N. D. LEVIN.

MINING AND LOADING MACHINE.

APPLICATION FILED AUG. 1, 1913.

1,290,591.

Patented Jan. 7, 1919.

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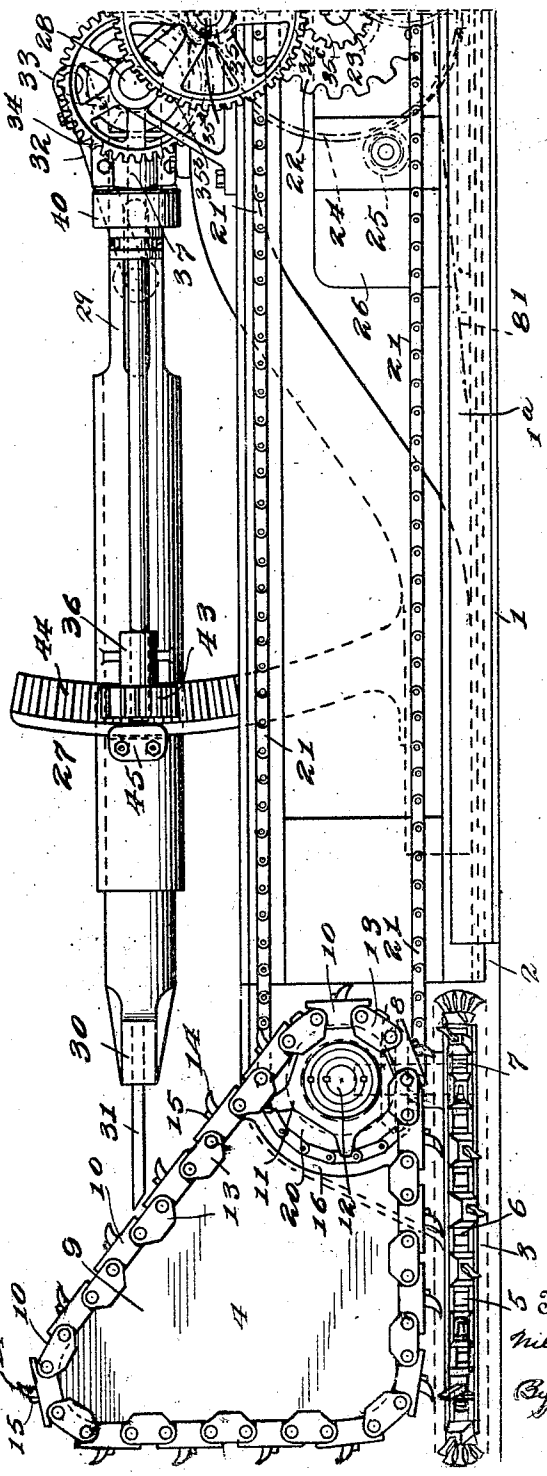


Fig. 1.

