

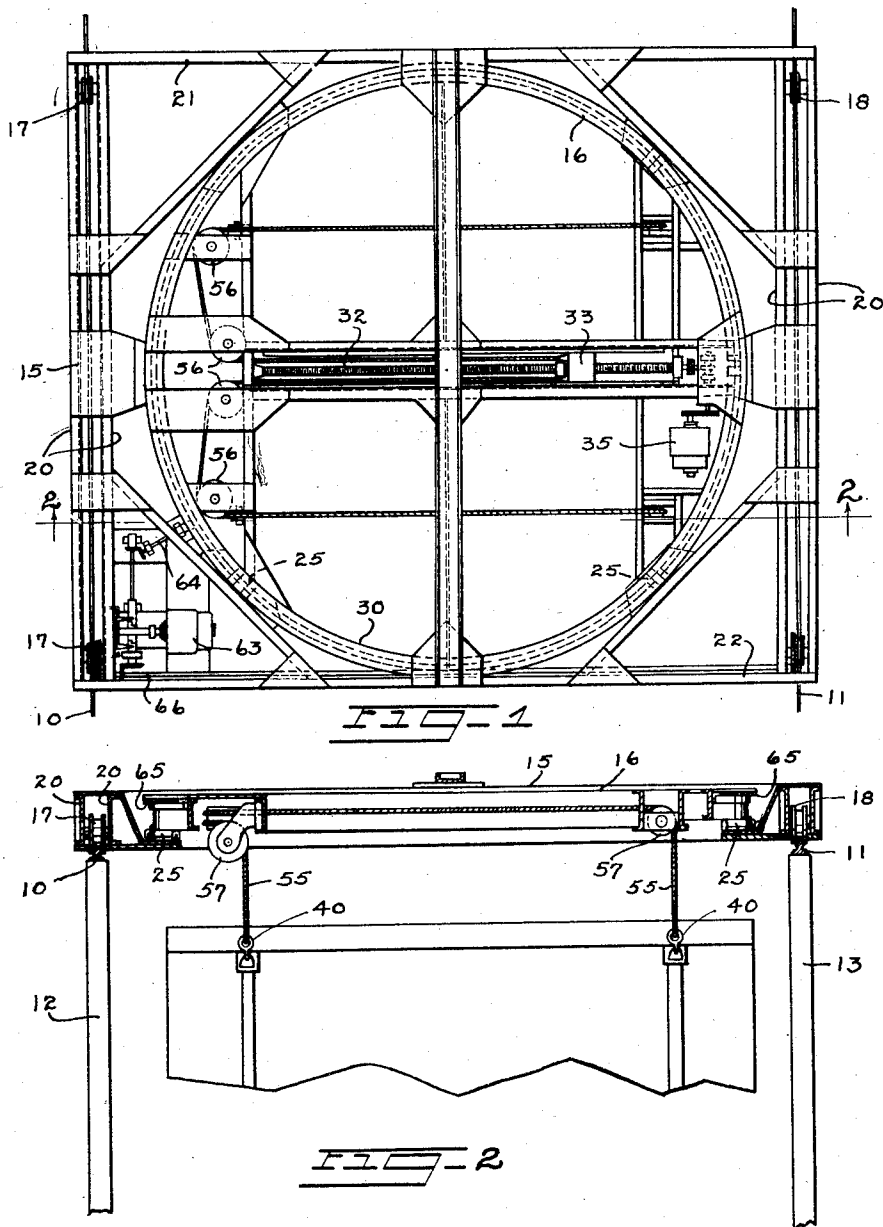
June 19, 1928.

