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C. W. WYMAN

CONTROLLING SYSTEM

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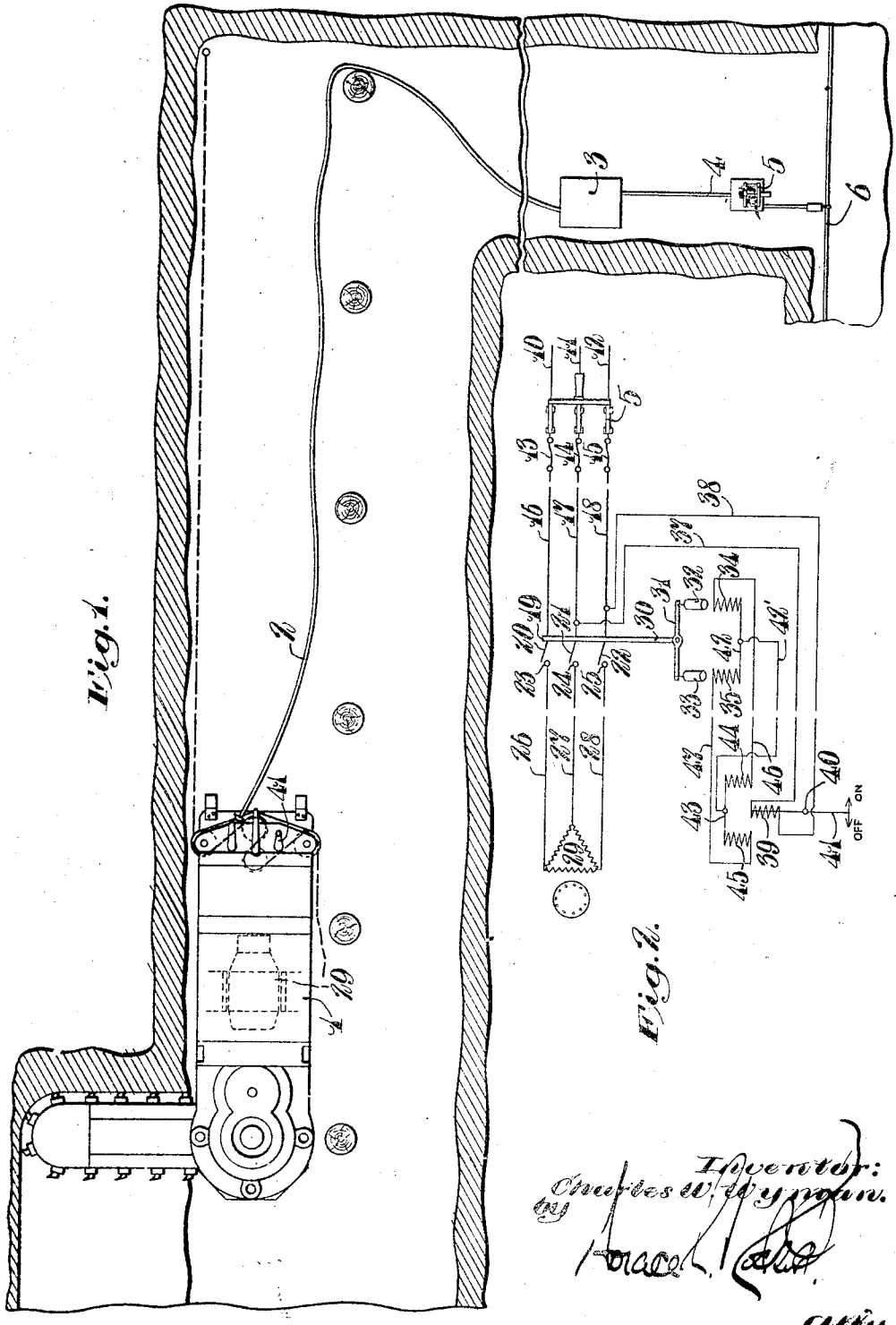


Fig. 1.

Fig. 2.

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CONTROLLING SYSTEM.

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To all whom it may concern:

Be it known that I, CHARLES W. WYMAN, a citizen of the United States, residing at Claremont, in the county of Sullivan and State of New Hampshire, have invented certain new and useful Improvements in Controlling Systems, of which the following is a full, clear, and exact specification.

My invention relates to controlling systems, and more particularly to controlling systems for electrically operated mining mechanisms.