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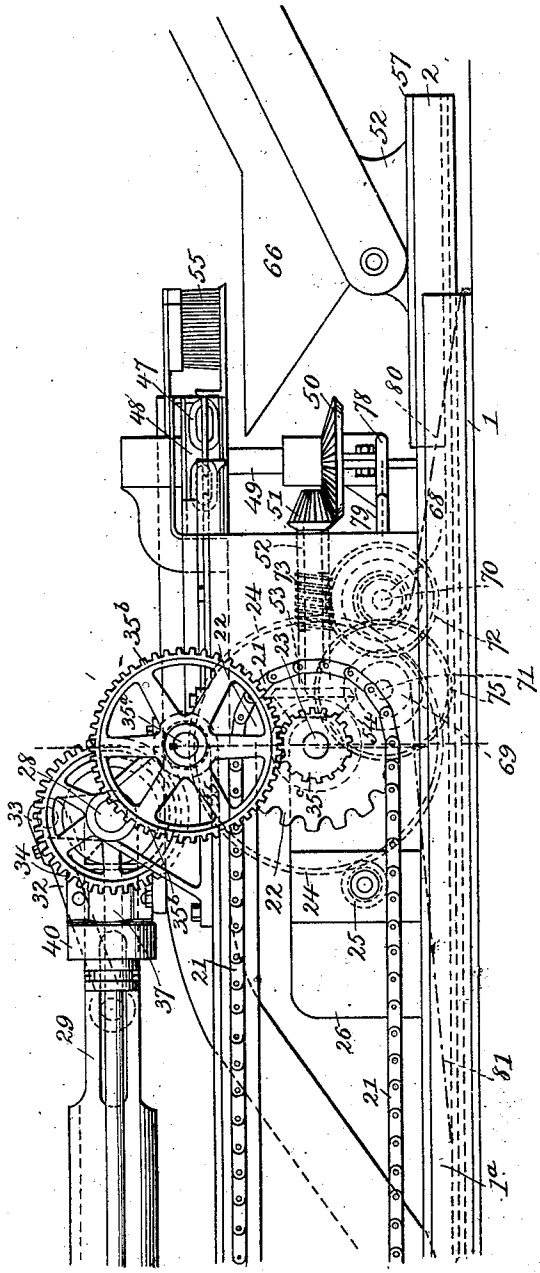
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4 SHEETS—SHEET 2.

Fig. 2.



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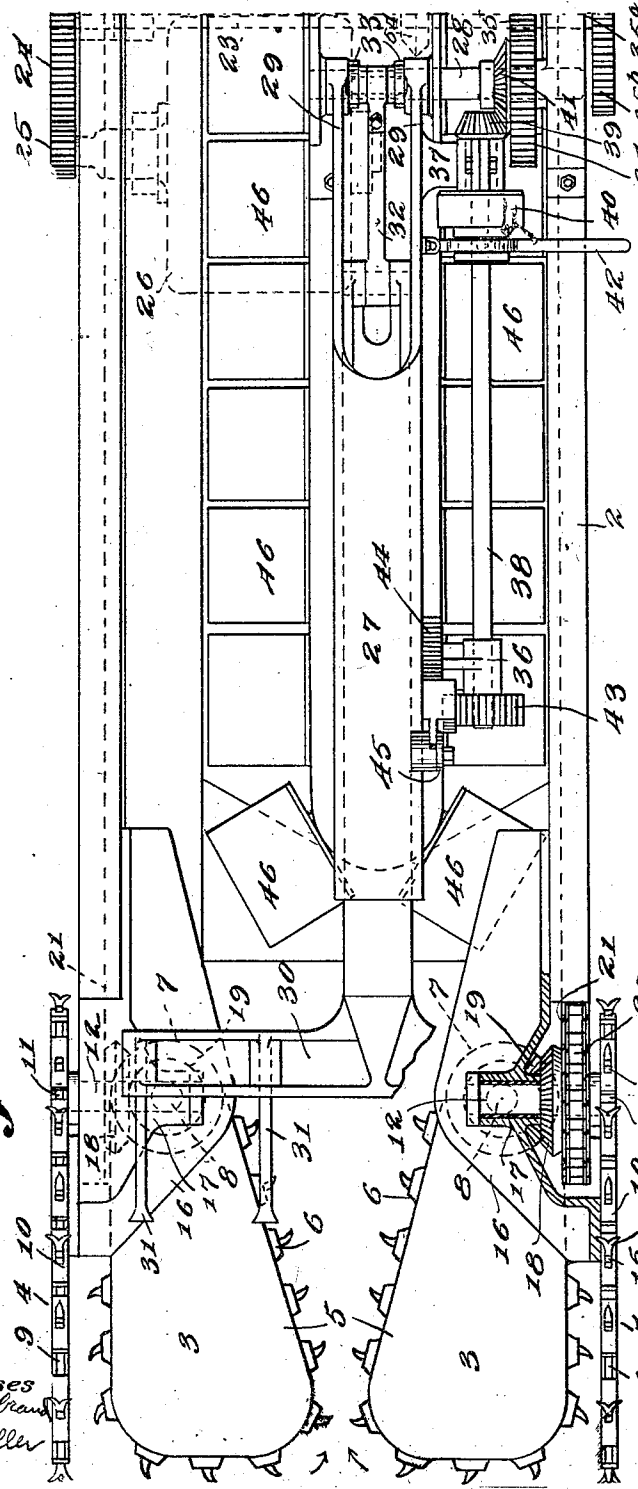