1,674,100

B. F. FITCH

HOIST MECHANISM

Original Filed March 30, 1925 2 Sheets-Sheet 1



Inventor

Benjamin F. Fitch,

By Rahr, Maerlin, Golrick & Team

Attorneys

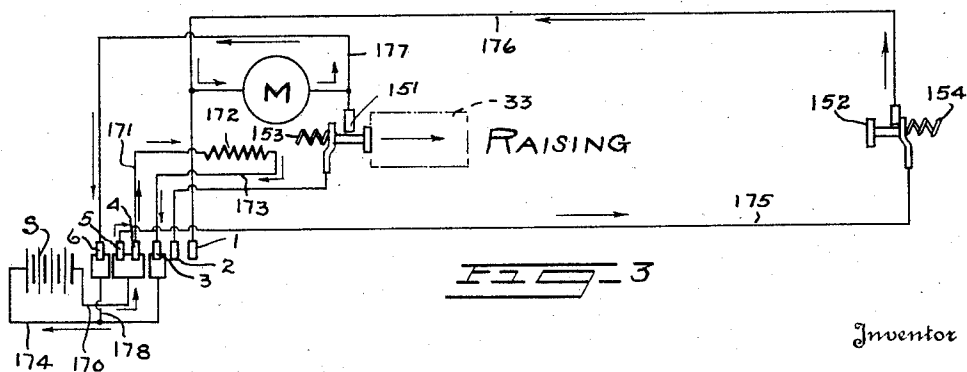
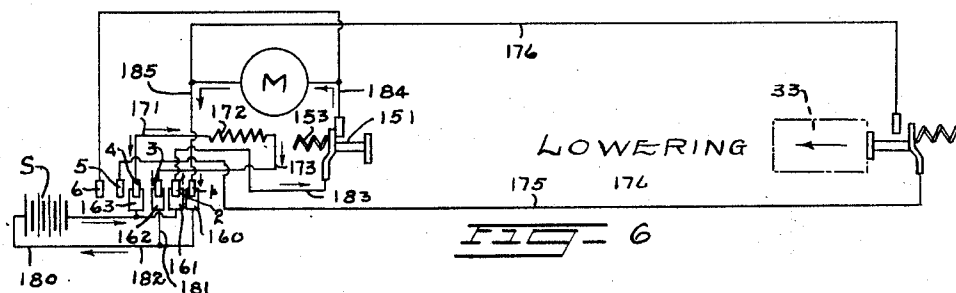
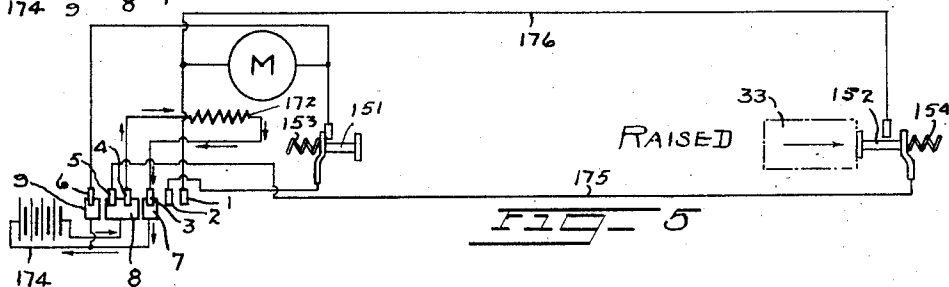
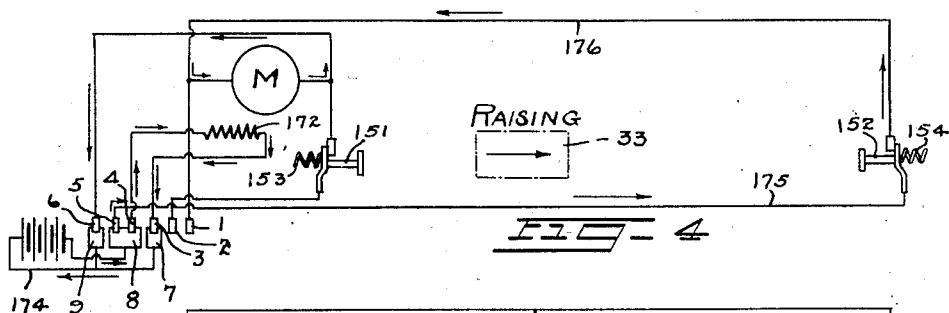
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Inventor

Benjamin F. Fitch

By Datis Macklin, Golnik Pear.

Attorneys'

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UNITED STATES PATENT OFFICE.

BENJAMIN F. FITCH, OF GREENWICH, CONNECTICUT, ASSIGNOR TO MOTOR TERMINALS COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE.

