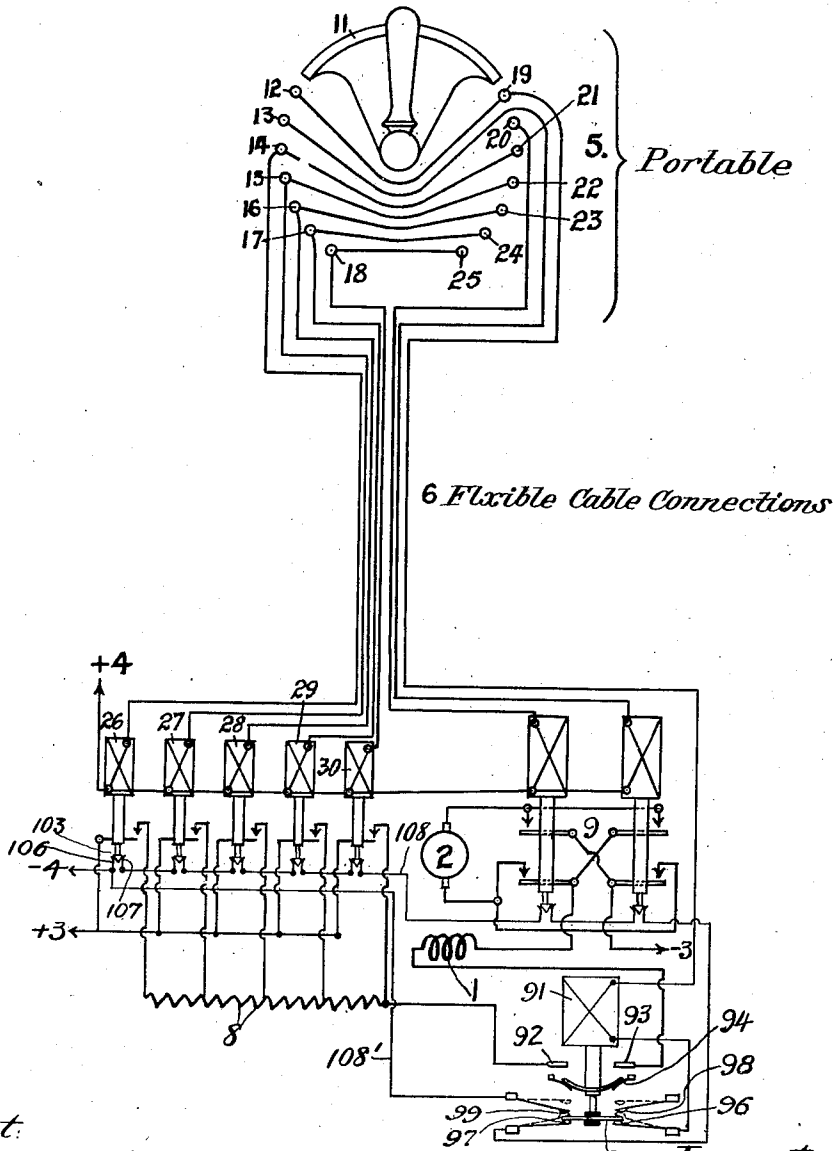


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 CONTROLLER FOR ELECTRIC CRANES.
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UNITED STATES PATENT OFFICE.

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CONTROLLER FOR ELECTRIC CRANES.

1,017,150.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EDWARD MORTEN HOLME, a subject of the King of England, residing at Stockport, in the county of Chester, England, have invented new and useful Improvements in Controllers for Electric Cranes, of which the following is a specification.

The object of this invention is to facilitate and to improve the control of the working of electric cranes, especially such as are used in loading and unloading ships, by making it easier and simpler than it has hitherto been to control such cranes with the promptitude and certainty desirable, by apparatus which is portable, and so capable of being placed from time to time in such positions as may be most convenient for the work to be performed.

