

N. D. LEVIN.
SYSTEM OF MOTOR CONTROL.
APPLICATION FILED MAR. 8, 1917.

1,290,594.

Patented Jan. 7, 1919.
2 SHEETS—SHEET 1.

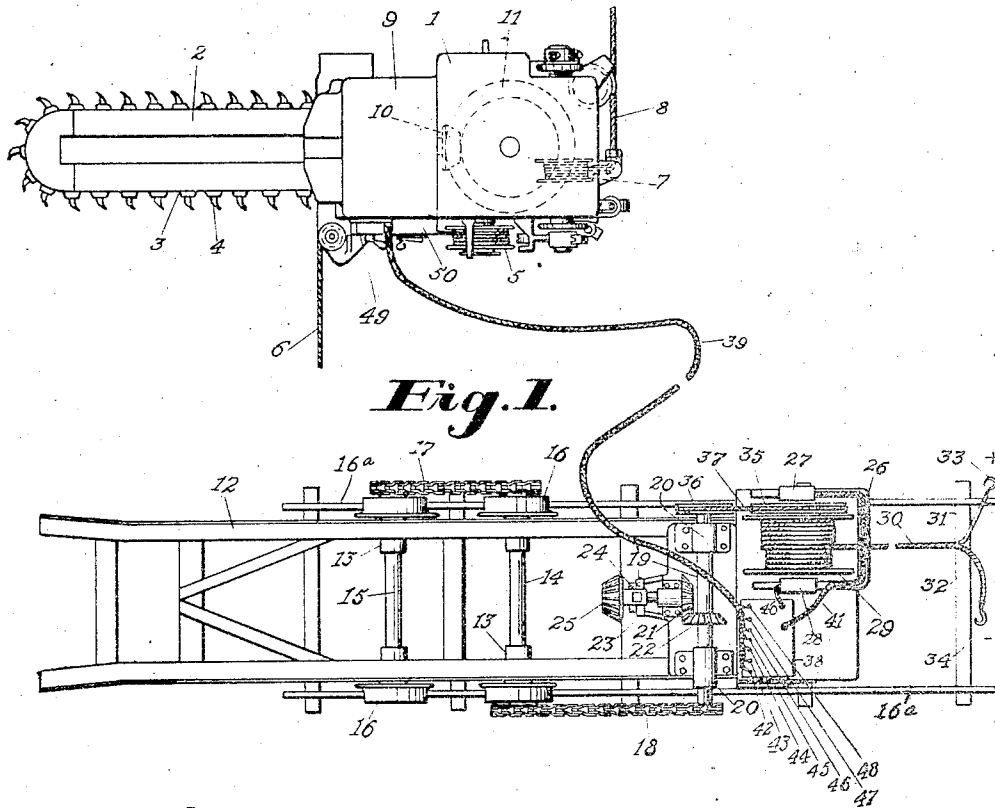


Fig. 1.

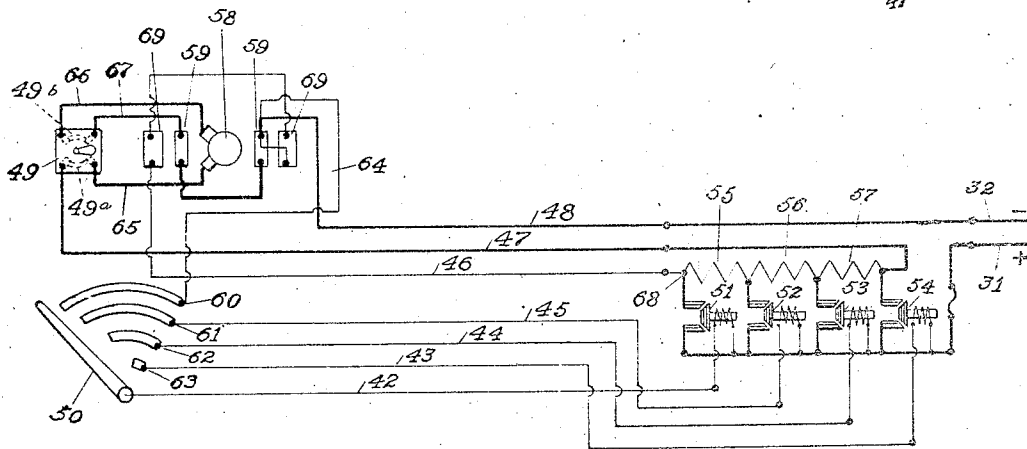


Fig. 4.

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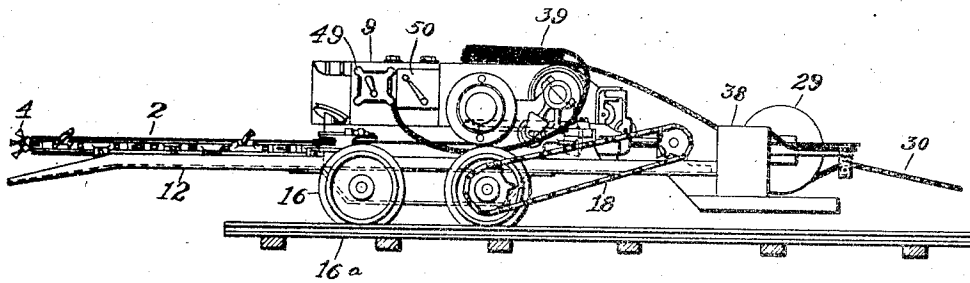


Fig. 2.