HOIST MECHANISM.

Original application filed March 30, 1925, Serial No. 19,280. Divided and this application filed February 4, 1926. Serial No. 85,878.

This invention comprises a division of my copending application, Serial No. 19,280, filed March 30, 1925, and relates to hoisting and conveying apparatus and is particularly concerned with the provision of a crane adapted to travel on overhead tracks. Such a crane is especially adapted for use in a system for handling freight wherein freight is stored in removable automobile bodies or

containers. which while possessing a minimum depth 55 still has sufficient power to raise a loaded container in the form of a removable automobile body, turn it and then transport it along an overhead trackway. Further objects are to shorten materially the span required to support such an overhead crane, yet to permit the turning of the load through a complete revolution. 60

To overcome the necessity for a skilled crane operator, I propose to provide means 65 for automatically controlling the extent of travel of the hoisting mechanism so as to minimize the changes incident to the operation of such a crane.

To carry out the above objects, I employ 70 a crane which has a main frame movable along an overhead trackway. The main frame carries a supplemental frame which embodies a turntable having hoisting mechanism mounted thereon. To permit the crane 75 to have a minimum depth, the supplemental frame is disposed within planes which define the upper and lower surfaces of the main frame.

In handling freight by such a system, it is desirable to adapt the apparatus to existing conditions without requiring extensive changes to be made in the structure of warehouses, platforms or runways adjacent thereto. The size of a removable container which has been found to give the most satisfactory results for handling freight is such, however, that the average warehouse or freight station is not constructed to receive a standard crane and to admit the container. Accordingly, extensive altering and shoring must be resorted to in order to strengthen the structures and to render them safe for handling loaded containers by means of an overhead crane. An additional characteristic frequently occurring in existing structures is the low head room, which greatly hinders the use of standard size cranes.

A further problem which arises in the handling of freight by the use of removable automobile bodies as containers is the difficulty of positioning a motor vehicle at right angles to a station platform. This difficulty arises 30 by reason of the fact that the street adjacent a platform is frequently very narrow, and that the motor vehicles employed for conveying freight are too long to permit the normal flow of traffic along the street if the vehicles are disposed at right angles to the platform. In order, therefore, to permit the handling of heavy loaded containers, it is desirable to use electrically operated overhead cranes which may raise a load, turn it, 45 and then transport it from one place to another. The size and weight of the containers, however, present a serious problem in the designing of a crane which will have sufficient power to raise the load, and to permit the turning thereof without making important and extensive changes in the construction of the building.

In addition, I provide mechanism including adjustable stops for automatically shutting off the hoisting motor when the load engaging members have reached a predetermined position with reference to the supplemental frame. Thus a controller having two 85 extreme positions may be used for operating the hoisting mechanism, wherefore the operator need only move the controller from one position to the other, and the hoisting mechanism will automatically stop at a predetermined position. The net result of this arrangement is that the services of a skilled crane operator may be dispensed with, and the various operations may be accomplished in a minimum period of time. 90

The preferred means for carrying out my invention is illustrated in the drawings wherein Fig. 1 is a plan view of a crane embodying my invention; Fig. 2 is a vertical section taken through the crane on a plane indicated by the line 2—2 in Fig. 1; and Figs. 3 to 6 inclusive are diagrams showing the electrical arrangement for effecting an automatic control of the hoisting mechanism. 100

In Figs. 1 and 2 the crane embodying my invention is illustrated as supported upon overhead tracks 10 and 11 which are carried on columns 12 and 13 respectively. The 105

One of the objects of the present invention therefore, is the provision of a crane

crane embodies a main frame, indicated in general at 15, and a supplemental frame, indicated in general at 16, which is carried by the main frame and is arranged to be rotated through a complete revolution with reference thereto. Wheels 17 and 18 journaled in the main frame, are arranged to travel on the tracks 10 and 11 respectively. These wheels as shown are slightly less in diameter than the depth of the main frame. The main frame may have longitudinal beams 20 which are connected at the ends by transverse beams 21 and 22 respectively. The end members are arranged in pairs so as to support the wheels in a conventional manner.

