Feb. 27, 1923. 1,446,774.

J. S. TOWNSEND.

LEVELING APPARATUS FOR LOCOMOTIVE JACKS.

FILED DEC. 9, 1920. 3 SHEETS—SHEET 1.

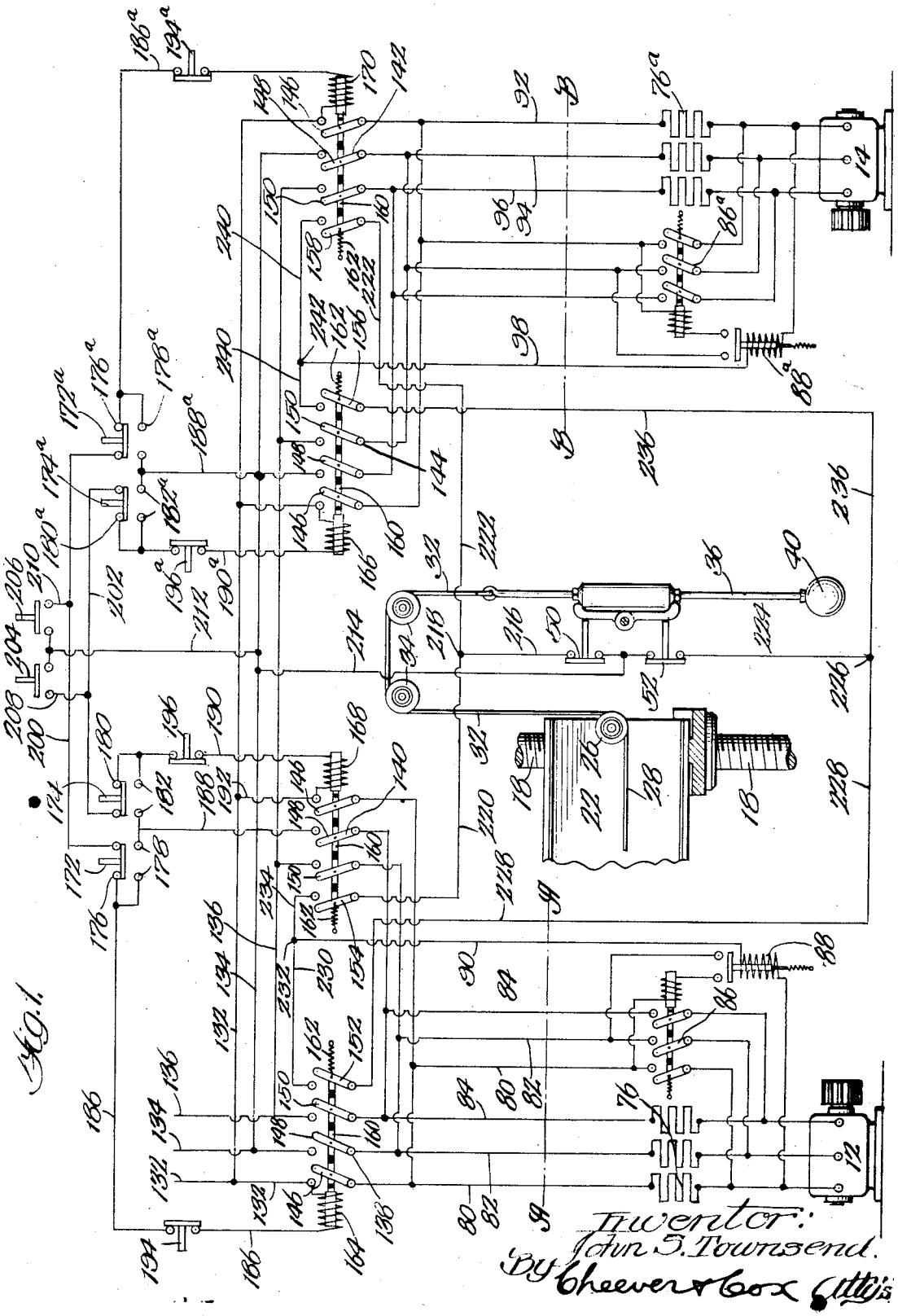


Fig. 1.

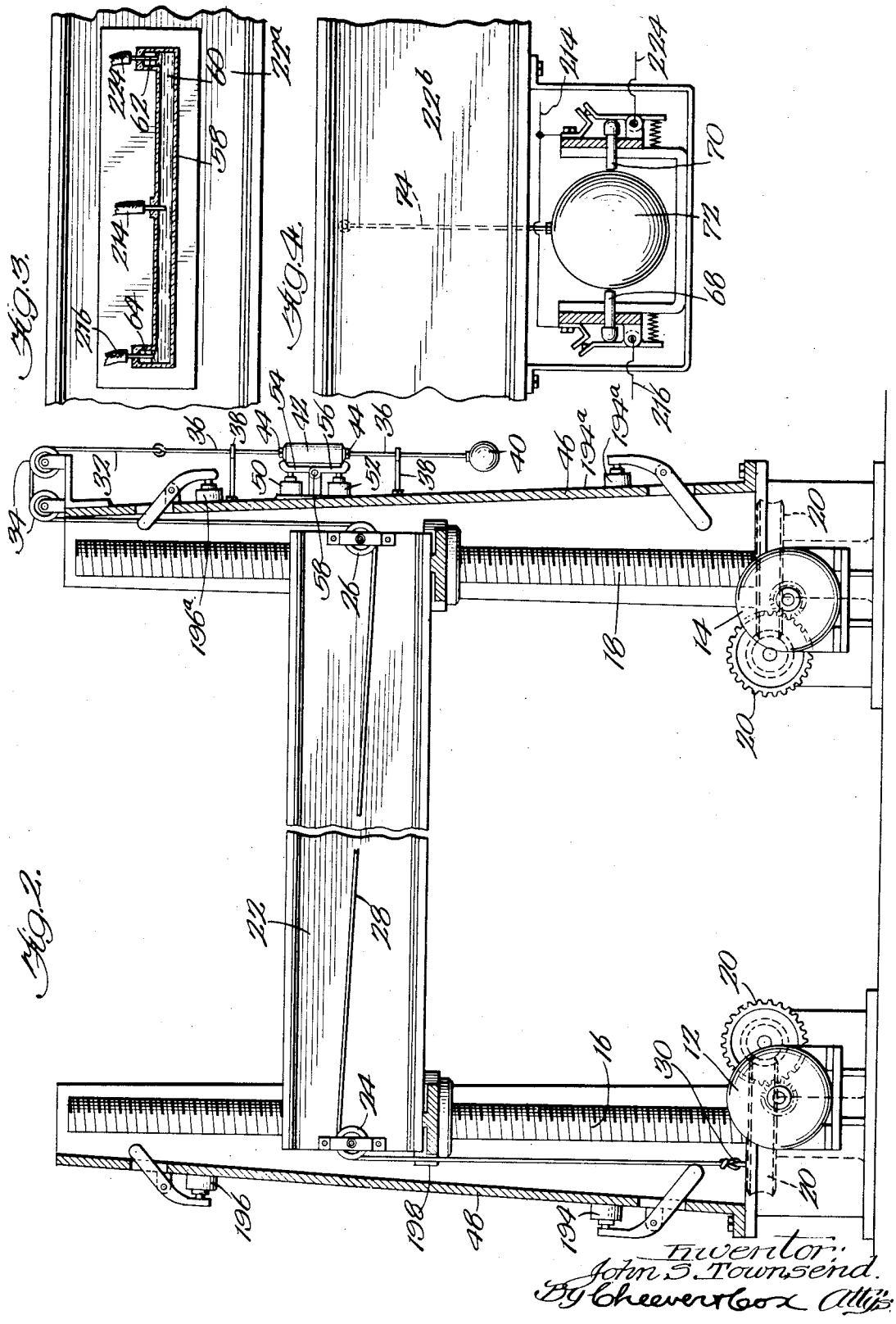
Inventor:
John S. Townsend.
By Cheever & Cox Attys