Fig. 3.

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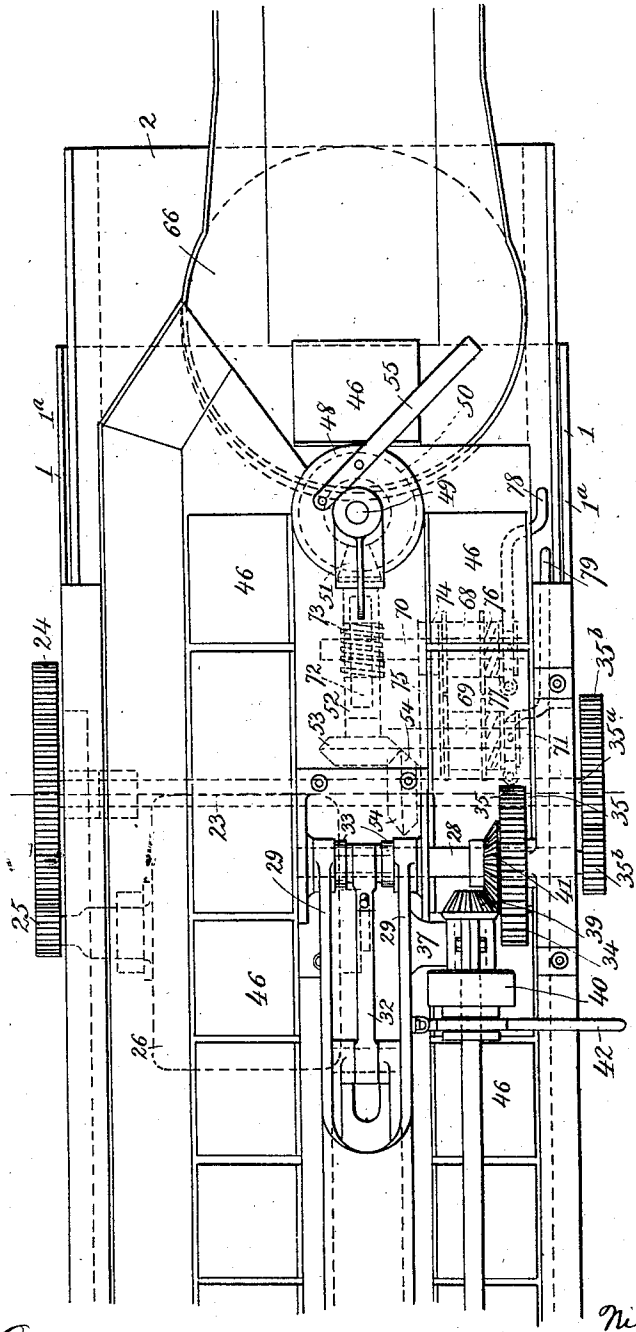
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4 SHEETS—SHEET 4.

Fig. 4



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MINING AND LOADING MACHINE

1,290,591. Specification of Letters Patent. Patented Jan. 7, 1919.

Application filed August 1, 1913. Serial No. 782,521.

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 Mining and Loading Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in mining machines of the class in which each is adapted to form an undercut in the coal, and to form two vertical shearing cuts, and also to break down the suspended block formed by such cuts and carry away the coal that is dislodged and deliver it to a loading apparatus.