To support the supplemental frame within the main frame, I have shown a plurality of spaced rollers 25 which are mounted radially, and are arranged to engage the underside of the supplemental frame adjacent the periphery thereof.

The supplemental frame as shown embodies a circular frame having a periphery comprising an inwardly facing channel-shaped beam 30, the lower flange of which rests upon the rollers 25. The supplemental frame carries the hoisting mechanism which preferably includes a screw and nut couple as illustrated by a threaded shaft 32 and a nut 33. The nut is arranged to travel along the shaft whenever the shaft is rotated. The means for rotating the shaft 32 is indicated as an electric motor 35 which is mounted on the supplemental frame and is suitably geared to the shaft. The motor is reversible so as to permit rotation of the threaded shaft in either direction.

To permit engagement of the hoisting apparatus with the load, I have shown load engaging members such as hooks 40 which are carried at the ends of four cables 55, for enabling the load to be engaged at four points. Each cable has one end thereof attached to the nut 33, wherefore the cables are simultaneously operated, to permit raising or lowering of a load. Horizontally disposed guide sheaves 56, and vertically disposed guide sheaves 57 function to lead the cables outwardly and then downwardly with respect to the supplemental frame.

To permit rotation of the supplemental frame with reference to the main frame, I have shown an electric motor 63 which is suitably geared to rotate a shaft 64 which in turn carries a pinion on the end thereof adjacent the supplemental frame. This pinion (not shown) is adapted to engage an annular rack 65 on the supplemental frame. The motor is mounted on the main frame and is also arranged to be selectively connected to the shaft 66 which in turn is suitably geared to one wheel 17 and another wheel 18 for enabling the main frame to be propelled along the trackway.

To obviate the necessity for employing a skilled crane operator, I employ an electrical control system including adjustable cut-out switches for limiting the vertical movement of the load engaging members in either direction. To carry out this plan I have shown in Figs. 3 to 6, wiring diagrams wherein the electric motor 35 is shown at M and is a reversible type of motor. In Fig. 3 for instance the nut 33 is about to travel back after reaching one end of the travel in one direction. In such position the cut-out limit switch 151 has been opened by the nut just as the end of the stroke has been reached. A similar limit switch 152 is adapted to be engaged by the nut when it reaches the opposite end of the stroke. These limit switches may each have a spring associated therewith as indicated at 153 and 154, respectively, so as normally to close the switch when the nut is out of contact therewith.

The source of current for operating the motor is indicated at S, while a hand controller having two positions is indicated as having a set of stationary contact fingers 1 to 6 inclusive and two sets of movable contact plates, which are so arranged that when one set is in engagement with some of the stationary contact fingers, the other set is out of engagement with all of the contact fingers. In Figs. 3, 4 and 5, one set of movable contact plates is illustrated at 7, 8 and 9, while in Fig. 6 the other set of plates is indicated at 160 to 163, inclusive.

Referring now to Fig. 3 the current flow is as follows:—Source of power S, line 170, contact 8, where the current divides, part flowing through contact 4, and line 171 to energize the field 172, thence through line 173, contact 3, contact 7, line 174 and back to the source of power. The rest of the current which is divided at contact 8 flows through contact 5, line 175, switch 152, line 176, armature of motor M, line 177, contact 6, contact 9, line 178, and thence back through line 174 to the source of power.

The result of this arrangement is that the motor is energized to drive the hoisting mechanism in such manner that the nut 33 is caused to travel along the supplemental frame in the raising direction until it engages the limit switch 152 and then to interrupt the current flowing therethrough. This automatically stops the motor.

In Fig. 4, the current is shown as flowing through the connections illustrated in Fig. 3, while the nut is approximately midway between the two limit switches. In Fig. 5, the nut has reached the end of the stroke and has broken the connection to the motor through the switch 152. In this figure the position of the controller is the same as that shown in Figs. 3 and 4, wherefore, the direction of motor rotation cannot be reversed,

even though the switch 151 is closed until the controller position is changed.

