means for swinging said arm structure vertically about its pivot to move the cutter head axis into horizontal positions at different elevations.

42. In a mining machine, a base adapted to rest upon and slide in any direction over a mine floor, an arm pivotally mounted at its rear end at the

rearward portion of said base in overlying relation thereon, said arm swingable in a vertical direction relative to said base, a horizontal plane kerf cutter mounted on the forward extremity of said arm and projecting forwardly in advance of said base, said kerf cutter having cutters movable in a horizontal orbit about the margin of said kerf cutter, and means for swinging said arm vertically about its pivot relative to said base to move said kerf cutter into parallel horizontal planes at different elevations.

43. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a kerf cutter supported on said main base, and flexible feeding means for said machine for feeding the latter bodily laterally over the mine floor including relatively rotatable feeding and controlling members mounted on said main base, feeding and controlling cables engaging said feeding and controlling members respectively and having their free extremities connectible to extraneous abutments at the opposite ribs near the working face, and guiding means for said flexible feeding and controlling cables including horizontal guide sheaves journaled on the forward end of said skid, the feeding and controlling cables extending from said feeding and controlling members around said front guide sheaves laterally in opposite directions from the opposite sides of the machine, said laterally extending portions of said cables arranged substantially parallel with the working face and in substantial alinement.

44. In a mining machine, a skid adapted to rest upon and slide in any direction over the mine floor and having a longitudinal guideway, a kerf cutter supported on said main base, and flexible feeding means for said machine for feeding the latter bodily laterally over the mine floor including relatively rotatable feeding and controlling members mounted on said main base, feeding and controlling cables engaging said feeding and controlling members respectively and having their free extremities connectible to extraneous abutments at the opposite ribs near the working face, guiding means for said flexible feeding and controlling cables including horizontal guide sheaves journaled on the forward end of said skid, the feeding and controlling cables extending from said feeding and controlling members around said front guide sheaves laterally in opposite directions from the opposite sides of the machine, said laterally extending portions of said cables arranged substantially parallel with the working face and in substantial alinement, and means for sliding said skid relative to said base to change the location of said front guide sheaves relative to said main base.

45. In a mining machine, a frame adapted to rest upon and slide in any direction over the mine floor, an arm pivotally mounted on said frame to swing in a vertical direction relative thereto, a cutter support pivotally mounted on the outer extremity of said arm, a kerf cutter carried by said cutter support and swingable with the latter into relatively inclined cutting planes, and motor operated means for actuating said kerf cutter, for swinging said arm relative to said frame, and for swinging said cutter support relative to said arm to position the cutter for cutting in relatively inclined cutting planes.

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