In many mines which are known as gassy mines, there is a sufficient amount of combustible gas at the working face so that it is dangerous to employ any mechanism at the face which could possibly, by reason of sparking or arcing, cause the ignition of the combustible mixture present. In mines of this type, by the use of alternating current motors in which the sparking resulting from commutation is avoided, it has been found possible to largely reduce the danger but in all commercial machines up to the present time it is still found necessary to employ a circuit making and breaking mechanism of some kind upon the machine and as a result, although these parts are very carefully enclosed, an explosion might occur were the casing opened or tampered with so as to permit access of the explosive mixture to the space within which sparking takes place. It is the object of my invention to provide an improved controlling mechanism in which, while controlling means is arranged upon the mining machine so that the latter may be controlled with all the customary convenience, still all circuit making and breaking mechanism is arranged as such a distance from the face that the danger of explosions is eliminated. Other objects and advantages of my invention will hereinafter more fully appear.

In the accompanying drawings I have shown for purposes of illustration one form which my invention may assume in practice.

In these drawings,—

Fig. 1 is a plan view of a portion of a mine showing a mining machine at work and a possible disposition of the controlling mechanism.

Fig. 2 is a simplified wiring diagram showing the circuits of the illustrative disclosure of my invention.

It will be observed that the mining machine 1 shown herein is working along a longwall face and that it is connected by a long flexible cable 2 with a box 3 and thence by other cable means 4 under control of a main line switch 5 with the power circuits in the main entry of the mine which is shown at 6, the distance between the chamber in which the machine is working and the parts 3, 4, 5 and 6 being under ordinary conditions one or two hundred feet perhaps, or under certain circumstances possibly even more. The power circuit is a three-phase transmission system and the three wires thereof are illustrated at 10, 11 and 12 in Fig. 2. These are connected by the three-pole switch 5 through suitable fuses 13, 14 and 15 with a set of three wires 16, 17 and 18 extending into the controller box 3. Within the box 3 is a second three-pole switch 19 whose blades 20, 21 and 22 cooperate with contacts 23, 24 and 25 to connect the lines 16, 17 and 18 with wires 26, 27 and 28 which are arranged within the cable 2 and lead to the motor 29 upon the machine, it being evident that when the main line switch is closed, upon closing of the controller switch, the motor will be caused to run. The main control switch 19 is provided with an operating shaft 30 which carries the knife blades 20, 21 and 22 and which when caused to oscillate in the proper manner closes and opens the circuits of the motor. For the purpose of imparting the necessary oscillatory movement to the shaft 30 it is provided with a cross arm 31 to which there are secured a pair of armature elements 32 and 33 with which in turn there cooperate a pair of magnet coils respectively numbered 34 and 35, all this mechanism being located within the box 3. Wires 37 and 38 are tapped off of the wires 17 and 18 within the box 3 and are arranged in the cable 2 within which they extend to the machine 1 and constitute a circuit through a coil 39 whose purpose will shortly become apparent. This coil is mounted for oscillatory movement with respect to a pivot 40 and may be moved in either direction from a central position by a control lever 41. The magnet coils 34 and 35 are connected together by a wire 42 at one end and this wire is connected by a wire 42′ within the cable 2 to a wire 43 connecting the ends of a pair of coils 44 and 45. The coils 44 and 45 are arranged radially with respect to the pivot 40. The

other ends of the coils 44 and 45 are connected by wires 46 and 47 also extending through the cable 2 with the other ends of the coils 34 and 35. It will be observed that by reason of the alternating current flowing in the wires 37 and 38 the coil 39 will act as one of the coils of a transformer and will induce a current in the coils 44 and 45, which current will be equal since the resistance and other characteristics of the two halves of the, so to speak, balanced circuit including the coils 34 and 35, 44 and 45 is equal.