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Fig. 5.

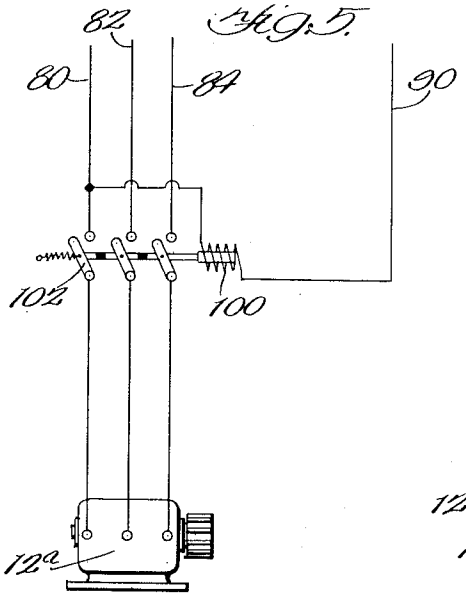


Fig. 7.

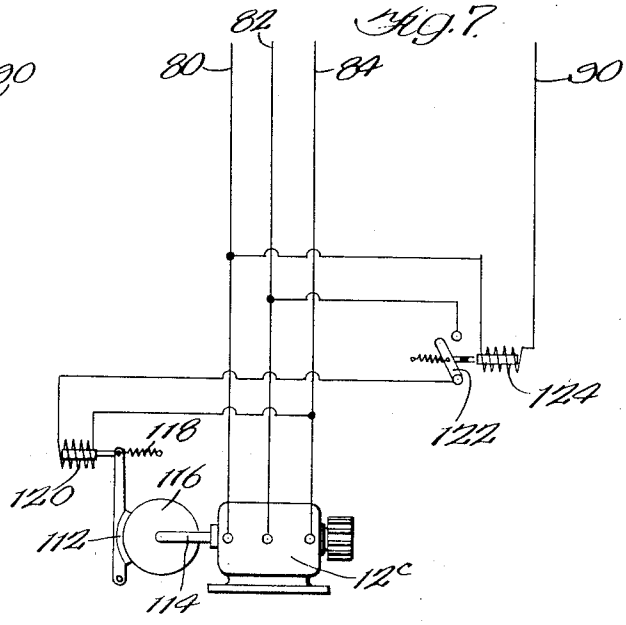


Fig. 6.

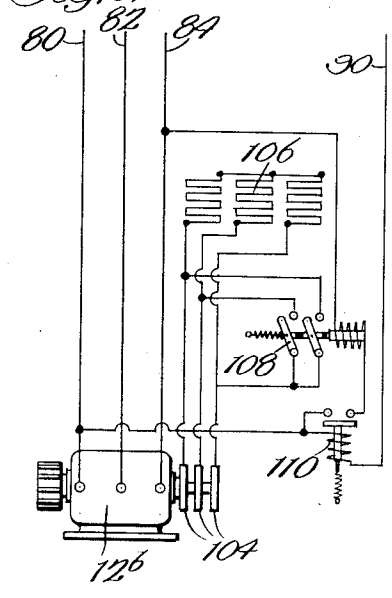
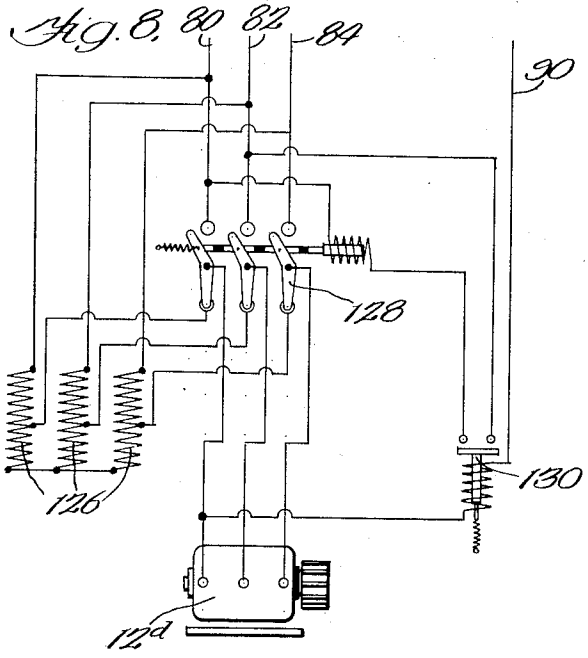


Fig. 8.



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By Cheever & Cox Attys.

Patented Feb. 27, 1923. 1,446,774

UNITED STATES PATENT OFFICE.

JOHN S. TOWNSEND, OF HARVEY, ILLINOIS, ASSIGNOR TO WHITING CORPORATION, OF HARVEY, ILLINOIS, A CORPORATION OF ILLINOIS.

