Oct. 12, 1926. 1,603,012

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SWITCH MECHANISM

Filed May 3, 1923 6 Sheets-Sheet 1

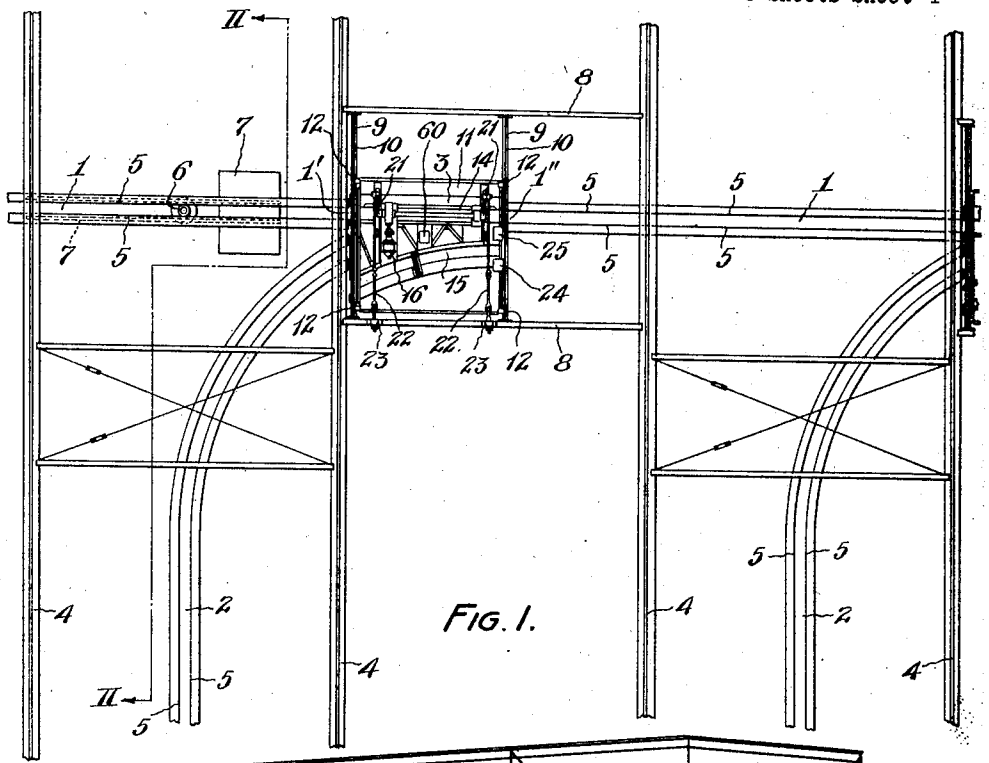


FIG. 1.

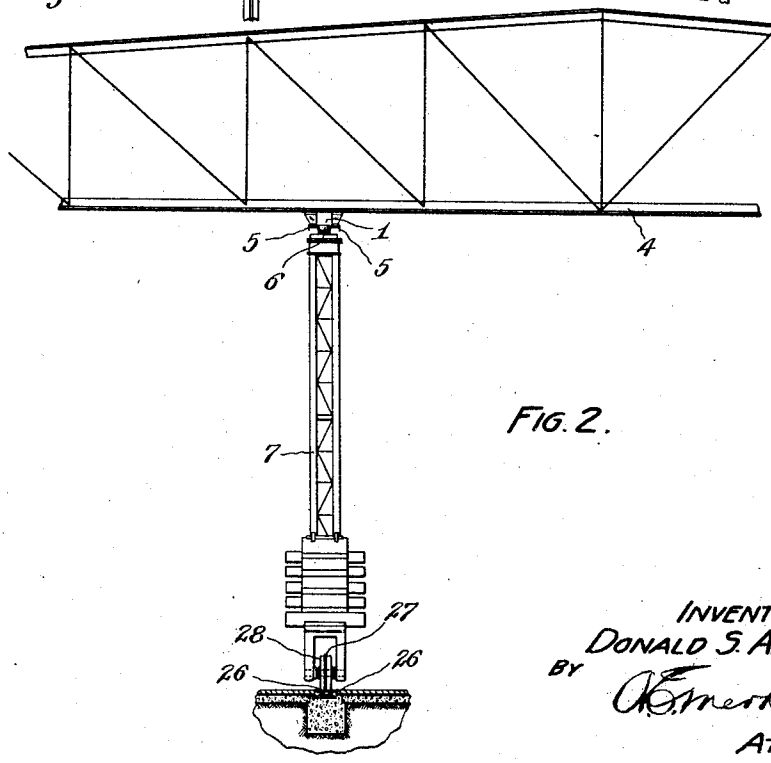


FIG. 2.