From the description so far given the mode of operation of this mechanism will be readily understood. Let it be assumed that it is desired to start the motor. The switch 5 will be closed. The lever 41 will be moved in a counter-clockwise direction about its pivot 40. As a result, the coil 39 will be moved to a position opposite the coil 45 and the very small current which was previously induced in the coil 44 will be further diminished, while that induced in the coil 45 will be largely increased. As a result the energization of the coil 35 will be increased while that of the coil 34 will be reduced. Accordingly, the armature 33 will be strongly attracted while the attraction of the armature 32 will be diminished and the shaft 30 will be rocked to cause the knife switch blades 20, 21 and 22 to engage the contacts 23, 24 and 25, and so current will flow from the lines 10, 11 and 12 through the lines 26, 27 and 28 and the motor will be operated. When is is desired to stop the motor, all that will be necessary will be to move the lever 41 in the opposite direction and, this having been done, the coil 44 will then have the greater current induced in it and this current flowing through the coil 34 will cause the armature 32 to swing the switch 19 to open position. It will be apparent that by suitably constructing the switch 19 it will be possible to cause it to effect a series of movements by the use of the magnets such as to first connect the motor windings in star and then in delta and finally to disconnect them entirely from the line, appropriate latch means being used to effect this sequence of operations. A single coil arrangement could obviously be used to effect circuit closing with spring or weight opening, also. It will also be evident that instead of having the circuits for moving the switch directly controlled in the manner described herein, the coils 34 and 35 might control a relay which would control primary magnets for operating the switch 19.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is used for purposes of illustration and that the invention may be modified and embodied in 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 system of devices for controlling the transmission of power to an electric motor driven mining machine, a plural-part set of motor control devices, one part being mounted permanently on the mining machine and the other being connectible to the power circuit and being adapted to remain at a distance from the mining machine while the latter is cutting, said second mentioned part comprising all circuit making and breaking devices and electro magnetic means for actuating the same, and said first mentioned part constituting means for inducing currents in said electro magnetic means.

2. In a system of devices for controlling the transmission of power to an electric motor driven device, a plural-part set of motor control devices, one part being mounted permanently on the driven device and the other being connectible to the power circuit and being adapted to remain at a distance from the device during operation thereof, said second mentioned part comprising all circuit making and breaking devices and electro-magnetic means for actuating the same, and said first mentioned part constituting means for inducing currents in said electro-magnetic means.

3. In a system of devices for controlling the transmission of power to an electric motor driven mining machine, a plural-part set of motor control devices, one part being mounted permanently on the mining machine and the other being connectible to the power circuit and being adapted to remain at a distance from the mining machine while the latter is cutting, said second mentioned part comprising all circuit making and breaking devices and electro magnetic means for actuating the same, and said first mentioned part constituting controlling means for said circuit making and breaking devices comprising means for inducing current flow through the portions of said electro magnetic controlling means.

4. In an electric mechanism, a magnet coil, a second coil, said coils being connected in a closed circuit with each other, and a coil supplied with alternating current movable relative to said second coil to induce a current therein, said movable coil having an element associated therewith which has a fixed relative position to said second coil.

5. In an electric controlling mechanism, a pair of magnet coils, a pair of coils connected one to each of said magnet coils, a single coil supplied with alternating current and movable relative to said second mentioned coils to induce currents therein and means

for moving the same at will towards either of said second mentioned coils.

6. In an electric mechanism, a pair of magnet coils, a pair of coils connected one to each of said magnet coils, and a single coil supplied with alternating current and normally disposed midway between said second mentioned coils movable relative to the latter to induce currents therein.

7. An electrical apparatus comprising motor controlling mechanism including an electro-responsive device, means for controlling current flow to said device including a plurality of coils, and means for inducing an electric current in one or another of said coils to effect control of said motor by said device.

8. In an electric controlling mechanism, a plurality of pairs of coils, a coil supplied with alternating current adapted to influence one pair of said coils to affect the other pair of said coils, and circuit controlling means oppositely actuated by said other pair of said coils.

9. In an electric controlling mechanism, a plurality of pairs of coils, magnetic generating means adapted to influence one coil or the other of one pair of said coils, and means whereby when one of said coils is influenced one of said coils in the remaining pair of coils will also be influence, said remaining pair of coils constituting switch gear operating means and respectively effecting establishment and interruption of current flow.

10. In an electric mechanism, means for controlling a motor including electro-responsive means, and means for varying the current flow to said electro-responsive means as desired by the operator, said latter means comprising a coil, and a second coil supplied with alternating current and adapted to be moved relatively to said first mentioned coil to induce a current therein.

11. An electric apparatus comprising a motor control mechanism including an electric conductor, and means for varying the current flow through said conductor comprising a pair of coils and magnetic generating means adapted to influence one or the other of said coils.

In testimony whereof I affix my signature.

CHARLES W. WYMAN.