LEVELING APPARATUS FOR LOCOMOTIVE JACKS.

Application filed December 9, 1920. Serial No. 429,373.

To all whom it may concern:

Be it known that I, JOHN S. TOWNSEND, a citizen of the United States, residing at Harvey, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Leveling Apparatus for Locomotive Jacks, of which the following is a specification.

U. S. Patents 1,085,734 to C. A. Hardy, February 3rd, 1914, and No. 1,107,706 to F. A. Rundle, August 18, 1914 illustrate generally, a mechanism, now in quite general use, for lifting railroad locomotives and other heavy objects thru the use of cross cars inserted at suitable points, under such locomotives or the like, each end of each bar being moved up and down by a separate mechanical lifting mechanism.

The object of this invention is to do away with the more or less cumbersome lifting mechanisms of said prior patents; to install at the end of each cross bar an independent electric motor mechanism controlling its adjacent bar end and to provide an automatic control mechanism for one or more pairs of opposite motors which manipulate the lifting of the locomotive or the like which will insure the load being carried upward in a position always parallel to that from which it started, thus removing the serious objection to individual electric motor equipment which has heretofore existed on account of the danger and in fact the certainty that the various motors will fail to operate in unison and thus allow the load to tilt; a very serious matter in lifting such a heavy bulky object as a locomotive where a comparatively slight deflection from level of one of the lifting bars might result in the entire locomotive sliding off from the jack mechanism with serious injury, not only to the locomotive itself, but the surrounding building and adjacent machinery. More definitely the object of this invention is to provide automatic mechanisms insuring the constant leveling of the locomotive as it is lifted by a plurality of electric motor operated hoisting devices at various points about it and to do this by mechanism which does not destroy the ability of the operator to, if desired, more or less limitedly manipulate a single one of the motors independently of the others.

The invention consists in mechanism for attaining the foregoing objects which is comparatively simple in construction; can be easily and economically applied; is satisfactory in use and is not liable to get out of order. More particularly the invention consists in the features and details of construction which will be hereafter more fully set forth in the specification and claims.

Referring to the drawings in which like numerals designate the same parts thruout the several views:—

Figure 1 is a wiring diagram showing one form of mechanism suitable for carrying out this invention in its preferred form, all the parts being in the position which they assume when everything is at rest with the load perfectly level.

Figure 2 is a side view of one level, switch operating mechanism which in the case illustrated happens to be the lifting beam which carries the locomotive or the like, showing its lifting mechanism and the devices manipulated by it for operating upon circuit diagram of Figure 1. This figure shows one particular form of switch mechanism which is operated when the beam gets out of predetermined, in the particular case here illustrated, level position.

Figures 3 and 4 show alternative forms of level operated switch mechanisms substitutable for that of 2.

Figure 1 shows one particular form, viz: a resistance device, for controlling the speed of a lifting motor.

Figures 5, 6, 7 and 8 show alternate means well known in the art for controlling the same motor which may be substituted for the specific means in Figure 1 without departing from the invention.

Referring particularly to Figure 2 there are two electric motors, 12 and 14, each driving its own lifting screw 16 and 18 respectively, thru gearing mechanism 20 without novelty herein. Suitably supported on, and driven vertically by these screws 16 and 18, is a cross member 22 which in the case shown is the cross bar for sustaining the locomotive or other objects. In normal construction the cross member 22 extends directly across the under side of the locomotive between screws 16 and 18 located on opposite sides of the track, not shown, on which the locomotive travels into position adjacent to the jack mechanism, but in so far as this cross member 22 performs the level function hereafter described of entering into the

speed control of the motors 12 and 14, it may be located in alignment with any two motor driven hoisting mechanisms located at any separated points with reference to the locomotive which it is desired to operate in unison. In other words, for this last mentioned or leveling purpose the member 22 may extend between motor driven hoisting mechanisms located wholly on one side of the locomotive or between such mechanisms located at opposite corners of the locomotive, as well as between such mechanisms located as shown on opposite sides of the locomotive.

In carrying out its level, switch operating function this cross bar 22 has at its opposite ends pulleys 24 and 26 over which pass a rope 28, one of whose ends 30 is attached to a stationary support while the opposite end 32 passes over pulleys 34 to the end of a rod 36 to which it is attached. This rod 36 is preferably reciprocatable through supports 38 and is preferably urged downward by suitable means, such as a weight 40 on its end. Rod 36 has adjustably mounted upon it, intermediate of its ends, a switch block 42 adjustably positioned thru the agency of suitable nuts 44, screw threaded on to the rod 36. The screws 16 and 18 are suitably protected by stationary walls 46 and 48, the former of which carries the supports 38. Suitably mounted on wall 46 between these supports are two level control switches 50 and 52, operated respectively by lever arms 54 and 56 independently pivoted at 58. The construction is such that when rod 36 moves upward, switch block 42 moves lever arm 54 to open switch 50 otherwise normally closed and that when rod 36 moves downward block 42 engages lever 56 to open normally closed switch 52.

From an inspection of Figure 2 it will be seen that when the right hand end of cross member 22 is higher than the left hand end, rod 36 will move downward and thus manipulate switch 52 and that when the left hand end of member 22 is higher than the right hand end rod 36 will be drawn upward and thus open switch 50. In other words, so far as motor control is concerned, the beam 22 and attached rope mechanism 28—36—42 is nothing but a level device of immaterial length which automatically operates the switches as its opposite ends are tilted.

Figure 3 shows merely another form of automatic level mechanism for operating switches 50—52 or their equivalents and attached parts. It consists essentially of a normally horizontal tube 58 carried on the beam 22^a, corresponding to member 22. The tube is partially filled with mercury 60, entered at its opposite ends by wire terminals 62 and 64 connected in the electric circuit exactly as switches 50 and 52 are, the result being that when beam 22^a tilts out of level one switch or the other of 62 and 64 is broken for the same purposes that switches 50 or 52 are opened.

Similarly in Figure 4 is shown two alternative switches 68 and 70, taking the place of switches 50 and 52 and alternatively operated by a pendulum mechanism 72, suspended from an alternative beam 22^b by a cord 74 or the like in the obvious manner, the result being that when beam 22^b gets ut of level. the pendulum 72 swings to strike and operate one of these switches 68 or 70 to perform the same functions as the corresponding switch 50 or 52.