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SWITCH MECHANISM

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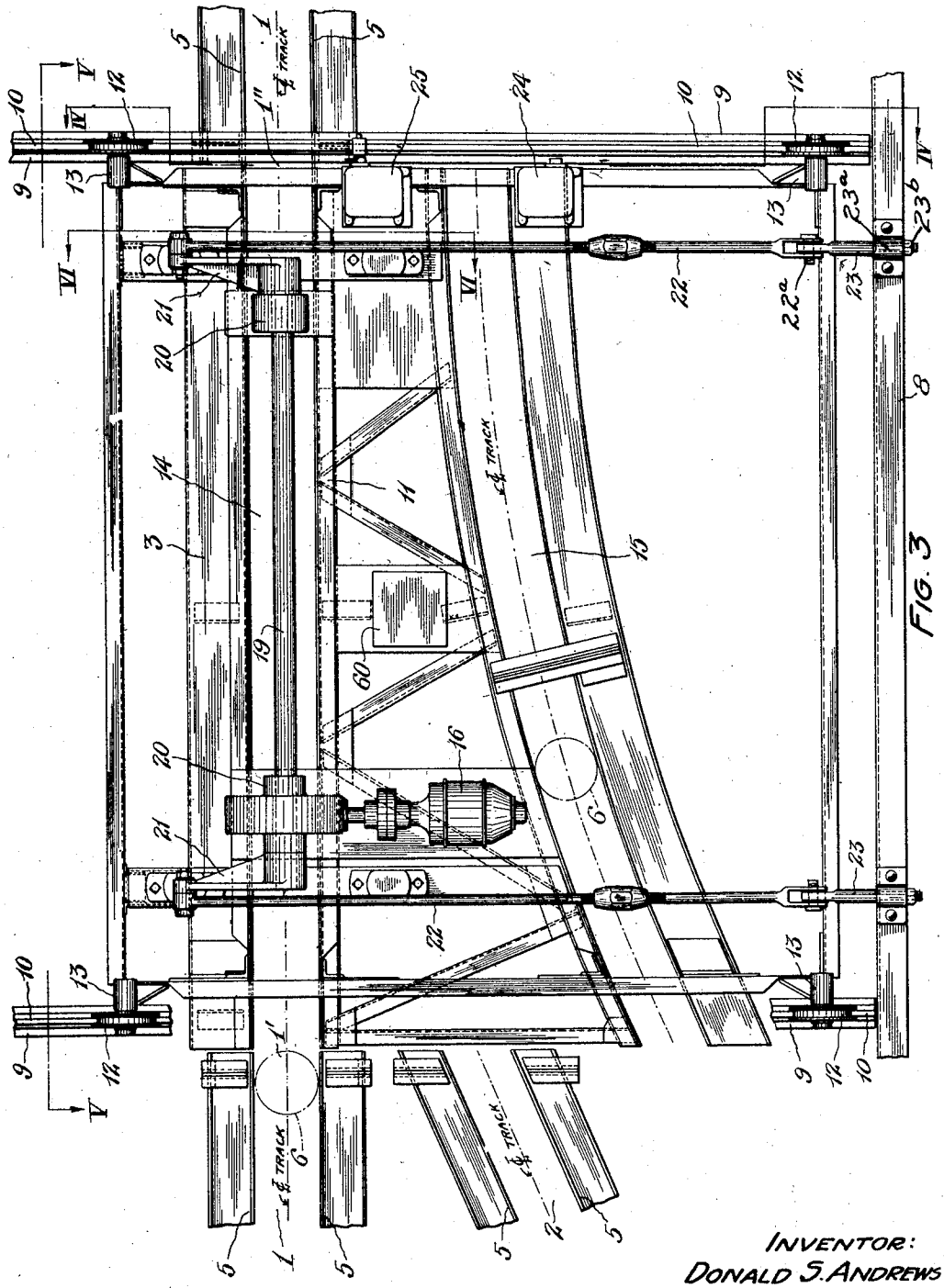


FIG. 3

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SWITCH MECHANISM

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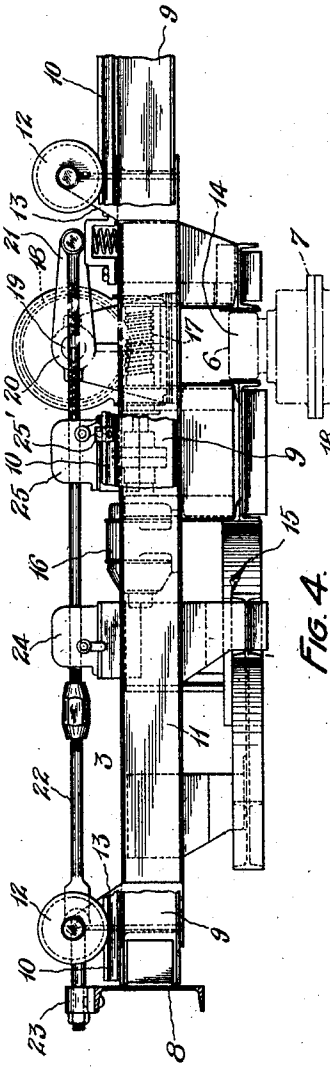

FIG. 4.