In Fig. 6, the controller position is changed so as to reverse the direction of motor rotation, even though the switch 152 is open. The current flow as shown by the connections in Fig. 6 is as follows: Source of power S, line 180, where the current divides, part flowing through contact plate 163 to energize the field winding, and part flowing through contact 161 to energize the armature winding. The current for energizing the field winding flows through contact finger 4, then through line 171, field windings 172, line 173, contact 3, contact 162, lines 181 and 182 and back to the source of power. The current flowing through the armature windings passes through contact 161, contact 2, line 183, switch 151, line 184, motor armature, line 185, contact 1, contact 160, and line 182 back to the source of power.

An inspection of the arrows and comparison of Figs. 3 and 6 will show that the direction of current flowing through the field winding remains the same while the direction of current flowing through the armature winding is reversed, whenever the controller is moved from the position shown in Fig. 3 to the position shown in Fig. 6. The result of the arrangement of windings and connections as illustrated in Fig. 6 is such that the nut may continue to travel until it engages the limit switch 151 and interrupts the flow of current to the armature winding.

Assuming now that a motor vehicle having a loaded removable body is brought to a station platform, then the main frame is caused to travel along the overhead trackway until it is disposed over the load, whereupon, the supplemental frame is turned, if required, with reference to the main frame until the load engaging members are in convenient position to permit engagement with the load when the hoisting cables are lowered. The downward movement of the load engaging members is effected by placing the controller, or resetting device, in the position shown in Fig. 6. The position of the switch 151, with reference to the supplemental frame, is previously so determined that the lowering operation is automatically stopped when the load engaging members are beneath the cooperating members on the load. Thereupon, the controller may be shifted to the position shown in Fig. 3 and as a result the motor 35 is caused to be rotated in a direction to raise the members. After the members have been brought into engagement with the load then further raising of the members will effect a raising of the load. The raising operation is continued until the nut 33 engages the limit switch 152, as indicated in Fig. 5. This interrupts the flow of current through

the motor and stops the raising operation. The main frame may then be trolleyed along the trackway until the desired location is reached for depositing the load.

If the main frame has reached the desired location then, if necessary, the supplemental frame is turned with reference to the main frame to deposit the load in the desired location. Thereafter, the controller is shifted to the position shown in Fig. 6 and the load is lowered until the nut engages the limit switch 151. The height of the platform or surface upon which the load is deposited is such that the lifting stresses are released from the cables before engagement is effected between the nut and the switch 151.

The arrangement of electrical connections which I employ permits the limit switches to be adjusted on the supplemental frame so as to be engaged by the nut at predetermined points in the path of travel. Obviously, the position of such limit switches is determined by the height of the lift desired, and the distance of the load from the supplemental frame, when the load is deposited upon a support. Moreover the controller may be suspended from the crane and may have an actuating member, such as a cable, extending downwardly within reach of an operator so as to permit shifting thereof from one operative position to another in an expeditious manner. After the controller has once been actuated, however, it need not again be shifted until a limit switch is actuated to stop the motor automatically at the desired time.

I claim:

1. In a crane, the combination with a frame, of a screw and nut couple mounted thereon, an electric motor associated with the frame and operatively connected to one member of the couple, hoisting cables attached to the other member of the couple, two switches in circuit with said motor, each switch being normally closed but adapted to be opened by engagement with said last-mentioned member, whereby the motor circuit is broken and the motor stopped, and a manually actuated re-setting device for establishing the motor circuit independently of the open switch through the other switch, said device functioning to close the motor circuit only in such manner that the direction of rotation of the motor is reversed.

2. In a crane, the combination with a frame, of a screw and nut couple mounted thereon, an electric motor operatively connected to the screw member of said couple, hoisting cables attached to the nut member, an electric motor associated with the frame for rotating the screw member, limit switches in the path of the nut member and arranged in circuit with said motor,

yieldable means for normally holding said switches in closed position, said switches, being adapted to be engaged by the nut member and to be opened thereby for stopping the motor, and a re-setting device for directing the flow of current through the switch at one end of the path of travel when the switch at the other end of the path of travel is open, said re-setting device functioning to reverse the direction of motor rotation. 10

In testimony whereof, I hereunto affix my signature.

BENJAMIN F. FITCH.