Broadly stated, the problem to be solved is to provide an electric control mechanism for the electric motors 12 and 14, automatically operated by the opening and closing of the switches 50 and 52, or their substitutes, when operated by a level device, as for instance beam 22, to maintain the level mechanism and consequently the load whose condition it indicates substantially level in all positions regardless of which end of the level gets out of normal level position, and regardless of whether the device is engaged in raising or lowering the load. Stated in concrete form in terms of the specific mechanism shown, the problem is to provide an electric mechanism so manipulated by the switches 50 and 52 that when member 22 is moving upward and one of its ends, as its right hand end is too high, thereby indicating that motor 14 is moving too fast, that motor will be slowed down and that when lowering is being done and the same end of member 22 is too high, thereby indicating that motor 12 is moving too fast, the motor 22 will be slowed down. The problem is further to do this by mechanism which so interlocks as to produce this result, notwithstanding the fact that a given end of the level always operates the same switch regardless of whether the load is being raised or lowered.

For the purpose of illustrating the control of the motors 12 and 14 by the level control switches, whether they be switches 50 and 52 or 68 and 70 or 62 and 64 an apparatus having any sort of an electric apparatus diagram which will produce the desired result may be used without departing from this invention. Merely for the purpose of illustrating one manner of accomplishing results a three phase alternating current diagram is shown in Figure 1.

In the particular form of individual motor control mechanism shown in Figure 1, the mechanism below the line A—A includes a standard resistance device 76 fed by power wire 80, 82 and 84, a contactor mechanism 86 and a time relay mechanism 88 controlled by current taken from wire 80 carried thru wire 90.

This mechanism just described is so con-

structed that when mechanism to be hereafter described causes current to pass in a normal operation of electric devices of this class, such current flowing down wires 80, 82, 84 initially passes thru resistance 76 to start the motor 12. Almost instantly current flows thru time relay 88 and wires 90 to operate contactor 86 to admit the current directly to the motor and cutting out the resistance 76 whereupon motor 12 comes up to full speed. Control of this motor is effected thru the use of switch mechanism which will be hereafter described which cuts out the current in wire 90, thereby breaks the relay circuit 88, cuts out the contactor 86 and compels the power current to travel thru the resistance 76 and thus slow down the motor. The diagram in Figure 1 shows below the line B—B exactly the same mechanism, lettered in general with the same numerals followed by "a," for controlling the motor 14, the power wires however being in this instance designated 92, 94 and 96 and the control wire corresponding to wire 90 being designated 98.

Figure 5 shows the motor 12^a supplied by the power wires 80, 82 and 84 as before with the current which goes thru wire 90 controlling a magnet 100 which operates a contactor switch 102 which automatically opens when the current passing thru wire 90 is cut off, thus stopping the motor. This mechanism may be substituted for that of Figure 1 by properly connecting it in the obvious manner below the transverse line A—A or B—B.

Similarly the alternative motor control mechanism of Figure 6 may be substituted below the line A—A or B—B of Figure 1. In this construction the motor 12^b is what is known as a "slip ring" motor in which the armature shaft carries rings 104 connected to resistance coils 106, short circuited by the closing of two pole contactor 108 manipulated by a time relay 110, energized by current passing thru wire 90. When the current is removed from wire 90 the relay 110 operates to so manipulate the contactor 108 that the coils 106 are left in series with the secondary circuit of the motor 12^b, thus slowing it down.

Similarly the motor control mechanism of Figure 7 may be substituted in Figure 1 below the line A—A or B—B without departing from the invention. In this construction the motor 12^c is driven directly by current from the wires 80, 82 and 84 and its speed is regulated by a brake device 112, diagrammatically shown as applied to motor shaft 114. As in standard construction this brake is normally held on the brake wheel 116 by a spring 118 and is retracted from the brake wheel by magnet 120 when properly energized by electric current. This magnet 120 is so connected in the circuit to a single pole contactor switch 122 that as long as this switch is held closed as it is held when current passes thru magnet 124 and wire 90, the current from the circuit 80—82—84 energizes this magnet 120 and thus holds the brake 112 off from brake wheel 116. When, however, the mechanism hereafter described cuts the current out of wire 90 contactor 122 opens, thus deenergizing coil 120 and allowing spring 118 to partially or wholly set the brake, thus adding to the load of the motor 12^c and slowing it down.

Similarly the motor control mechanism of Figure 8 may be substituted below the line A—A or B—B without departing from this invention. In this form of the device the motor 12^d is, as in the case of Figure 1, driven at full speed by current supplied by wires 80—82 and 84 and the speed of the motor is reduced by throwing into the circuit the transformer mechanism 126, which takes the place of the resistance mechanism 76 of Figure 1. The throwing in of this transformer mechanism is effected by the manipulation of the three pole contactor 128 which is operated for this purpose in obvious manner when the current passing thru wire 90 is cut off, thus deenergizing time relay 130 which is in the circuit of wire 90, the result being that the transformer as is well known in the art reduces the voltage in the motor circuit, thus slowing it down.

The various motor slowing devices are cited merely as typical examples of many well known motor slowers which may be used without departing from the invention.

In the complete diagram of Figure 1 electric power is provided from any suitable source to main power wires 132, 134 and 136 selectively connectible to the wires 80—82 and 84 of motor 12 thru phase reversing contactors 138 and 140 and similarly connectible to the wires 92, 94 and 96 of motor 14 thru phase reversing contactors 142 and 144. Contactors 138 and 142 only being used when the load is to be lowered and 140 and 144 only being used when the load is to be hoisted.

Each one of these phase reversing contactors is provided with four poles, three of which 146, 148 and 150 are in each case standard parts required in the electric mechanism of the class described and without any reference to this invention. Each one of these contactors is also provided with an additional contact member, numbered respectively 152, 154, 156 and 158 adapted to perform functions hereafter described. The contactor bars of each contactor are in standard form mounted on a reciprocatable member 160 retracted by springs 162 to normally hold the respective contactor switches in open position shown in Figure 1. Member

160 and attached parts of contactor 138 is movable to the left against the action of its spring 162 whenever an electric current passes thru the adjacent magnet coil 164. The same action takes place in contactor 144 when magnet coil 166 is energized. Correspondingly member 160 of contactor 140 is moved to the right against the action of its spring 162 whenever magnet coil 168 is energized. The same action takes place in contactor 142 when magnet coil 170 is energized.