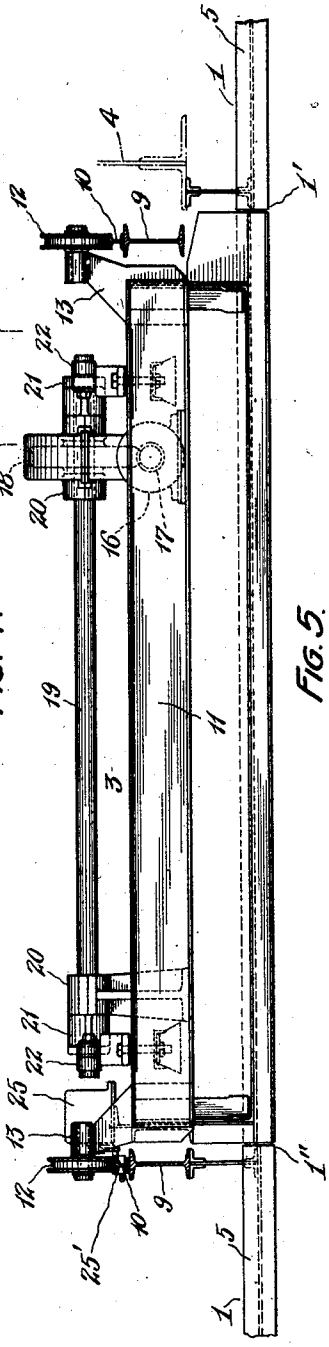

FIG. 5.

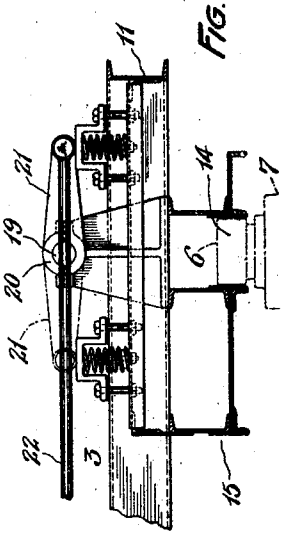

FIG. 6.

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SWITCH MECHANISM

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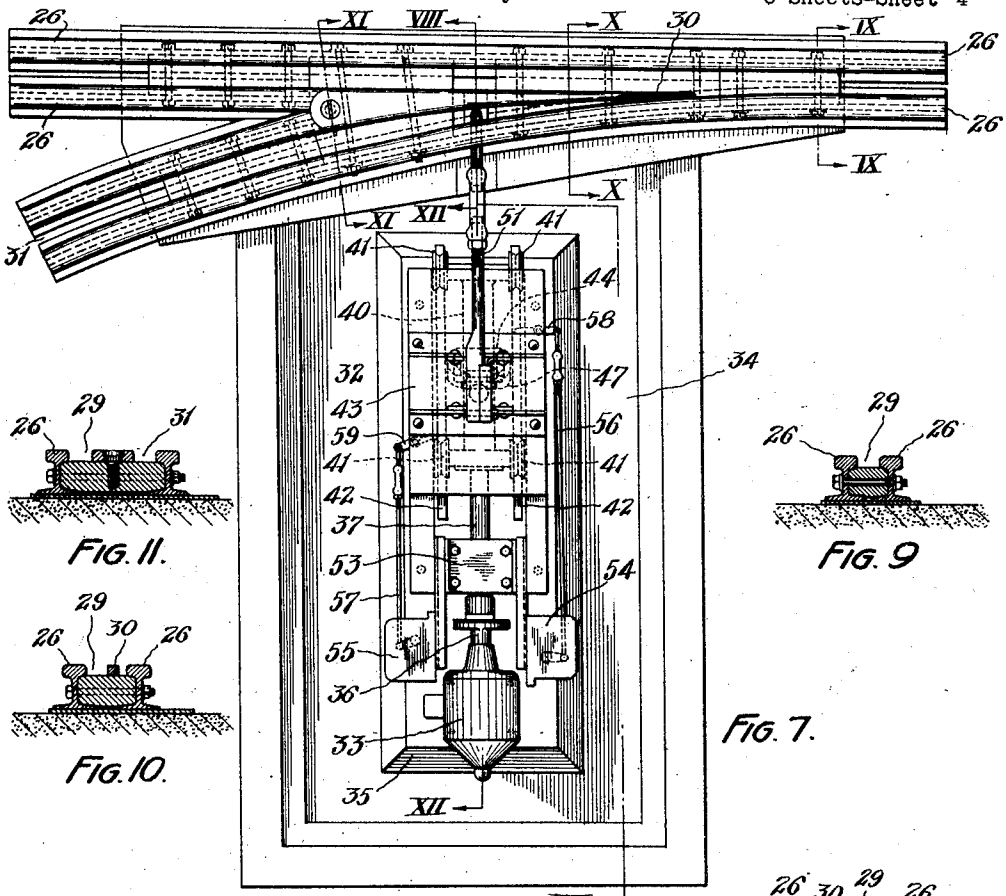


FIG. 7.