The object of the invention is to provide chain cutters which will not only form a rectangular kerf at the bottom of the coal but will also serve as a backwardly acting conveyer to positively engage with and force the dislodged coal over a long distance back from the kerf to the main conveyer; also to provide an improved mechanism for driving horizontal chain cutters and vertical chain cutters at the front end of a relatively elongated carriage; and also to arrange a conveyer and power transmitting mechanism in such a way that large blocks or masses of coal can be taken backward and upward without impedance from shafting, gearing, or any of the parts of the mechanism.

In the accompanying drawings which show one embodiment of my invention,

Figure 1 is a side elevation of the front part of the machine;

Fig. 2 is a side elevation of that part of the machine where are located the motor and the prime power transmitting gearing and also the forward end of the car-loading conveyer;

Fig. 3 is a plan view of the front part of the machine; and

Fig. 4 is a plan view of the parts shown in Fig. 2.

Referring to the drawings 1 represents a bed frame or a pan adapted to rest directly upon the floor of a main room or entry in which the machine is being operated. It is provided with side walls 1^a—1^a between which the main frame or carriage of the machine is guided for forward and backward movement with respect to the pan.

The main frame is indicated as a whole by 2 and can be formed in any provided way, as for instance by suitably connecting together several cast and rolled parts. Mounted at the forward end of the main frame at opposite sides thereof are two horizontal cutter heads 3—3 and two vertical cutter heads 4—4. Each cutter head 3 comprises a plate 5 which is rigidly connected to the main frame, and a chain 6 which moves in a suitable guide on the periphery of the plate, and which passes over a sprocket wheel 7 mounted on a vertical shaft 8. The two chains 6—6 are arranged to be driven in opposite directions, as indicated in Fig. 3.

Each of the cutter heads 4—4 is provided with a vertical plate 9 which is rigidly secured to the main frame, and a chain 10 which passes around the plate and over a sprocket wheel 11 mounted on a short horizontal shaft 12. The chain 10 is of special construction and each second link is provided with guide wings 13 which overlap the sides of the plate and serve to hold the chain against displacement. The cutters 14 of the chain are held in place by wedges 15.

The plates 5 and 9 at each side of the machine are connected to the main frame or carriage by means of a bracket casting 16 and the forward surfaces of the two castings are inclined inward to form guides for the coal which is caught between them. Each of the brackets 16 is provided with a bearing 17 for the corresponding horizontal shaft 12, and a bearing for the corresponding vertical shaft 8. These two shafts are connected together for simultaneous rotation by means of bevel gears 18 and 19. Mounted upon the shaft 12 is a sprocket wheel 20 over which passes a chain 21. At the rear the chains 21—21 at opposite sides of the machine pass over sprocket wheels 22 mounted on a transverse shaft 23. This shaft 23 carries at one end a large spur gear 24 which meshes with a pinion 25 on the armature shaft of an electric motor 26. It will be clear that when the motor is rotated power will be transmitted through the

mechanism which has been described to drive the chains of both horizontal cutter heads, and both vertical cutter heads.

27 is a puncher mechanism which is mounted on the transverse shaft 28 by means of arms 29—29. The details of this mechanism have not been shown for the reason that they constitute no part of my present invention, and it is sufficient to say that a puncher of any of the forms now known may be used. The puncher carries at its forward end a transverse bar 30 in which are mounted picks 31—31. The puncher receives its power by means of the connecting rod 32 which is mounted at its rear end on the cranked part 33 of the shaft 28. This shaft 28 carries a spur gear 34 which meshes with a pinion 35 on the shaft 23. The shaft 35^a carries a gear 35^b which meshes with a pinion 35^c on the shaft 23. In this way power is transmitted from the main drive shaft to drive the puncher.