In order to provide means by which an operator may selectively control motor 12 to cause it to move in either direction, and thus correspondingly raise and lower its end of member 22 independent of the control of this motor in unison with any other motor two individual four pole switches 172 and 174 are provided. Switch 172 has two pairs of contacts 176 not of interest at the moment and two other contacts 178. Switch 174 has two similar pairs of contacts 180 and 182.

One terminal of magnet coil 164 is connected to power wire 132 while the other terminal is connected by wire 186 to one contact 178 of switch 172. The other contact 178 is connected by wire 188 to power wire 134, the result being that when the operator moves switch 172 downward from the position in Figure 1 to close contacts 178 the current flows thru magnet 164 and moves contact 138 to closed position, thus admitting current to the motor 12 in such a manner as to cause it to lower the end of member 22 controlled by it.

Similarly one contact 182 of switch 174 is connected to power wire 134 by wire 188 while the contact pole 182 is connected by wire 190 to magnet coil 168 whose opposite end is connected by wire 192 to power wire 132, with the result that when the operator moves switch 174 downward from the position shown in the drawing to close contacts 182, current is sent thru the circuit which includes magnet 168, thereby energizing it and rocking contactor 140 to the right to close it and thus send power current thru the motor to cause it, under well known practice, to move in the proper direction to hoist the end of member 22 controlled by it. In actual practical operation of the mechanism-switches 172 and 174 are of the hand held type viz: They are intended never to operate except when a person takes hold of one of them and moves it as described and holds it in that position.

Similarly motor 14 is provided with two switches 172^a and 174^a corresponding in construction and function to switches 172 and 174 whereby the operator can control motor 14 independently of any other motor in the system as 12. The wiring and contacts for these switches thus described on the right hand side of the diagram are numbered to correspond with that on the left hand, following the regular numeral with the small letter "a." By properly momentarily using the four switches 172—174—174^a and 172^a the operator can manipulate the motors 12 and 14 to accurately position the beam 22 before starting regular operations.

Included in the wire 186 is a limit switch 194 and included in the wire 190 is a limit switch 196, suitably positioned as shown in Figure 2 to be engaged by some convenient part, moving in unison with member 22, as for instance the guide 198, to open the particular switch engaged and thus stop further movement of the motor when a danger point is reached. The motor 14 is also protected by corresponding limit switches 194^a and 196^a.

The hand manipulated switches 172, 174, 172^a and 174^a are provided with mechanism which causes them to normally close their respective upper contacts 176, 180, 180^a and 176^a, as shown and leave the lower contacts, described, open. One contact 176 is connected to wire 186 and one contact 176^a is connected to wire 186^a. The two opposite terminals 176 and 176^a are connected together by a wire 200. Similarly the otherwise free terminals 180 and 180^a are connected together by wire 202. Adjacent to these wires 200 and 202 are placed a pair of multiple motor control switches, 204 for hoisting, and 206 for lowering. These multiple motor control switches are ordinary two pole switches of any suitable type. One pole of switch 204 is connected thru wire 208 to 202 and one pole of switch 206 is connected by wire 210 to 200. The opposite poles of switches 204 and 206 are connected to a common wire 212, whose opposite end is connected to power wire 134 which wire is in turn connected by wire 214 to one pole each of switches 50 and 52 heretofore described. The otherwise free pole of switch 50 is connected to wire 216, divided at 218, where one branch 220 leads to contact member 154 of hoisting contactor 140 while the other branch 222 leads to contact member 158 of lowering contactor 142. Similarly the otherwise free pole of switch 52 is connected to wire 224, which at division point 226 branches into two wires, one 228 leading thru contact member 152 of lowering contactor 138 to wire 230 which after passing thru division point 232 becomes wire 234 connected to the contact member 154, which is opposite to the connection of wire 220, so that when contactor member 154 closes, connection is made between wires 220 and 234. Similarly, the other branch of wire 224 beyond division point 226 becomes wire 236 which leads to the lower terminal of contactor bar 156. The upper terminal of contactor bar 156 is connected by wire 240 thru

division point 242 to the upper terminal of contactor bar 158. The result being that when contactor bar 158 closes its circuit current flows between wires 240 and 222. The upper end of wire 90 heretofore referred to connects into wire 230—234 at division point 232 and wire 98 connects into wire 240 at division point 242.

Normal operation.

When the operator wants to hoist beam 22 or any other part moving in unison with it, he closes switch 204, thus producing the same effect on motor 12 as though switch 174 were moved downward to close contacts 182 and producing the same effect on motor 14 as though switch 174[a] were moved downward to close contacts 182[a]. The result is that under normal hoped for conditions, both motors operate in unison and the part to be moved travels upward to successive positions parallel to its orginal position, that is to say, if the beam 22 were originally level, it will theoretically move upward in level position and if it were initially in a position angular to screws 16 and 18 it will move upward always parallel to that position.

Similarly, when switch 204 remains open and the operator closes switch 206, he produces the same effect on the circuits as though switch 172 were closed across contacts 178 and switch 172[a] were closed across contacts 178[a], with resulting theoretically uniform lowering of both ends of controlled members in the particular case here illustrated the beam 22.

The trouble is that in practice, due to friction and various other elements entering into the situation the electric motors exemplified by motors 12 and 14 lifting the locomotive may not be able to run at uniform speed and therefore produce a uniform lifting or lowering and the mechanism described is therefore provided for automatically slowing down the motor which runs too fast, until the moving control member in the particular case illustrated, the beam 22 is restored to its original angular position. The operation to produce this result will now be described.

Operation to maintain uniform movement.

Assume that switch 204 is closed to produce hoisting operation. This means that contactors 140 and 144 are moved to closed position. The result of this is that in the particular form of the motor control mechanism of Figure 1 contactors 86 are in closed position, thus cutting out from both motors the respective resistances 76. If now the right hand end of bar 22 is moving upward too fast it in the manner described early in the specification causes the rod 36 to move downward, thus opening switch 52. Under the hoisting conditions of normal operation assumed, switch 52, when closed, allowed current to flow from wire 234 down wire 214 thru the switch, thence thru wires 224, 236, contactor member 156, wire 240, division point 242, wire 98, time relay 88[a] and thence back to the line. Under the conditions heretofore fully described when the current is in time relay 88[a], contactor 86[a] is closed, with the result that resistance 76[a] is cut out from motor 14. When now switch 52 opens in the manner described current ceases to flow thru time relay 88[a], thus causing contactor 86[a] to open and throw in the resistance 76[a] to the motor 14, thus slowing down the motor and ultimately causing beam 22 to resume its normal relationship to the two screws 16 and 18, whereupon rope 28 causes rod 36 to move upward sufficiently to cause switch 52 to automatically close and reestablish current thru time relay 88[a], thus close contactor 86[a], thus cut out resistance 76[a] and restore the motor to normal operation.