FIG. 11.




FIG. 9




FIG. 10.

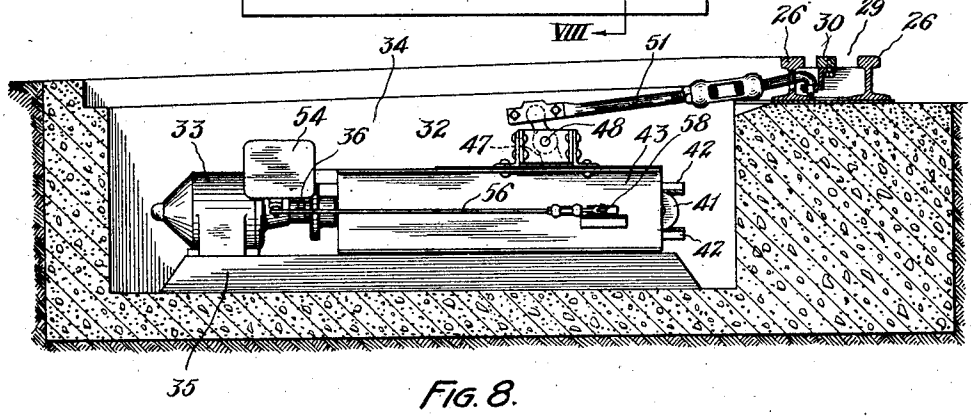


FIG. 8.

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SWITCH MECHANISM

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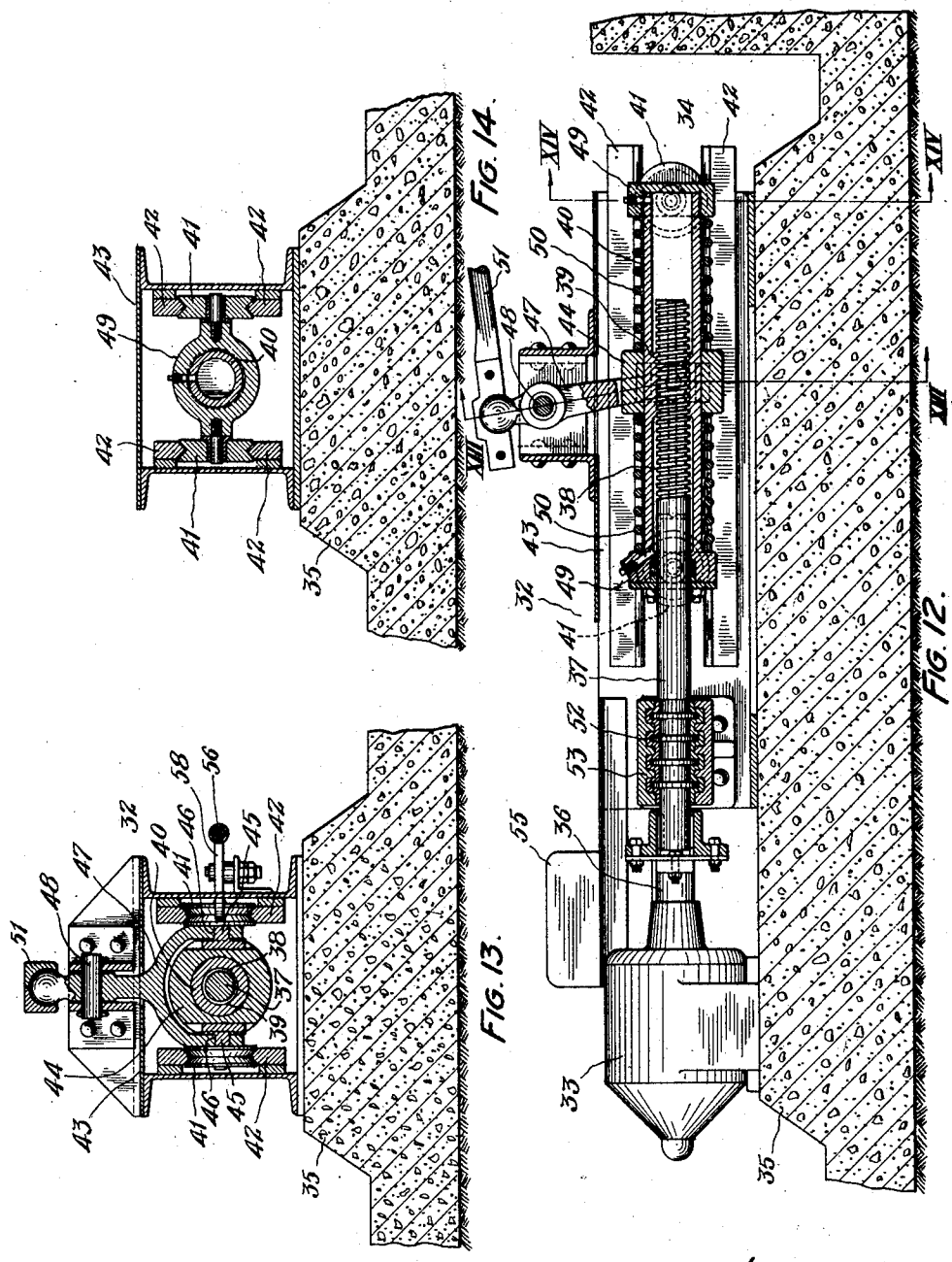

FIG. 12.