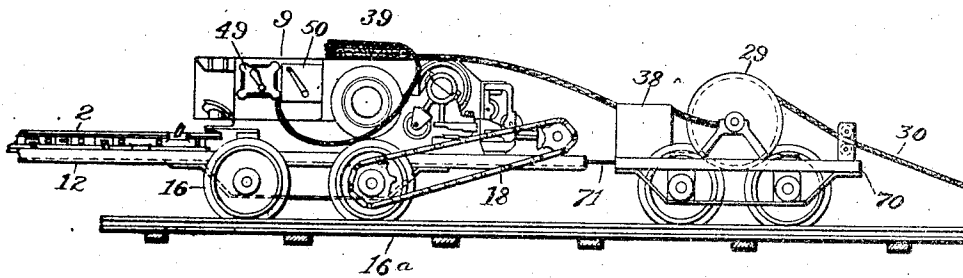


Fig. 3.

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UNITED STATES PATENT OFFICE.

NILS D. LEVIN, OF COLUMBUS, OHIO, ASSIGNOR TO THE JEFFREY MANUFACTURING COMPANY, OF COLUMBUS, OHIO, A CORPORATION OF OHIO.

SYSTEM OF MOTOR CONTROL.

1,290,594.

Specification of Letters Patent.

Patented Jan. 7, 1919.

Application filed March 8, 1917. Serial No. 153,472.

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 the State of Ohio, have invented certain new and useful Improvements in Systems of Motor Control, of which the following is a specification, reference being had therein to the accompanying drawing.

The present invention relates to improvements in current controlling apparatus adapted for use in operating a motor-propelled vehicle and for operating a mining mechanism adapted to be fitted to said vehicle, and also to be removed and actuated at points remote therefrom, the same motor and the same controlling devices being utilized both for propelling the vehicle and the machine and for actuating the cutting mechanism.

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

Figure 1 is a general plan view of a mining machine and truck, of well known design, equipped with the devices of my invention, showing the mining machine removed from the truck.

Fig. 2 is a side elevation of the devices illustrated in Fig. 1 showing the mining machine loaded upon the truck for transportation along the tracks of the mine.

Fig. 3 is a side elevation of a modification of the devices illustrated in Fig. 2, the cable reel and electrically actuated controlling devices being mounted upon an auxiliary truck for greater convenience in operation.

Fig. 4 is an electrical diagram illustrative of my invention.

Like numerals refer to similar parts in the several figures.

For purposes of illustration, I have shown in Fig. 1 of the drawings, a plan view of a mining machine and its attendant truck of a well known design. This mining machine is adapted to be moved about over the floor of a mine room to cut a kerf at the base of the coal body, or to be loaded upon the truck for transportation from one part of the mine to another.

The mining machine here illustrated, comprises a main frame 1 adapted to rest upon and slide over the floor of a mine, from which projects a cutter frame 2 about the

edges of which travels a cutter chain 3 having renewable cutter bits 4 by which the coal is cut. Suitable feeding and guiding devices, comprising the winding drum 5 and feeding rope 6, and the retarding drum 7 and guide rope 8, are mounted upon the frame 1 but as these devices form no part of the present invention further description at this time is not thought to be required. Mounted upon the main frame 1 is a motor 9 having a bevel armature pinion 10 in engagement with the master bevel gear 11 which constitutes part of the gearing system by which the power of the motor is transmitted to the several operative elements of the mining machine.

The truck comprises a body frame 12 adapted to conveniently receive the mining machine, support it for transportation and conveniently discharge it at the place where it is to perform its cutting operations. Attached to this frame 12 are journal bearings 13 and in these are journaled the axles 14 and 15. To the axles 14 and 15 are attached the traction wheels 16 which support the truck upon the rails 16^a of the mine track. The axles 14 and 15 are rotatively connected together by an endless chain 17 engaging suitable sprocket wheels attached to the respective axles. The axle 15 is also connected by a similar endless chain 18 with the transverse power shaft 19 journaled in suitable bearings 20 attached to the truck frame. The shaft 19 is connected through a pair of bevel gears 21 and 22 with a longitudinal power shaft 23 journaled in bearings 24 of the truck frame. At the forward end of the shaft 23 is attached a bevel pinion 25 which is adapted to engage with the master gear 11 when the mining machine is in position for transportation upon the truck. By this arrangement of gearing power may be transmitted from the motor of the mining machine to the traction wheels to propel the truck along the tracks of the mine. Attached to the rear end of the truck frame 12 is a supplemental frame 26 having journal bearings 27 and 28 in which is supported the winding drum 29. Attached to the winding drum 29 and windable thereon is a flexible conductor cable 30 containing two electric conductors 31 and 32 terminating in hooks 33 and 34 by which they may be connected respectively with the positive and negative conductors of the current supply system ex-