Attention is called at this point to the fact that the other branch wire 228 of wire 224 leads to contactor member 152 of lowering contactor 138 and carries no current in a hoisting operation owing to the fact that lowering contactor 138 is open, with the result that opening the switch 52 produces no effect on motor 12.

Similarly if the left hand end of beam 22 goes too high it causes a rod 36 to rise, thus opening switch 50, which in obvious manner from the previous description of circuits opens time relay 88, thus opening contactor 86 and throwing resistance 76 into the circuit of motor 12, thus slowing down the motor and keeping the left hand end of beam 22 down until it reaches such a position that switch 50 again closes thus restoring the motor 12 to normal operation. Attention is here again called to the fact that in the hoisting operation wire 222 leading from switch 50 terminates in open contactor member 158 of lowering contactor 142 so that when switch 50 opens it has no effect whatever on motor 14, and only operates on motor 12.

Assuming now that the parts are in the position of Figure 1 and that the lowering operation is started by closing switch 206—this in the manner described closes contactors 138 and 142, but leaves contactors 140 and 144 open. The result produces a very essential feature of this invention, in that when under these conditions the right hand end of beam 122 is too high and therefore switch 52 opens it does not, as before, control motor 14, but it controls motor 12 and prevents it continuing to move the left hand end of the beam 22 downward too rapidly; and conversely it results in that if the left hand end of beam 22 is now too high, the opening of switch 50 does not slow down

motor 12, but does slow down motor 14 which is moving the right hand end of beam 22 downward too rapidly. The reason why this result is accomplished is that the contactors 138 and 142 being now closed while the other contactors 140 and 144 are open the current from switch 52 flows thru wire 128 and contactor bar 152 to time relay 88a, thus controlling motor 12 and it cannot as before get thru now open contacting bar 156 to relay 88 and conversely a current from switch 50 in wire 216 now flows thru wire 222 and contactor bar 158 to time relay 88a and cannot as before get thru formerly closed contactor bar 154 to time relay 88. Except that current from the switches 50 and 52 now controls opposite time relays and consequently opposite motors from what it did in the hoisting operation, the mechanism operates to restore load equilibrium, just as it did in the hoisting operation.

It has heretofore been explained that the separate motor control mechanism of Figures 5, 6, 7, and 8 may be substituted for that of Figure 1 to control the motor, the switches 50 and 52 operating in each case to energize or deenergize, as the case may be, the coils of the devices 100, 110, 124 and 130 in exactly the same way that relays 80, and 88a are operated.

The operation of the device is actually the same, irrespective of whether the switch operating mechanism of Figures 2, 3 or 4 are used.

In the claims the word "level" is used as including not only an object always actually level in all its positions, but one which if initially out of level moves successively thru positions parallel to its original position.

Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:—

1. In a hoisting apparatus, two oppositely disposed electric motor driven hoisting mechanisms, a level indicating device operatively connected to each, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, or to lower, and means operated by the level indicating device when and if the motors do not maintain it level to manipulate the motor control mechanism of the proper motor to restore the indicating device to level.

2. In a hoisting apparatus, two oppositely disposed electric motor driven hoisting mechanisms, a level indicating device operatively connected to each, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist or to lower, means operated by the level indicating device when and if the motors do not maintain it level to manipulate the motor control mechanism of the proper motor to restore the indicating device to level and interswitching means operated on the selection of the particular motor operating means whereby in a given position of the level indicating device out of level one motor is controlled on hoisting and the other motor is controlled on lowering.

3. In a device of the class described, two oppositely disposed electric motor driven hoisting mechanisms, a load carrying member operatively connected to each such mechanisms, independent means controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, and to lower, means carried by the load carrying member adapted to remain practically stationary with reference to the load carrying member when the latter moves at all times parallel to its original position, and adapted to shift its position with reference to the load carrying member if the load carrying member fails to maintain said uniform position, and means operative by said carried means when it moves with reference to the load carrying member to manipulate the control of the necessary motor to restore the load carrying member to proper position relative to its first position.

4. In a hoisting apparatus, two oppositely disposed electric motor driven hoisting mechanisms, each including a vertical revolving screw, a load carrying bar threaded on said screws, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, other selectively operatable means for driving the motors in unison to lower, a level indicating device carried by the load carrying member and means operated by the level indicating device when and if the motors do not maintain the load carrying member substantially level to manipulate the motor control mechanism of the proper motor to restore the indicating device to level.

5. In a hoisting apparatus, two oppositely disposed electric motor driven hoisting mechanisms, a single level indicating device operatively connected to each, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, other selectively operatable means for driving the motors in unison to lower, and means operated by the level indicating device when and if the motors do not maintain it level to manipulate the motor control mechanism of one motor in the hoisting operation and to correspondingly manipulate the opposite motor in the lowering operation when the level indicating device is in the same position out of normal in both cases.

6. In a hoisting apparatus, two oppositely disposed electric motor driven hoisting mechanisms, a single level indicating device operatively connected to each, independ-

ent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, other selectively operatable means for driving the motors in unison to lower, means operated by the level indicating device when and if the motors do not maintain it level to manipulate the motor control mechanism of one motor in the hoisting operation and to correspondingly manipulate the opposite motor in the lowering operation when the level indicating device is in the same position out of normal in both cases, and interlocking means actuated on the selection and operation of the hoisting or lowering mechanism which prevents the level indicating device in the same position operating the same motor in both the hoisting and lowering operation.

7. In a hoisting apparatus two oppositely disposed electric motor driven hoisting mechanisms, a level indicating device operatably connected to each, independent means for controlling the speed of each motor, including an electric circuit and a switch, selectively operatable means for causing the motors to hoist in unison or lower in unison, means operated by the level indicating device normally engaging but not operating both of said switches adapted when and if the motors do not maintain the level indicating device level to operate the proper one of said switches to effect the control of a separate one of the motors to restore the indicating device to level.