FIG. 14.



FIG. 13.

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SWITCH MECHANISM

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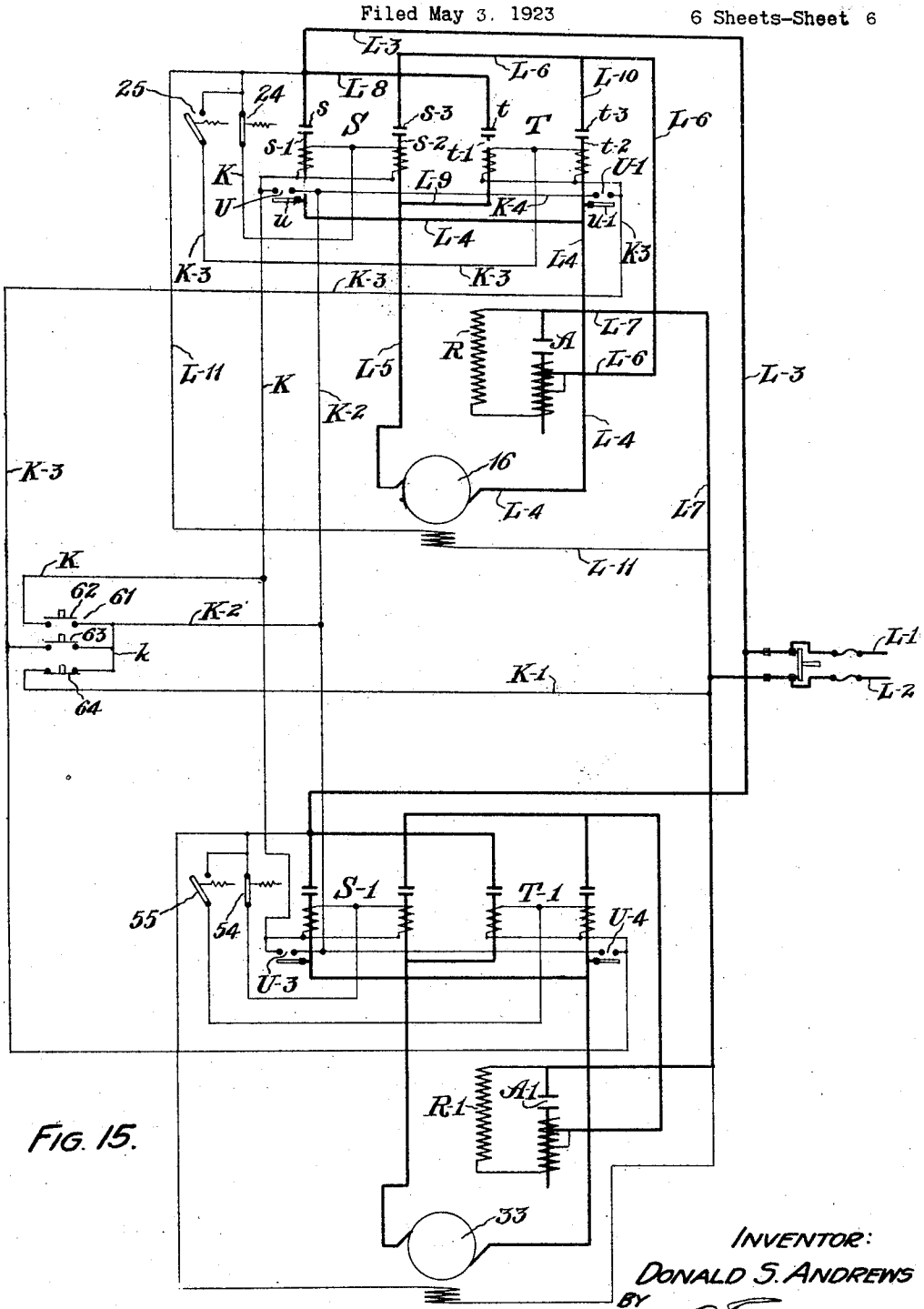


FIG. 15.

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Patented Oct. 12, 1926. 1,603,012

# UNITED STATES PATENT OFFICE.

DONALD S. ANDREWS, OF NEW YORK, N. Y., ASSIGNOR TO ANDREWS CRANE CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

## SWITCH MECHANISM.

Application filed May 3, 1923. Serial No. 636,297.

My invention relates to switch mechanism, and particularly to mechanism for operating the switches of a conveyor which includes the use of a ground track and an overhead supporting track.

The object of said invention is to provide a switch mechanism of the above-described character which may be operated in a simple manner and which will function efficiently.