Mounted on the sides of the main frame of the puncher are bearings 36 and 37, and in these bearings there is mounted a shaft 38. Within the bearing 37 there is mounted a rotatable sleeve which surrounds the shaft 38, and which carries at its rear end a bevel gear 39 and at its forward end one element of a friction clutch 40. The bevel gear 39 meshes with a bevel gear 41 mounted on the shaft 28. A hand lever 42 is provided for throwing the clutch 40 into or out of engagement, thus connecting or disconnecting the shaft 38 and the drive gear 39. The shaft 38 carries at its forward end a gear wheel 43 which meshes with a curved rack 44 mounted on the main frame. It will be clear that by turning the shaft 38 and the wheel 43 the whole puncher mechanism can be raised or lowered. This raising or lowering can be controlled by means of the hand lever 42 and the clutch 40. At 45 there is provided a clip which engages with a suitable guide secured to the rack, thus serving to hold the puncher mechanism against lateral movement.

The pick carrying frames are very heavy, and difficulty has been experienced in so arranging the various parts of the machine as to sustain the front end of this frame with rigidity and firmness; and much power is required to adjust it vertically, as the power devices for this purpose have been applied at points near the hinge of the pick frame.

To obviate these difficulties, I have combined with the frame the devices that have been described which engage with it at points near its front end, and I extend power-transmitting devices from the rear end of the carriage forward to these means which sustain the pick frame.

For removing the material loosened by the cutter chains and by the pick mechanism, I provide a conveyer which is similar to that shown and described in my co-pending application for loading machines, Ser. No. 671,037, filed Jan. 13, 1912, and my co-pending application for conveyer for loading machines, Ser. No. 752,475, filed March 6, 1913. As this conveyer is fully disclosed in the said applications it will not be necessary to here describe it in detail. It will be sufficient to point out that it comprises a series of horizontal flights 46 mounted upon an endless drive and carrier chain 47. A suitable guideway is provided for the chain, and a suitable supporting trough with side walls is provided for the flights. The trough and chain guides are so arranged that the conveyer at its forward end lies substantially in the central horizontal plane of the horizontal cutter heads, and at its rear end lies in a relatively elevated horizontal plane. The chain 47 passes at the rear around a sprocket wheel 48 on a vertical shaft 49. This shaft 49 carries a bevel gear wheel 50 which meshes with a bevel pinion 51 on a longitudinal shaft 52. At the forward end of the shaft 52 is a bevel gear 53 meshing with a bevel gear 54 on the main drive shaft 23. In this way power is transmitted to drive the conveyer. 55 is a brush mounted at the rear end of the conveyer and arranged to remove material from the flights 46 as they pass it.

The motor, it will be seen, is at the bottom of the mechanism on the lower part of the carriage frame. All of the initial shafting and gearing are so positioned that there is an unobstructed space above the active part of the conveyer; that is to say, above it there are no over-lying gears or shafts. The active side of the conveyer and its trough are above the motor and all of the gears and transmitting parts are either in the vertical planes of the empty, idle or inactive side of the conveyer, or in vertical planes remote from those of the active side. The outwardly moving parts of the cutter chains 6, after leaving their cutting line, diverge backward and outward, and as they maintain a prolonged, continuing contact, over a long distance, with the loosened coal, which falls in the space between them, they exert a prolonged pressure upon it which continues until the conveyer elements are successively loaded.

The receiving-end of a secondary conveyer is indicated in Figs. 2 and 4. This end is mounted on the carriage frame by means of a turn table 57, above which is the hopper 66, into which the material is delivered from the first conveyer. This secondary conveyer is intended to have its delivery end so arranged that the coal carried by it can be discharged into a car.