8. In a hoisting apparatus two oppositely disposed electric motor driven hoisting mechanisms, a level indicating device operatably connected to each, independent means for controlling the speed of each motor, including an electric circuit and a switch, selectively operatable means for causing the motors to hoist in unison or lower in unison, means operated by the level indicating device normally engaging but not operating both of said switches adapted when and if the motors do not maintain the level indicating device level to operate the proper one of said switches to effect the control of a separate one of the motors to restore the indicating device to level and interswitching means between said first mentioned switches and their respective motor controls operated and interlocked by the selection of the operating device for hoisting or lowering as the case may be, whereby when the level indicating device moves out of level to a given position in hoisting it operates the control of one motor and when it assumes the same position in lowering it effects the control of the opposite motor.

9. In a hoisting apparatus two oppositely disposed electric motor driven hoisting mechanisms, a level indicating device operatably connected to each, independent means for controlling the speed of each motor, including an electric circuit and a switch, selectively operatable means for causing the motors to hoist in unison or lower in unison, means operated by the level indicating device normally engaging but not operating both of said switches adapted when and if the motors do not maintain the level indicating device level to operate the proper one of said switches to effect the control of a separate one of the motors to restore the indicating device to level, interswitching means between said first mentioned switches and their respective motor controls operated and interlocked by the selection of the operating device for hoisting or lowering, as the case may be, whereby when the level indicating device moves out of level to a given position in hoisting it operates the control of one motor and when it assumes the same position in lowering it effects the control of the opposite motor and means preventing simultaneous effect on the control of the other motor.

10. In a hoisting apparatus two oppositely disposed electric motor driven hoisting mechanisms, a level indicating device operatively connected to each, independent means for controlling the speed of each motor, means for operating the two motors in unison to move the hoisting mechanisms in unison and consequently move the level indicating device from position to position parallel to itself, and means interposed between the level indicating mechanism and the respective motor control whereby if the level indicating mechanism is tilted one way from its just described normal position it manipulates one motor and if it is tilted in the opposite direction it manipulates the opposite motor to, in each case, restore the level indicating device to normal position.

11. In a hoisting apparatus two oppositely disposed electric motor driven hoisting mechanisms, a level indicating device operatively connected to each, independent means for controlling the speed of each motor, means for operating the two motors in unison to move the hoisting mechanisms in unison and consequently move the level indicating device from position to position parallel to itself, means interposed between the level indicating mechanism and the respective motor control whereby if the level indicating mechanism is tilted one way from its just described normal position it manipulates one motor and if it is tilted in the opposite direction it manipulates the opposite motor to, in each case, restore the level indicating device to normal position, means for selectively causing the motors to operate in unison to move the level indicating device in either selected direction, and interlocking switch devices operated on the selection of the direction of movement of the hoisting

mechanism operating to cause the level indicating device when in a given position, out of level, to control one motor in hoisting and when in the same position in lowering to control the opposite motor.

12. In a hoisting apparatus, two oppositely disposed electric motor driven hoisting mechanisms, an independent electric circuit for each motor hoisting mechanism equipped with switches and co-related devices by which an operator may independently operate each motor mechanism in either direction, limit switches in the circuit of each motor hoisting mechanism operatable by a moving member to break the circuit of that particular motor to stop it independently of the other motor, a load carrying member connecting and adapted to be driven by the electric motor driven hoisting mechanisms adapted as it assumes different proper positions to operate said limit switches, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, and to lower, a level indicating device moving in unison with the load carrying member, and means operative by the level indicating device when and if the motors do not maintain the load carrying member level, to manipulate the motor controlling mechanism of the proper motor to restore the load to level.

13. In a hoisting apparatus, two oppositely disposed electric motor driven hoisting mechanisms, an independent electric circuit for each motor hoisting mechanism equipped with switches and co-related devices by which an operator may independently operate each motor mechanism in either direction, limit switches in the circuit of each motor hoisting mechanism operatable by a moving member to break the circuit of that particular motor to stop it independently of the other motor, a load carrying member connecting and adapted to be driven by the electric motor driven hoisting mechanisms adapted as it assumes different proper positions to operate said limit switches, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, and to lower, a level indicating device moving in unison with the load carrying member, means operative by the level indicating device when and if the motors do not maintain the load carrying member level, to manipulate the motor controlling mechanism of the proper motor to restore the load to level and interswitching means operated on the selection of the particular direction of motion of both motors whereby in a given position of the level indicating device, out of level, one motor is controlled on hoisting, and the other motor is controlled on lowering.

14. In a hoisting apparatus two oppositely disposed three phase motor driven hoist mechanisms, independent electric circuits for each motor hoisting mechanism equipped with two independent switches, a phase reversing contactor in circuit with each motor and one switch, adapted when manipulated by the operation of its particular switch to cause the motor to operate in a different direction from that which it is operated when the other of the two switches is operated, a load carrying member connecting and adapted to be driven up and down by the motor driven mechanism, electric circuits connecting the two first mentioned independent motor circuits equipped with two independent switches each adapted when operated to simultaneously drive both motors in the opposite direction from the motion driven by the opposite switch, a level indicating device normally movable in unison with the load carrying member, and means operated by the level indicating device when and if the motors do not maintain the load carrying member level to selectively manipulate the phase reversing contactors in proper manner to control a motor to restore the load carrying member to level.

15. In a hoisting apparatus two oppositely disposed three phase motor driven hoist mechanisms, independent electric circuits for each motor hoisting mechanism equipped with two independent switches, a phase reversing contactor in circuit with each motor and one switch, adapted when manipulated by the operation of its particular switch to cause the motor to operate in a different direction from that which it is operated when the other of the two switches is operated, a load carrying member connecting and adapted to be driven up and down by the motor driven mechanism, electric circuits connecting the two first mentioned independent motor circuits equipped with two independent switches each adapted when operated to simultaneously drive both motors in the opposite direction from the motion driven by the opposite switch, a level indicating device normally movable in unison with the load carrying member, means operated by the level indicating device when and if the motors do not maintain the load carrying member level to selectively manipulate the phase reversing contactors in proper manner to control a motor to restore the load carrying member to level, and interswitching means (on the phase reversing contactors) operated on the selection of the particular direction of motion of both motors whereby in a given position of the level indicating device, out of level, one motor is controlled on hoisting, and the other motor is controlled on lowering.