The said invention consists of means hereinafter fully described and particularly set forth in the claims.

More specifically my said invention consists of overhead and ground switch members and means for simultaneously actuating same so as to permit the traveling conveyor member to take the desired direction.

The annexed drawings and the following description set forth in detail certain means embodying my invention, the disclosed means, however, constituting but one of various mechanical ways in which the principle of the invention may be applied.

In said annexed drawings:

Fig. 1 represents a plan of a part of a mono-rail conveyor system embodying my invention.

Fig. 2 represents an elevation of such system on the planes indicated by lines II—II, Fig. 1.

Fig. 3 represents a plan of the overhead switch, on an enlarged scale.

Fig. 4 represents a rear elevation of said overhead switch on line IV—IV Fig. 3, and

Fig. 5 represents a side elevation of same on line V—V Fig. 3.

Fig. 6 represents a vertical transverse detail section taken upon the plane indicated by line VI—VI, Fig. 3, and viewed in the direction indicated by the arrows.

Fig. 7 represents a plan of the ground switch, made on an enlarged scale.

Fig. 8 represents a rear elevation of the said ground switch.

Figs. 9, 10 and 11 represent detail sections taken upon the planes indicated by lines IX—IX, X—X and XI—XI respectively, in Fig. 7.

Fig. 12 represents a section taken upon the plane indicated by line XII—XII, Fig. 7, on a still further enlarged scale.

Figs. 13 and 14 represent sections taken upon the planes indicated by lines XIII—XIII and XIV—XIV respectively, Fig. 12.

Fig. 15 is a diagram of the electrical wiring of the switch system.

The illustrated embodiment of my invention includes an overhead main-track 1, one or more switch-tracks 2 and an overhead switch 3, Fig. 1, all suitably supported, as for instance in this case, by the roof-trusses 4 of a building.

In this case the said tracks 1 and 2 consist of two I-beams 5—5 suitably supported, and which form a lateral guideway for the roller 6 mounted upon the top of the traveling crane 7 of the system, all as shown in Figs. 1, 2, 4 and 6.

The main-track is interrupted so as to provide the main-track terminals 1′ and 1″, and the switch-track 2 terminates adjacently to the said terminal 1′.

Supported upon two cross-beams 8—8 extending between and supported by two adjacent trusses 4, are two parallel I-beams 9—9 which extend at right angles to and are located above the overhead main and switch-tracks, as shown in Fig. 5, and upon which are laid and secured the rails 10—10.

As shown in Fig. 1, the adjacent main and switch-track terminals lie just outside and below the one supporting truss 4.

Supported by rails 10—10 is a switch-carriage 11, provided with the wheels 12—12 running upon said rails and mounted on brackets 13—13 from which the main-frame of the carriage is suspended, as shown in Figs. 4 and 5.

This carriage has suitably secured thereto a main-track section 14 and a switch-track section 15 having runways of the same cross-sectional form as the main and switch-tracks, and arranged so that by shifting this carriage upon its track the main-track section may be alined with the main-track terminals, or the switch-track section alined with the one main-track terminal and the switch-track terminal, as will be understood and seen from an inspection of Fig. 3.

Mounted upon the carriage is an electric motor 16 secured to whose shaft and alined therewith is a worm 17, shown in dotted lines in Fig. 4. This worm engages a worm-wheel 18 secured to a shaft 19 having its

axis parallel with the main-track 1, and journaled in bearings 20—20 mounted upon said carriage. To the two ends of this shaft are secured the two crank-arms 21—21 which articulate with the one end of connecting rods 22—22 whose other ends are pivoted at $22^a$ to anchor members 23—23, having reduced ends $23^a$ which are rigidly fastened to one of the cross beams 8 by nuts $23^b$.

It will thus be seen that the rotation of the motor-shaft by the motor may be made to drive the shaft 19, oscillate the crank-arms 21 and shift the carriage upon its supporting structure.

The carriage furthermore has secured thereto two spring-actuated and normally closed limit-switches 24 and 25, suitably mounted, and adapted to be engaged to open by a member 25′ which is conveniently and adjustably fixed to one of the rails 10, as shown in Figs. 3 and 4. Said member is so adjusted upon said rail that the limit-switches will be operated to break the motor circuit and stop the carriage at a point in its travel such as will bring the switch sections into proper alinement with the main-track terminals or with the one main-track terminal and the switch-track terminal, as the case may be and as will be readily understood. The details of the electrical connections will be further hereinafter described in connection with the wiring diagram, Fig. 15.

The main ground-track illustrated, consists of two T-rails 26—26, Fig. 7, forming an intermediate runway for the single central flange 27 of the supporting traction wheel 28 of the crane 7, as shown in Fig. 2.

A suitable frog 29 is provided for this track and includes an oscillating switch-point 30 whereby the said wheel may be switched from the main ground-track to the ground switch-track 31, as will be readily understood from an inspection of Fig. 7.

