N. D. LEVIN.

COAL MINING APPARATUS.

APPLICATION FILED APR. 27, 1918. RENEWED MAY 10, 1921.

1,406,660. Patented Feb. 14, 1922.

2 SHEETS—SHEET 1.

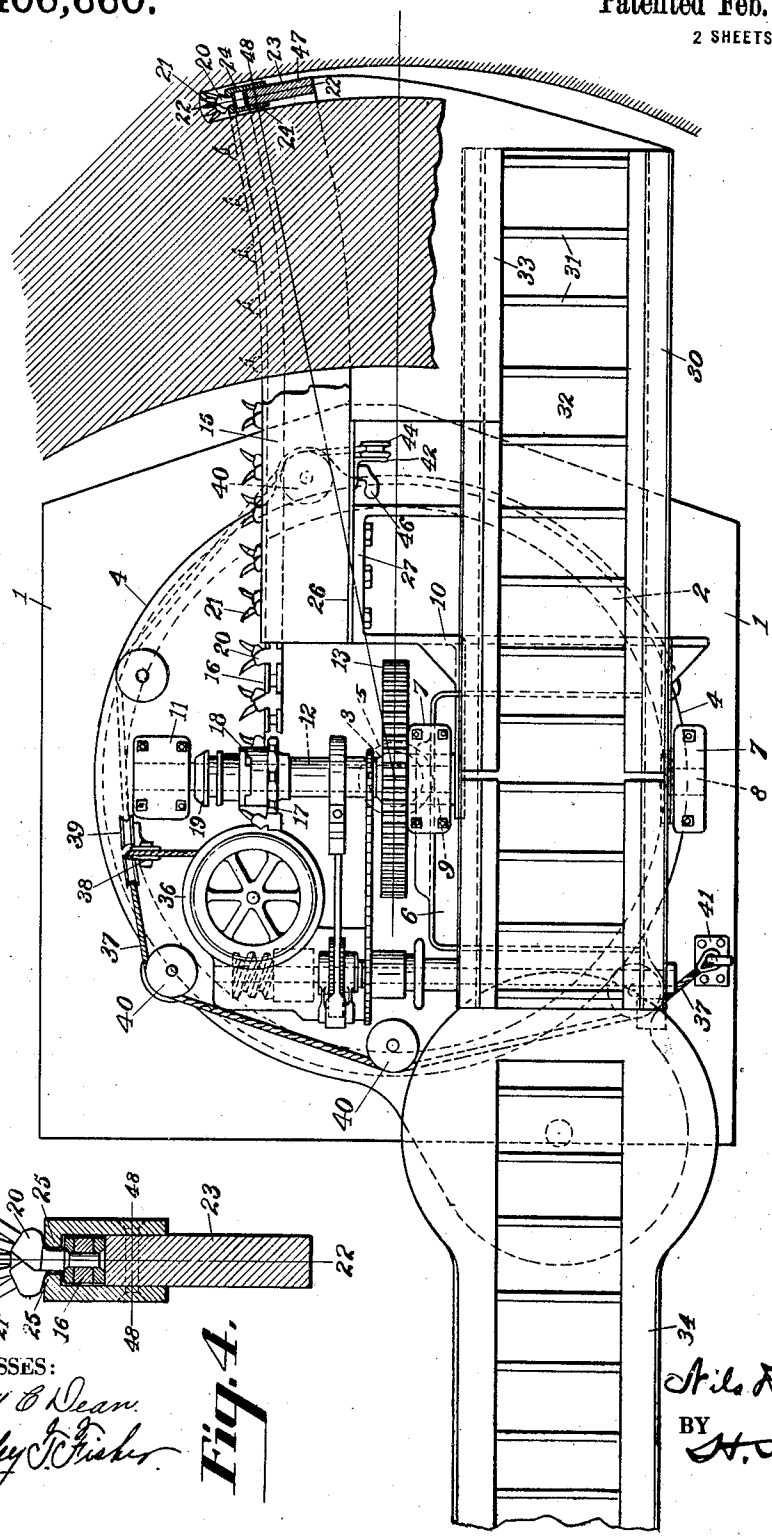


Fig. 1.

Fig. 4.