For feeding the main part of the machine forward and backward with respect to the

bed frame I provide the two horizontal winding drums 68 and 69, which are loosely mounted on transverse shafts 70 and 71. The shaft 70 carries a worm wheel 72 which meshes with a worm 73 on the shaft 52. The shaft 70 also carries a spur pinion 74 which meshes with a spur gear 75 on the shaft 71. By means of the gearing which has been described the shaft 70 is constantly rotated at a relatively high speed, and the shaft 71 at a much slower speed. 76 and 77 are clutches controlled respectively by the hand levers 78 and 79 for connecting the drums 68 and 69 to the shafts 70 and 71. Wound upon the shaft 68 is a flexible cable 80 which extends rearward and is connected at its end to the bed frame 1. Wound upon the drum 69 is a flexible cable 81 which extends forward and is connected at its end to the bed frame 1. From the foregoing description it will be clear that the operator by means of the lever 79 can throw in the clutch 77 and cause the drum 69 to turn. As the drum 69 turns at a relatively slow speed the cable 81 is wound and the machine is pulled slowly forward with respect to the bed frame. The operator by releasing the clutch 77 and throwing in the clutch 76 can cause the cable 80 to be wound at a relatively high speed, thus causing the machine to be pulled backward relatively rapidly.

The operation of the machine will now be readily understood. The machine is first put in place with the front cutters adjacent a coal face. The bed frame 1 is secured against movement by means of suitable jacks or other devices, and the motor 26 is started thus causing the movement of the cutter chains. The operator throws in the clutch 77, and thus causes the cutting mechanism to be slowly advanced into the coal, a horizontal undercut being formed and two parallel vertical shear cuts. As soon as the cutter mechanisms have advanced a little way into the coal the puncher 27 is brought into use, and the operator by means of the clutch 40 can slowly oscillate this up and down to cause the coal to be loosened and broken down into the path of the conveyer. As the machine advances the loosened coal is forced backward between the inclined walls of the castings 16—16 and is picked up by the conveyer flights 46—46 and carried backward and upward and discharged into the hopper 66. From the hopper 66 the coal is carried by the belt 58 upward and backward and deposited in a car. It will be understood that the rear end of the second conveyer can be swung to one side or the other in order that it may be brought over the car which is to receive the material.

The parts of the apparatus are so arranged that the undercutters carry the coal backward. The rearward travel of these cutters terminates at transverse lines which are at or near the front end of the carriage and are so positioned that the coal which they carry backward can be readily received by the forward end of the conveyer, which transports it, as described, to points at the rear of the carriage.

As soon as the machine has reached its extreme limit of forward movement the clutch 77 is disengaged and the clutch 76 is thrown in, thus causing the cutting mechanism to be retracted. The machine as a whole can then be moved to a new position by any suitable means, and the operation above described can be repeated.

What I claim as my invention is:

1. The combination of the bed frame, the sliding carriage, the power devices at the rear end of the carriage, the brackets secured to the front end of the carriage frame one on each side of the machine, the horizontally arranged chain guiding plates secured to the brackets, the vertically arranged chain guiding plates secured to said brackets, the two oppositely moving cutter chains fitted to and guided by the horizontal plates, the cutter chains fitted to and guided by the vertical plates, the relatively short shafts, one on each side of the machine and mounted in the said brackets, each operatively connected to a vertical cutter chain and to a horizontal cutter chain, and two sets of driving devices at the sides of the machine respectively connected to the said shafts and to the power devices at the rear of the carriage.

2. The combination of the bed frame, the sliding carriage, the brackets secured to the front end of the carriage, one on each side of the machine, the horizontally arranged chain guiding plates secured to the brackets respectively, the vertically arranged chain guiding plates secured to the brackets, the oppositely moving horizontally arranged cutter chains fitted to the said horizontal plates, the vertically arranged cutter chains fitted to the said vertical guide plates, and the conveyer having its receiving portion in the bottom horizontal planes of the front part of the carriage, the horizontal chains being arranged to have the outwardly moving parts travel on straight lines diverging backward and outward and adapted to force the coal backward to the conveyer.

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

NILS D. LEVIN.

Witnesses:
E. P. SNIVELY,
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