The free end of the switch-point lies in the vertical transverse plane in which the terminal 1″ and the terminal of the overhead switch-track 2 lie, so that when the proper alinement of the overhead switch sections with the overhead main or switch-tracks, and a corresponding position of the switch-point 30, are imparted, the guiding roller 6 and the traction wheel 28 and hence the top and bottom of the crane, will be simultaneously diverted in the required and proper direction.

Mechanism 32 is provided for actuating the switch-point 30 including an electric motor 33 whose connections will be later described but which are of a nature such that the operation of the overhead and ground switch mechanisms wil be synchronized.

The mechanism 32 is preferably located in a pit 34 sunk below the floor-level as shown in Fig. 8, and provided with a suitable cover (not shown).

The motor 33 is mounted upon and suitably secured to a base 35 and has its shaft 36 connected with a coaxial threaded shaft 37 whose threads 38 engage the internal threads 39 of a cylindrical and tubular cross-head 40 provided with guiding-wheels 41 running upon parallel tracks 42 fixed to a housing 43 mounted and suitably secured to said base 35.

Slidably mounted upon the exterior of such cross-head is a sleeve 44, Figs. 12 and 13, provided with journals 45, Fig. 13, set in bearings 46 of an oscillating yoke 47 pivoted upon a pin 48 mounted on the housing 43. The cross-head is provided with end flange-members 49 and between these members and the sleeve are located two helical springs 50—50, one on each side of said cross-head, as shown in Fig. 12.

The upper end of the yoke articulates with one end of a connecting rod 51, whose other end articulates with the switch-point 30, as shown in Fig. 8.

The shaft 37 is provided with flanges 52 seated in thrust-bearings 53 fixed to the housing 43.

When the motor is rotated, the cross-head 40 will be shifted and its motion transmitted to the sleeve 44 through the springs 50, thereby effecting the movement of the yoke 47, the connecting rod 51 and switch-point 30.

To limit the movement of these parts, two fixedly mounted spring actuated and normally closed limit-switches 54 and 55 are provided which may be actuated by rods 56 and 57 respectively, the latter being operated by the contact of the wheels 41 with levers 58 and 59 respectively, which articulate with the ends of these rods.

These switches are conveniently placed upon opposite sides of the mechanism, as shown in Fig. 7. The two coiled springs permit the sleeve 44 to yield and thereby obviate the necessity of very fine adjustment of the levers 58 and 59 for proper operation and prevention of breakage of parts.

The arrangement and wiring connections of the motors, limit-switches, push-buttons and other electrical connections, is illustrated diagrammatically in Fig. 15, and is as follows:

As before stated the motors 16 and 33 are mounted respectively upon the overhead carriage 11 and the stationary base of the ground switch mechanism.

A main supply circuit $L^1$, $L^2$ is provided, one side of which is connected by the conductor $L^3$ with one of the fixed switch-members $s$ of a magnetically-operated normally open switch S, the corresponding movable mem-

ber $s^1$ of which is connected, by means of the conductor $L^4$, with one terminal of the armature of the motor 16. The other terminal of such armature is connected by means of a conductor $L^5$ with the movable member $s^2$ of the other switch-member of said switch S, the fixed member $s^3$ of which is connected by means of a conductor $L^6$, with an accelerating switch A, which is connected by means of a conductor $L^7$ with the other side of the main circuit, as shown.

A conductor $L^8$ connects conductor $L^3$ with one of the fixed switch-members, $t$, of a second magnetically-operated normally open switch T, and the corresponding movable member $t^1$ is connected, by means of a conductor $L^9$ with the conductor $L^5$, and thus connected with the motor 16 in the same manner as is the corresponding member of switch S.

A conductor $L^{10}$ connects conductor $L^6$ with the other fixed member, $t^3$, of said switch T, the corresponding movable member $t^2$ of which is connected with the conductor $L^4$, as shown.

A starting resistance R is connected in parallel with the accelerating switch A.

The switches S, T and A are conveniently mounted upon the carriage 11, in a box 60, Fig. 3, provided for that purpose, and such described conductors as may be necessary, are made flexible so as to permit the movement of said carriage without disrupting the circuit, all as will be readily understood by those skilled in the art.

The field of the motor 16 is connected with the main circuit by means of the conductor $L^{11}$ and the current flows through same always in the same direction.

A push-button control-station 61 is provided and conveniently placed upon a pillar or other support (not shown) placed in proximity to the path of the crane so that it may be reached by the operator from his cage on the crane.

This station is provided with three spring-actuated push-buttons, switches 62, 63 and 64; switches 62 and 63 being normally held in their open positions, and switch 64 in its closed position, by these springs. A conductor K leads from one terminal of switch 62 to the conductor $L^3$, making connection with the one side $L^1$ of the main circuit; and a conductor $K^1$ connects the other side $L^2$ of said circuit with one terminal of the switch 64. The other two terminals of switches 62 and 64 are connected with each other by conductor $k$. The two coils of the magnetically-operated switch S are connected in this last-described circuit, in parallel and the limit-switch 24 in series.