16. In a hoisting apparatus, two oppositely disposed power motor driven hoisting

mechanisms, a level indicating device operatively connected to each, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, or to lower, and means automatically operated by the level indicating device when and if the motors do not maintain it level to manipulate the motor control mechanism of the proper motor to restore the indicating device to level.

17. In a hoisting apparatus, two oppositely disposed power motor driven hoisting mechanisms, a level indicating device operatively connected to each, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist or to lower, means operated by the level indicating device when and if the motors do not maintain it level to manipulate the motor control mechanism of the proper motor to restore the indicating device to level and interswitching means operated on the selection of the particular motor operating means whereby in a given position of the level indicating device out of level, one motor is controlled on hoisting and the other motor is controlled on lowering.

18. In a device of the class described, two oppositely disposed power motor driven hoisting mechanisms, a load carrying member operatively connected to each of such mechanisms, independent means controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, and to lower, means carried by the load carrying member adapted to remain practically stationary with reference to the load carrying member when the latter moves at all times parallel to its original position, and adapted to shift its position with reference to the load carrying member if the load carrying member fails to maintain said uniform position, and means operative by said carried means when it moves with reference to the load carrying member to manipulate the control of the necessary motor to restore the load carrying member to proper position relative to its first position.

19. In a hoisting apparatus, two oppositely disposed power motor driven hoisting mechanisms, each including a vertical revolving screw, a load carrying bar threaded on said screws, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, other selectively operatable means for driving the motors in unison to lower, a level indicating device carried by the load carrying member and means operated by the level indicating device when and if the motors do not maintain the load carrying member substantially level, to manipulate the motor control mechanism of the proper motor to restore the indicating device to level.

20. In a hoisting apparatus, two oppositely disposed power motor driven hoisting mechanisms, a single level indicating device operatively connected to each, independent means for controlling the speed of each motor, selectively operated means for driving the motors in unison to hoist, other selectively operatable means for driving the motors in unison to lower, and means operated by the level indicating device when and if the motors do not maintain it level to manipulate the motor control mechanism of one motor in the hoisting operation and to correspondingly manipulate the opposite motor in the lowering operation when the level indicating device is in the same position out of normal in both cases.

21. In a hoisting apparatus, two oppositely disposed power motor driven hoisting mechanisms, a level indicating device operatably connected to each, independent means for controlling the speed of each motor, including an electric circuit and a switch, selectively operatable means for causing the motors to hoist in unison or lower in unison, means operated by the level indicating device normally engaging but not operating both of said switches adapted when and if the motors do not maintain the level indicating device level to operate the proper one of said switches to effect the control of a separate one of the motors to restore the indicating device to level, and interswitching means between said first mentioned switches and their respective motor controls operated and interlocked by the selection of the operating device for hoisting or lowering as the case may be, whereby when the level indicating device moves out of level to a given position in hoisting it operates the control of one motor and when it assumes the same position in lowering it effects the control of the opposite motor.

22. In a hoisting apparatus, two oppositely disposed power motor driven hoisting mechanisms, a level indicating device operatably connected to each, independent means for controlling the speed of each motor, including an electric curcuit and a switch, selectively operatable means for causing the motors to hoist in unison or lower in unison, means operated by the level indicating device normally engaging but not operating both of said switches adapted when and if the motors do not maintain the level indicating device level to operate the proper one of said switches to effect the control of a seperate one of the motors to restore the indicating device to level, interswitching means between said first mentioned switches and their respective motor controls operated and interlocked by the selection of the operating device for hoisting or lowering, as the case may be.

23. In a hoisting apparatus, two oppo-

sitely disposed power motor driven hoisting mechanisms, a single level indicating device operatively connected to each, independent means for controlling the speed of each motor, selectively operatable means for driving the motors in unison to hoist, other selectively operatable means for driving the motors in unison to lower, means operated by the level indicating device when and if the motors do not maintain it level, to manipulate the motor control mechanism of one motor in the hoisting operation and to correspondingly manipulate the opposite motor in the lowering operation when the level indicating device is in the same position out of normal in both cases, and interlocking means actuated on the selection and operation of the hoisting or lowering mechanism which prevents the level indicating device in the same position operating the same motor in both the hoisting and lowering operation.

24. In a hoisting apparatus, two oppositely disposed power motor driven hoisting mechanisms, a level indicating device operatably connected to each, independent means for controlling the speed of each motor, including an electric circuit and a switch, selectively operatable means for causing the motor to hoist in unison or lower in unison, means operated by the level indicating device normally engaging but not operating both of said switches, adapted when and if the motors do not maintain the level indicating device level, to operate the proper one of said switches to effect the control of a separate one of the motors to restore the indicating device to level, whereby when the level indicating device moves out of level to a given position in hoisting it operates the control of one motor and when it assumes the same position in lowering it effects the control of the opposite motor and means preventing simultaneous effect on the control of the other motor.

25. In a hoisting apparatus, two oppositely disposed power motor driven hoisting mechanisms, a level indicating device operatively connected to each, independent means for controlling the speed of each motor, means for operating the two motors in unison to move the hoisting mechanism in unison and consequently move the level indicating device from position to position parallel to itself, and means interposed between the level indicating mechanism and the respective motor control whereby if the level indicating mechanism is tilted one way from its just described normal position it manipulates one motor and if it is tilted in the opposite direction it manipulates the opposite motor to, in each case, restore the level indicating device to normal position.

26. In a hoisting apparatus, two oppositely disposed power motor driven hoisting mechanisms, a level indicating device operatively connected to each, independent means for controlling the speed of each motor, means for operating the two motors in unison to move the hoisting mechanisms in unison and consequently move the level indicating device from position to position parallel to itself, means interposed between the level indicating mechanism and the respective motor control whereby if the level indicating mechanism is tilted one way from its just described normal position it manipulates one motor and if it is tilted in the opposite direction it manipulates the opposite motor to, in each case, restore the level indicating device to normal position, means for selectively causing the motors to operate in unison to move the level indicating device in either selected direction, and interlocking switch devices operated on the selection of the direction of movement of the hoisting mechanism operating to cause the level indicating device when in a given position, out of level, to control one motor in hoisting and when in the same position in lowering to control the opposite motor.

In witness whereof, I have hereunto subscribed my name in the presence of a witness.

JOHN S. TOWNSEND.

Witness:
VELMA GRIFFITH.