According to this invention in order to control the working of the electro-motors used to effect the movements requisite in the working of a crane there is provided for each motor, or if desirable, for two or more of the motors of the crane, a controller in which contact-devices or other circuit-closing devices operated separately, or moved two or more together, are put into and out of use so as to close circuits and to cut out resistances in proper order as may be necessary, by means of a solenoid or electro-magnet or solenoids or electro-magnets, and brought into action or moved by means of controlling or operating devices provided in a portable apparatus, either adapted to be carried wholly or in part by the operator, or to be placed in different places for use at different times. And the connection between the controller of the motor or motors, and the controlling or operating devices, is made by means of flexible or jointed conductors for electric currents, so as to make it easy for the operator to carry about the whole or part of the controlling or operating devices, as the case may be, or for such controlling or operating devices to be moved into different positions from time to time.

In the drawing is shown a diagrammatic view, illustrating the portable apparatus at the upper part connected to solenoid switches and the motor at the lower part of the figure by flexible leads or connections shown diagrammatically and also illustrating diagrammatically a main switch or circuit breaker for the crane motor supply circuit.

In the diagram in which 1 represents the

field-magnet and 2 represents the armature of one motor of a crane to receive electric current from any convenient supply mains by means of leads marked +3 and -3, to indicate the relation of the mains to which they are respectively connected. The main controller consists of a series of resistance solenoid switches 26, 27, 28, 29, 30, worked respectively by solenoids or electro-magnets, which, being operated, cut out the starting resistance 8 in successive steps, and double-pole switches 9 worked by solenoids or electro-magnets for reversing the direction in which the main motor may run. The solenoids or electro-magnets 26, 27, 28, 29, 30, which are intended to be energized by electric current received through leads marked +4 and -4 which may if desirable be of a different or lower voltage supply than that of the main motor supply +3 -3, are connected as shown with a portable or movable switch-board 5 through a flexible or jointed cable 6. In the drawing the movable contact 11 of the portable or movable switch-board is shown in the "off" position. If moved counter-clockwise one notch or division, the movable contact 11 will connect contacts 12, 13, and 14, and so energize one solenoid or electro-magnet of the reversing switch 9, and the first resistance-switch 26; and if moved two notches or spaces, contact 15 is reached, and the second resistance switch 27 is energized. And similarly, movement to the other notches or divisions causes the contacts 16, 17, and 18 to be reached in turn, and the remaining resistance switches 28, 29, and 30 to be energized. If the movable contact 11 be moved clockwise from the "off" position, at the first notch or division it connects contacts 19, 20, and 21, thus energizing the other solenoid or electro-magnet of the reversing switch, and so connecting the motor to run in the opposite direction and by further movements of the movable contact clockwise the solenoids of the resistance-switches are successively energized as the contacts 22, 23, 24, and 25, are successively reached.

The details of construction shown are not essential and the method of driving, the forms of the stops, and the form of the portable switch-board may be modified in detail; and if desirable a dash-pot or buffers of any suitable kind may be added to limit the speed of the turning of the controller or to minimize shocks.

As according to this invention the switches controlling the crane-motors are all operated from a distance, and are not directly under the eye of the operator, it is desirable to provide in the main circuit of the crane-motor supply, a special main-switch or circuit-breaker to be operated for making or breaking circuit by means of a solenoid or electro-magnet energized from the portable or movable switch-board, and to interlock this special main switch electrically with the resistance switch or switches so that it cannot complete the circuit unless all the resistance is in circuit or the circuit is open. Such a main switch is shown in the diagram in which 91 is the solenoid 92, 93 are the main circuit contacts and 94 the contact making brush with auxiliary contacts to minimize sparking and a magnetic blow out if desired. The interlocking contacts are shown below the brush. A disk or plate 95 is shown as attached to the brush but insulated therefrom. When the main-switch is "off," the plate 95 connects contacts 96 and 97 carried on spring arms, so as to be capable of remaining in contact with the plate 95. As the solenoid raises such plate 95, and when the main switch is "on," the plate 95 connects contacts 98 and 99 and leaves contacts 96 and 97, contacts 98 and 99 being flexibly supported so as to yield sufficiently to allow the brush to make proper contact with the contacts 92 and 93.