WITNESSES:

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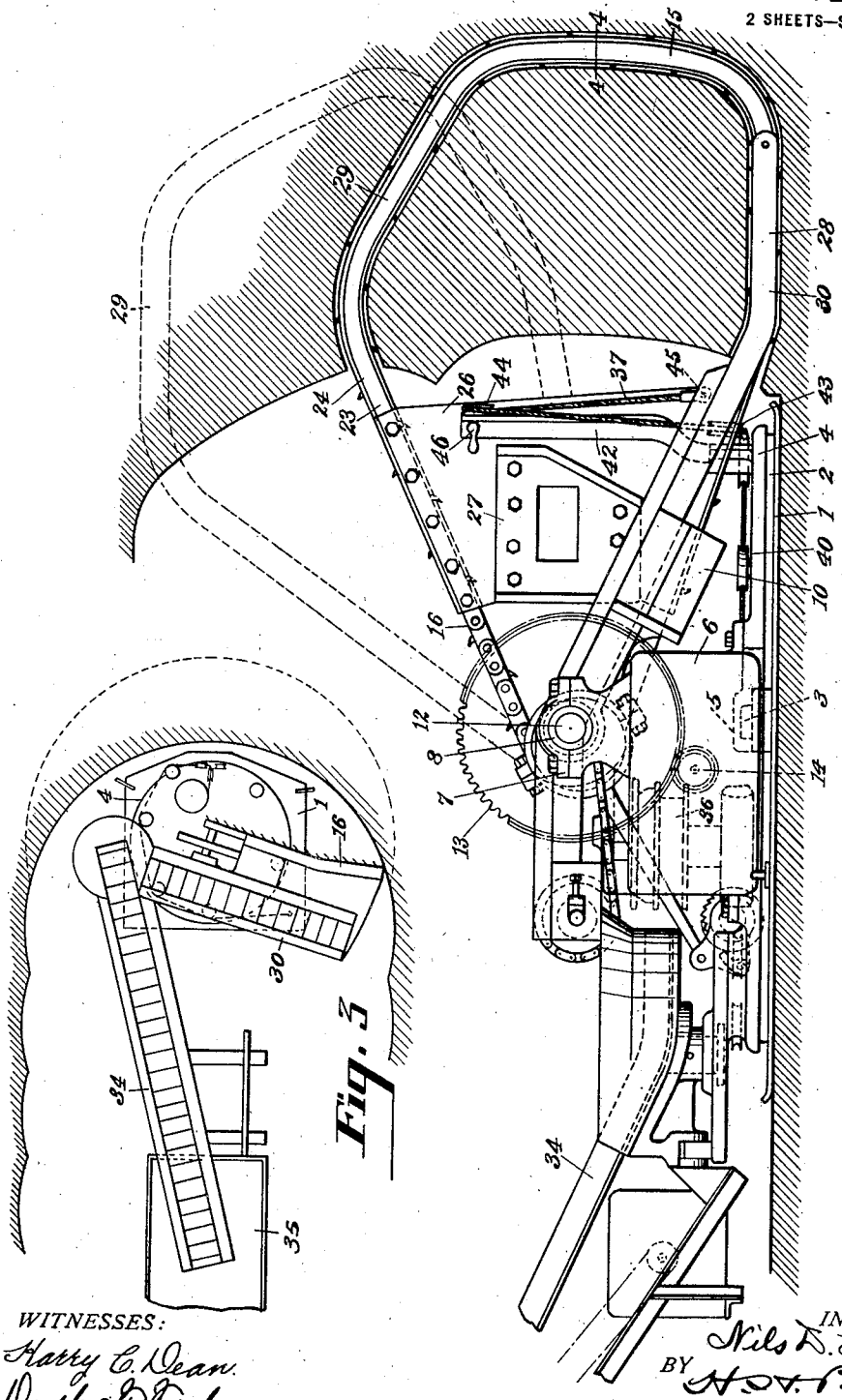


Fig. 2.

Fig. 3

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COAL-MINING APPARATUS.

1,406,660. Specification of Letters Patent. Patented Feb. 14, 1922.

Application filed April 27, 1918, Serial No. 231,182. Renewed May 10, 1921. Serial No. 468,306.

To all whom it may concern:

Be it known that I, NILS D. LEVIN, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Coal-Mining Apparatus, of which the following is a specification, reference being had therein to the accompanying drawing.

The present invention relates to certain new and useful improvements in coal mining apparatus, and particularly to that class of apparatus whereby sections are completely severed from the mass of the coal vein and deposited in conveniently disposed receptacles for transportation from the mine.