One terminal of a normally open switch U is connected with the one terminal of switch 62 by means of conductor $K^2$, and the other terminal of switch U with the other terminal of switch 62 as shown, by conductor K, and the movable member $u$ of said switch U is actuated by the movable member $s^1$ of switch S.

A conductor $K^3$ leads from one terminal of switch 63 to the conductor $L^3$ thus also making connection with the one side $L^1$ of the main circuit, the other terminal of said switch 63 being connected to the other side of said main circuit, by means of conductor $K^1$, switch 64 and conductor $k$ as shown. The two coils of the switch T are connected in this last-described circuit in parallel and the limit-switch 25 in series.

The one terminal of a normally open switch $U^1$ is connected with conductor $K^3$ and the other terminal with conductor $K^2$ by means of a conductor $K^4$. The movable member $u^1$ of switch $U^1$ is actuated by the movable member $t^2$ of switch T.

A duplicate of the above-described wiring system and parts is provided in parallel therewith for controlling the movement of the ground switch. This duplicate system includes the motor 33, switches $S^1$, $T^1$, $U^3$, $U^4$, starting resistance $R^1$, accelerating switch $A^1$, and the limit-switches 54 and 55, as shown in the lower half of Fig. 15.

The operation of the above-described mechanism is as follows:

Let it be assumed that the track-switches are in the positions shown in Figs. 3 and 7, in which positions the limit-switches 25 and 55 will be open, since they will have been actuated by the switch-mechanism to so open; and the limit-switches 24 and 54 will be closed, since they are normally closed and are not engaged by the mechanism to assume the open position.

Switches S, $S^1$, T and $T^1$ are, under these conditions, open as well as are the switches U, $U^1$, $U^3$, $U^4$, 62, 63 and the accelerating switch A. Switch 64 will be closed.

These described positions are those shown in Fig. 15.

When it is desired to change the positions of said track-switches, the push-button of switch 62 is pressed. This closes circuit $L^1$, $L^3$, K, $k$, $K^1$, $L^2$ and the switches S and $S^1$ will close. The circuit through the armatures will thus be closed and the armatures rotated so as to shift the movable track-switch members. When switches S and $S^1$ are closed switches U and $U^3$ will also be closed, the push-button of switch 62 may be released and the motor continue to operate, thus obviating the necessity of keeping the switch 62 closed until the shifting movement of the track switches is completed.

When the track-switches have reached their proper and new positions, the limit-switches 24 and 54, will be actuated to open, and switches S, $S^1$, U and $U^3$ will automatically open, the motor-circuit broken and

the motors stopped. Limit-switches 25 and 55 will in the meantime have been automatically closed.

When the push-button switch 63 is closed switches T, $T^1$, $U^1$, $U^4$ and A are operated and the current through the armatures and hence the direction of rotation of the motors is reversed so that a movement of the track-switches in the opposite direction may be obtained.

The switch 64 may be used in an emergency to break the circuit and stop the motors.

What I claim is:

1. In switch mechanism for conveying apparatus, the combination of an overhead track; a ground track; switches for said overhead and ground tracks mounted to move in a horizontal plane; and means for simultaneously actuating said switches.

2. In switch mechanism for conveying apparatus, the combination of an overhead track; a ground track; switches for said overhead and ground tracks; and electrically-operated means for simultaneously actuating said switches.

3. In switch mechanism for conveying apparatus, the combination of a switch-carriage; a track-switch mounted thereon; an electrically operable motor mounted on the switch-carriage; means connected therewith for actuating said switch-carriage; electrical connections for actuating said motor in either of the two opposite directions and including a circuit containing a magnetically-operated motor switch member; a starting switch for said circuit; and an auxiliary circuit containing a switch-member operated by said motor switch-member to close said auxiliary circuit, whereby said starting switch may be disconnected and the operation of said motor-switch continued.

4. In switch mechanism for conveying apparatus, the combination of a switch-carriage; a track-switch mounted thereon; an electrically operable motor mounted on the switch-carriage; means connected therewith for actuating said switch-carriage; electrical connections for actuating said motor in either of its two opposite directions and including a circuit containing a magnetically-operated motor-switch member; a starting switch for said circuit; and an auxiliary switch-member operated by said motor-switch member to close said auxiliary circuit; said starting switch being normally open and adapted to close upon being released.

5. In switch mechanism, the combination of a main-track; a switch-track; a carriage having a main-track section and a switch-track section mounted thereon and adapted to be moved so as to bring either of said two sections into alinement with the main-track; a motor mounted upon said carriage; a fixed anchor member; and connections between said motor and anchor member for actuating said carriage.

6. In switch mechanism, the combination of a movable switch carriage; an anchor member; a motor mounted upon said carriage; a shaft driven by said motor; a crank fixed to said shaft; and a connecting rod articulating at one end with said crank and at the other end with said anchor-member.

Signed by me this 24th day of April, 1923.

D. S. ANDREWS.