The contacts 96 and 98 are connected to the solenoid the other end of which is connected to the solenoid supply — 4. The contact 97 is connected to auxiliary contacts of the resistance solenoid switches, 26, 27, 28, 29, 30 and the reversing switch 9. To take one of these switches 26 for example, 106 and 107 are flexibly supported contacts, which in the "off" position of the solenoid switch 26, are connected by the insulated contact 103, but in the "on" position of the solenoid switch 26 are left disconnected.

The auxiliary contacts of resistance-solenoid-switches are connected in series through the lead 108 and a switch on the portable or movable switch-board to the + solenoid supply-main; and the lead 108 is also connected to the contact 99. It is obvious that the solenoid 91 can be deenergized at any time with the switch on the portable or movable switch-board, or will become deenergized by failure of the current through the solenoid, and so made to break the main circuit; but it cannot again be energized unless the resistance-solenoid-switches and reversing switches are in the "off" position.

The solenoid or electro-magnet operated gear hereinbefore described enables a crane to be efficiently and conveniently controlled from any advantageous position outside the structure of the crane itself.

As in certain cases hand-operation from the crane may be desirable, it may be pointed out that the system hereinbefore described may be arranged for hand-operation or interconnected with gear arranged for hand-operation, which may be for example of the ordinary type.

What is claimed is:—

1. In an electrical control means for a crane, the combination of an electrically operated winding motor, a plurality of electro-magnetic devices, a plurality of starting resistances connected with the motor, and adapted to be successively put in and out of circuit by the electro-magnetic devices, a portable switch instrument adapted to be carried by the operator and to be operated at a distance from the motor and said devices and having a plurality of circuit opening and closing contacts connected respectively with the said electro-magnetic devices, a flexible cable connection connecting the said portable switch instrument, and the said electro-magnetic devices, substantially as set forth.

2. In an electrical control means for a crane, the combination of an electric winding motor, a plurality of electro-magnetic devices, a plurality of starting resistances connected with the motor and adapted to be successively put in and out of circuit by the electro-magnetic devices, means for reversing the connections for causing the motor to rotate in opposite directions, electro-magnetic devices for controlling the operation of the reversing means, a switch instrument adapted to be carried by the operator and operated at a distance from the motor and devices and having a plurality of circuit opening and closing contacts connected respectively with the two sets of electro-magnetic devices, a flexible cable connection connecting said portable switch instrument, and the said electro-magnetic devices also connected with the portable switch instrument through the said flexible cable connection, substantially as set forth.

3. In an electrical control means for a crane, the combination of an electric winding motor, electro-magnetic devices, a plurality of starting resistances connected in circuit with the motor and adapted to be successively put in and out of circuit by the electro-magnetic devices, a switch instrument adapted to be carried by the operator and to be operated at a distance from the motor and said devices, and having a plurality of circuit opening and closing contacts, connected respectively with the said electro-magnetic devices, a flexible cable connection connecting the said portable switch instrument and the said electro-magnetic devices, and a safety main interlocked switch, substantially as set forth.

4. In an electrical control means for a

crane, the combination of an electric winding motor, a plurality of electro-magnetic devices, a plurality of starting resistances connected in circuit with the motor, and
5 adapted to be successively put in and out of circuit by the said devices, a portable switch instrument adapted to be carried by the operator and to be operated at a distance from the motor and devices and having a
10 plurality of circuit opening and closing contacts connected respectively, with the said electro-magnetic devices, a flexible cable connection connecting the said portable switch instrument and the said electro-magnetic de-

vices, and a separate circuit making and 15 breaking main switch interlocked with the main controlling system and adapted to prevent the main circuit being re-closed except when all the starting resistances are in circuit, substantially as set forth. 20

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD MORTEN HOLME.

Witnesses:

SOMERVILLE GOODALL,
DONALDSON P. COULTER.