It is the especial object of this invention to provide a relatively small and compact mining machine of great capacity, adapted to operate upon the arc wall plan, having improved cutting mechanism by which sections of material may be completely severed from the mine wall with the production of a greatly reduced proportion of slack.

The devices by which I attain this object are fully set forth in the following specification and illustrated in the accompanying drawings of which—

Fig. 1 is a general plan view of the preferred embodiment of my invention.

Fig. 2 is a side elevation of the machine illustrated in Fig. 1.

Fig. 3 is a diagrammatic plan view showing the relation of the machine to the material to be mined.

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 2.

Like numerals indicate similar parts in the several figures.

Speaking broadly this machine comprises a sole plate adapted to rest upon and slide over the floor of the mine, upon which is mounted a turn table constituting the base frame upon which the operative parts of the machine are mounted. These operative parts consist of a laterally projecting vertically disposed loop shaped cutter frame adapted, when the turn table is rotated, to form a kerf in the mine wall extending aboove, behind and below a section of coal to completely sever it from the mass of the vein, and a system of conveyers adapted to receive such severed sections of coal and transport them to the rear of the machine to be deposited in conveniently placed cars for transportation from the mine. Upon this turn table is also mounted feeding devices by which the turn table may be rotated in either direction and by which the entire machine may be moved relative to the coal face.

Referring to the drawings the numeral 1 indicates the sole plate adapted to rest upon and slide over the floor of the mine. To this sole plate is secured an annular ring 2 and an upstanding stud 3 concentric therewith. Bearing upon the ring 2 is a base plate 4 having a pivotal bearing 5 engaging the stud 3 about which the said base plate is rotatable, forming a turn table upon which the operative parts of the machine are mounted. Attached to the base plate 4 is a motor 6 which supplies power to actuate the machine. For purposes of illustration I have shown an electric motor, but it is to be borne in mind that any type of motor may be employed which is suitable to the conditions under which the machine operates. Formed on the frame of the motor 6 are journal bearings 7 in which are mounted the trunnions 8 and 9 of the cradle casting 10 upon which is carried the cutting mechanism and the gathering devices of the machine as will hereinafter appear. Journaled in a bearing formed in the trunnion 9, and a second bearing 11 supported on a pedestal of the base plate 4, is a transverse shaft 12 from which the several elements of the machine are actuated, and which is itself driven through the spur gear 13 and armature pinion 14 from the motor 6.

The cutting mechanism comprises a vertically disposed loop shaped cutter frame 15 upon which travels a cutter chain 16 adapted to form a kerf above, behind and below a section of the mine wall. This cutter chain is of a type well known in the mining machine art consisting of alternate strap and block links, and is engaged by a sprocket wheel 17 rotatively mounted upon the power shaft 12. Upon the hub of the sprocket wheel 17 is formed clutch teeth 18 adapted to engage with similar teeth upon a clutch member 19 splined to the shaft in the manner common to such clutches. Formed upon the block links of the cutter chain are laterally projecting sockets 20 into which are secured the renewable cutter bits 21 by which the coal is cut. In order that the proportion of slack in the product may be reduced as far as possible, I have reduced the width of the cutter chain 16 to the smallest dimen-

sion consistent with the degree of strength and durability required for such service. This necessitates the uniform distribution of strains among the members of the chain, which can be best accomplished only when such members are symmetrically arranged about a center line 22—22 coinciding in direction with the forces by which the bits are fed into the coal. To attain this arrangement I have provided upon the forward edge of the cutter frame a guide way along which the cutter chain travels and by which it is maintained in proper working relation with the coal. The cutter frame 15 is formed of a steel bar 23 of rectangular cross section, the forward edge of which serves as the bottom of the guide way upon which the chain slides. To the sides of the bar 23 are secured guide plates 24 provided on their adjacent faces with flanges 25 adapted to engage the chain links to prevent their accidental displacement from the guide ways. The rectangular bar 23 is bent to form four sides of a pentagon and is secured at both ends to a vertical plate 26 which forms the fifth side of said pentagon, and which is attached by suitable bolts to the vertically extending flange 27 of the cradle casting 10.