tending along the various galleries of the mine to supply current for the actuation of the motor of the mining machine. To the winding drum 29 is attached a shive wheel 35 in alinement with a similar shive wheel 36 upon the power shaft 19 to which it is connected by an endless rope or belt 37 in such manner that the winding drum will be rotated to wind the cable 30 as the truck 10 moves toward the point of attachment with the supply circuits, or pay out said cable as the truck travels away from such point of attachment. Mounted upon the truck frame 12 is a casing 38 containing the electrically actuated circuit closing switches and motor 15 controlling resistance by which the mining machine motor 9 is controlled. From this casing 38 extends a multiple conductor flexible cable 39 by which the devices within the casing are connected with the devices upon the motor 9. Connection is also made by short flexible cables 40 and 41 with the trunnions in the journal boxes 27 and 28 which are connected with the conductors 31 and 32 of the flexible cable 30 in a manner well known in the art.

As the details of construction of the devices used form no part in the present invention I have shown them in the diagrams, 30 Fig. 4 of the drawings, by the customary symbols which are understood by persons skilled in the art. The conductors 42, 43, 44, 45, 46, 47, and 48 are all contained within the flexible cable 39. The reversing switch 35 49 and the controlling switch 50 are mounted upon the mining machine convenient to the hand of the operator, while the electrically actuated circuit closing switches 51, 52, 53 and 54 and the motor controlling resistance 55, 56, and 57 are mounted within the casing 38 upon the truck. When it is desired to start the motor the reversing switch 40 49 is first set to connect the armature 58 and field coils 59 in such relation as to produce the desired direction of rotation of the armature. The controlling switch blade 50 is then moved to its first operative position in contact with the segment 60 causing current to flow from the positive conductor 31 50 through the actuating coil of the circuit closing switch 51, the conductor 42, switch blade 50, contact segment 60, conductors 64 and 48 to the negative conductor 32 thereby actuating the coil to close the contactor 51. 55 Current will then flow from the positive conductor 31 through the contactor 51, the resistance 55, 56 and 57, conductor 47, reverse switch contacts 49^a, conductor 61, armature 58, conductor 66, reverse switch contacts 49^b, conductor 67, series field coils 60 59, and conductor 48 to the negative conductor 32. At the same time current will flow from the point 63, through the conductor 46, shunt field coils 69 and conductor 65 48 to the negative conductor 32. The result

of these connections will be that the motor will be driven in the desired direction at a relatively slow speed. As the controller switch blade 50 is advanced to contact successively with the contact segments 61, 62 70 and 63 the coils of the circuit closing switches 52, 53 and 54 will be successively actuated to cut out the sections 55, 56 and 57 of the resistance, progressively increasing the speed of the motor. When the switch 75 blade 50 is moved in the reverse direction it is apparent that the circuit closing switches will operate successively to open their respective circuits, reducing the speed of the motor until the last switch 51 is opened 30 when the motor will stop.

By the arrangement of apparatus here described the control of the motor is effected by the manipulation of parts positioned upon the mining machine convenient to the 35 hand of the operator, while switches and resistances of sufficient capacity to control the motor under full load and of proportions to be durable under the trying conditions of coal mine service, may be employed without 90 unduly increasing the weight and dimensions of the mining machine, and the design of both the mining machine and truck may be materially simplified by the omission of friction clutches and reversed gear mecha- 95 nism formerly found to be desirable.

When the mining machine is loaded upon the truck the speed and direction of travel may be controlled through the manipulation of the controlling switch 50 and reverse 100 switch 49 with the facility of operating an electric locomotive while the flexibility of the cable 39, connecting the devices upon the truck with those upon the mining machine, permits the greatest freedom of movement 105 of the mining machine when unloaded from the truck.

In Fig. 3 I have illustrated a modification of the devices above described wherein the cable reel 29 and the controller casing 38 110 have been separated from the mining machine truck 12 and mounted upon an auxiliary truck 70 which is connectible to the mining machine truck 12 by a suitable coupling 71. As the separation of the cable reel 115 and such auxiliary parts from the mining machine truck and the provision of an auxiliary truck for their more convenient transportation around the short curves of the narrow passages of the mine is well known 120 in the art it is here thought to constitute an equivalent method to that shown in Figs. 1 and 2 and further description is not deemed to be required at this time.

What I claim is— 125

In a system of devices for controlling the transmission of power to a power-propelled wheeled truck, and also controlling the transmission of power to a mining machine adapted to be fitted in predetermined posi- 130

tion on the said wheeled truck, but separable, and operative when separated therefrom, said mining machine comprising a motor adapted both to actuate the mining apparatus, and to propel the wheeled truck, the combination with the wheeled truck, of a wheel-driving mechanism permanently mounted thereon, the mining machine removable from the truck but adapted to be fitted thereto to position the motor thereon in predetermined operative relationship to the said truck driving mechanism, and a two-part set of motor control devices, one

part being mounted permanently on the truck and the other part on the mining machine, and adapted to regulate the motor when propelling the truck and also regulating it when actuating the mining apparatus at points remote from the truck.

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

NILS D. LEVIN.

Witnesses:

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