The cutter frame thus formed is adapted to rotary movement about the trunnions 8 and 9 and is so formed that when in its lower position the lower side 28 of the pentagon will be parallel with the general direction of the coal seam at the line of the floor, and, when in its elevated position, the upper side 29 of the said pentagon will be parallel with the general direction of the coal seam at the roof of the mine. When the mining machine is placed adjacent the coal face, as shown in Fig. 3, and the turn table 4 is rotated in a direction to cause the bit 21 to engage the wall of the mine, there will be formed a loop shaped kerf extending above, behind and below a section of the coal, entirely severing a crescent shaped block from the body of the vein, and producing a coal face which is technically known as an arc wall, it being arcuate in form of a radius equal to the overall length of the cutter frame 15 from the pivot stud 3.

Owing to the natural cleavages of the coal, however, this severed block breaks off into smaller fragments of suitable size to be conveniently transported from the mine, and I have provided a gathering mechanism adapted to receive such fragments and convey them rearwardly of the machine. This gathering mechanism consists of a conveyer 30 which may be of any preferred type, but which for purposes of illustration I have shown as a conveyer of the well known chain and scraper type wherein a plurality of cross bars 31 are caused to travel along a suitable trough 32 to move the coal therealong. As the construction of such conveyers is well known in the art, and as it forms no part of the present invention, it is thought unnecessary to further describe these devices at this time. An apron 33, formed of a suitable plate extends from the lower side 28 of the cutter frame to the conveyer 30, and upon this apron the fragments of coal are received as they break off from the body of the vein, to be pushed onto the conveyer 30 by the advance of the cutting mechanism. These fragments are conveyed rearwardly of the machine and deposited in a secondary conveyer 34 by which they are transferred to a suitably placed car 35 for transportation from the mine.

To effect the rotation of the turn table and other manipulations of the machine I have provided a feeding mechanism consisting of a winding drum 36 upon which is windable a feed rope 37. This feed rope 37 is adapted to pass around suitable guide sheaves 38, 39 and 40 and to be connected to a suitable anchor 41 attached to the sole plate 1. When the rope 37 is connected as above described and is wound upon the drum 36 the turn table will be rotated about the pivot stud 3 to cause the cutter bits 21 to engage the coal to cut it. The winding drum 36 is actuated through a suitable train of gearing from the motor 6 and is provided with suitable controlling mechanism whereby the operator may control the winding of the rope to regulate the feeding of the cutting mechanism into the coal. As these devices are well known in the art and as they form no part of the present invention further description of them is not thought to be required at this time.

In order to facilitate handling the machine in the mine, the vertical width of the cutter frame 15 is made less than the total height of the coal vein which is to be mined, and, after the lower portion of the coal has been removed, the cutter frame may be rotated upon the trunnions 8 and 9 to its upper position and a second cut made to remove the remainder of the coal. This vertical adjustment of the cutter frame is provided for in an upwardly extending arm 42 attached to the base plate casting 4 and extending parallel to and adjacent the rearward side of the plate 26 of the cutter frame. Mounted upon this vertical arm 42 are guide sheaves 43 and 44 around which the feed rope 37 may be led to be attached to a projection 45 of the plate 26. When the rope 37 is so arranged the cutter frame may be lifted by winding the rope, and may be secured in any desired position by a pin 46 arranged to be inserted in suitable apertures of the arm 42 and cutter frame plate 26. The reduction of the width of the kerf has called for a corresponding reduction in the thickness of the rectangular bar 23 which necessitates a proportionate increase in its width

to maintain sufficient rigidity in the cutter frame. This has resulted in a material increase in the length of the arc of the mine wall subtended by the inner side 47 of the cutter frame. As it is inexpedient, from a manufacturing point of view, to form this part of the bar 23 with a curvature corresponding to that of the mine wall a more exacting distribution of the clearance spaces at this part of the kerf is required. The most efficient arrangement of these parts is attained when the central longitudinal vertical plane 48 of the cutter frame coincides with a radius of rotation and the center line 22—22 of the bar 23 and chain 16 form a right angle with such plane. With this arrangement of parts the direction of the feeding pressure upon the cutter chain will substantially correspond with the direction of the center line 22—22 producing a most satisfactory distribution of strains in the chain 16 and at the same time the most economical arrangement of clearance spaces.

For convenience of manipulation in the contracted rooms and passages of the mine, the overall width of the machine should be confined within the narrowest practicable limits, and the apparatus should be approximately balanced upon the turn table. Such an arrangement necessitates positioning the sprocket wheel 17 at a considerable distance to one side of the center of rotation, and the cutter frame has been curved forwardly along its length to permit the cutter chain 16 to engage the sprocket wheel 17 and at the same time obtain the desired radial disposition of the inner end of the cutter frame as above described.

By this arrangement of parts I have produced a mining machine adapted to operate upon an arc wall to completely sever sections of material therefrom, which is economical to manufacture, convenient and durable in operation, and which produces a product of improved quality containing a minimum proportion of slack.

What I claim is—

1. In a mining machine, the combination with a supporting base adapted to rotation about a vertical axis, a laterally projecting cutter frame mounted upon and rotatable with the supporting base, a cutter chain adapted to travel in guide ways of the cutter frame along a path of travel the outer part of which lies in a vertical plane tangent to a circle concentric with and remote from the axis of rotation, the inner part of said path of travel lying in a vertical plane forming an angle with said tangent plane.

2. In a mining machine, the combination with a supporting base adapted to rotation about a vertical axis, a laterally projecting cutter frame mounted upon and rotatable with the supporting base, a cutter chain adapted to travel in guide ways of the cutter frame along a path of travel the outer part of which lies in a vertical plane tangent to a circle concentric with and remote from the axis of rotation, the inward part of said path of travel lying in a vertical plane forming an angle with said tangent plane outside of the vertical bounding planes of the supporting base.

3. In a mining machine, the combination with a supporting base adapted to rotation about a vertical axis, a laterally projecting cutter frame mounted upon and rotatable with said supporting base, a cutter chain adapted to travel in guide ways of the cutter frame along a path of travel the outer part of which lies in a vertical plane tangent to a circle concentric with and remote from the axis of rotation, the inner part of said path of travel lying in a vertical plane inclined forwardly of said tangent plane.

4. In a mining machine, the combination with a supporting base adapted to rotation about a vertical axis, a laterally projecting cutter frame mounted upon and rotatable with the supporting base, a cutter chain adapted to travel in guide ways of the cutter frame along a path of travel the outer part of which lies in a vertical plane tangent to a circle concentric with and remote from the axis of rotation, the inner part of said path of travel lying in a vertical plane inclined forwardly of and intersecting said tangent plane outside the vertical bounding planes of the supporting base.

5. In a mining machine, the combination with a supporting base adapted to rotation about a vertical axis, a laterally projecting vertically extending loop shaped cutter frame mounted upon and rotatable with the supporting base, a cutter chain adapted to travel in guide ways of said cutter frame along a path of travel the outer part of which lies in a vertical plane tangent to a circle concentric with and remote from the axis of rotation, the inner part of said path of travel lying in a vertical plane forming an angle with said tangent plane.

6. In a mining machine, the combination with a supporting base adapted to rotation about a vertical axis, a laterally projecting vertically extending loop shaped cutter frame mounted upon and rotatable with the supporting base, a cutter chain adapted to travel in guide ways of the cutter frame along a path of travel the outer part of which lies in a vertical plane tangent to a circle concentric with and remote from the axis of rotation, the inner part of said path of travel lying in a vertical plane forming an angle with said tangent plane outside the vertical bounding planes of the supporting base.

7. In a mining machine, the combination with a supporting base adapted to rotation about a vertical axis, a laterally projecting

vertically extending loop shaped cutter frame mounted upon and rotatable with said supporting base, a cutter chain adapted to travel in guide ways of said cutter frame along a path of travel the outer part of which lies in a vertical plane tangent to a circle concentric with and remote from the axis of rotation, the inner part of said path of travel lying in a vertical plane inclined forwardly of said tangent plane.

8. In a mining machine, the combination with a supporting base adapted to rotation about a vertical axis, a laterally projecting vertically extending loop shaped cutter frame mounted upon and rotatable with the supporting base, a cutter chain adapted to travel in guide ways of said cutter frame along a path of travel the outer part of which lies in a vertical plane tangent to a circle concentric with and remote from the axis of rotation, the inner part of said path of travel lying in a vertical plane inclined forwardly of and intersecting said tangent plane outside the vertical bounding planes of the supporting base.

9. In a mining machine, the combination with a cutter arm adapted to be moved laterally and having its advancing edge curved to advance its extremity ahead of its base, and a cutter chain adapted to travel on the edges of said cutter arm to engage the material to be mined to cut it.

In testimony whereof, I affix my signature in presence of two witnesses.

NILS D. LEVIN.

Witnesses:
ANNA M. FENLON,
HARRY C. DEAN.