(No Model.) 4 Sheets—Sheet 1.

F. E. HERDMAN.

ELEVATOR.

No. 507,617. Patented Oct. 31, 1893.

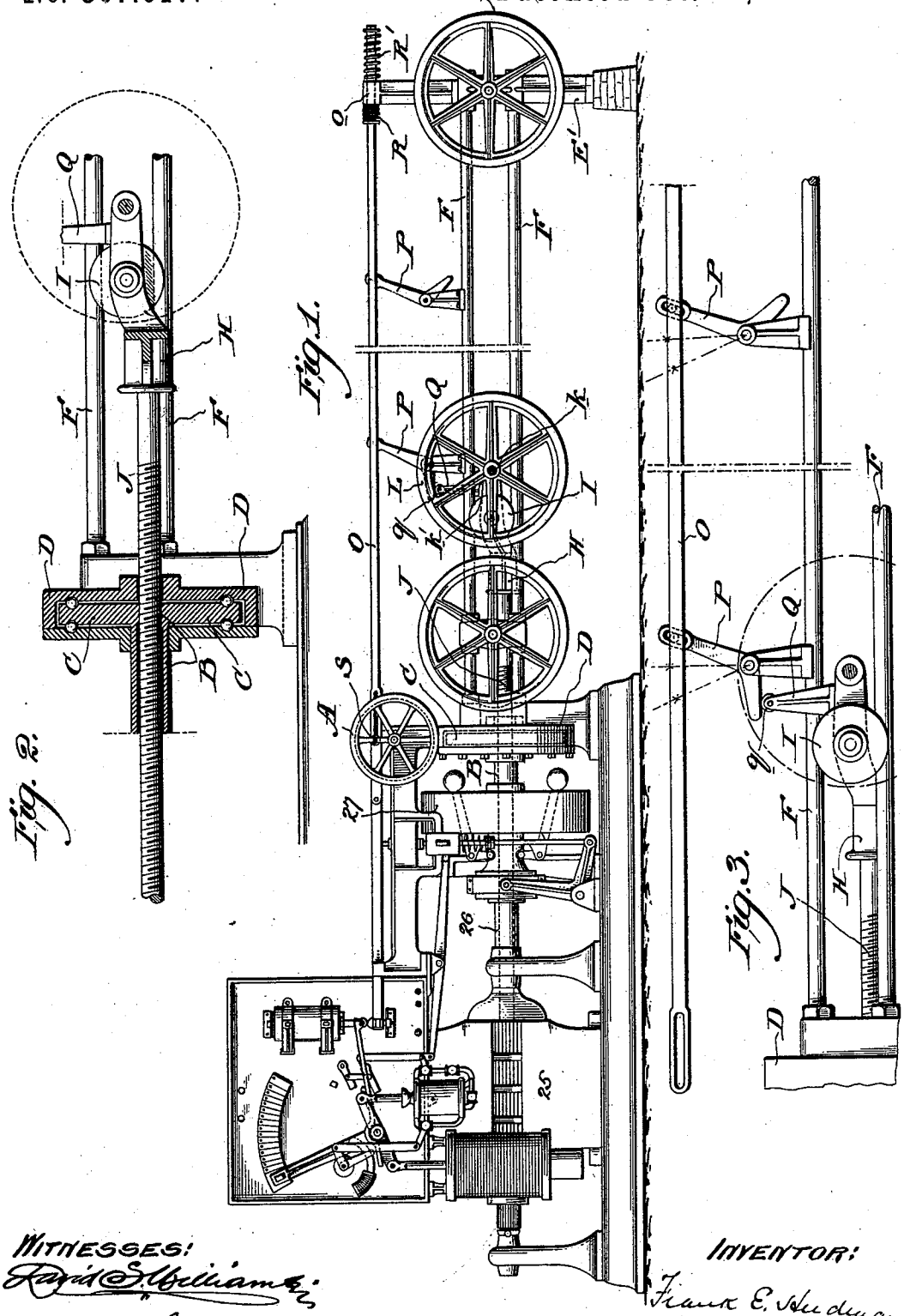

Fig. 1.

Fig. 2.

Fig. 3.

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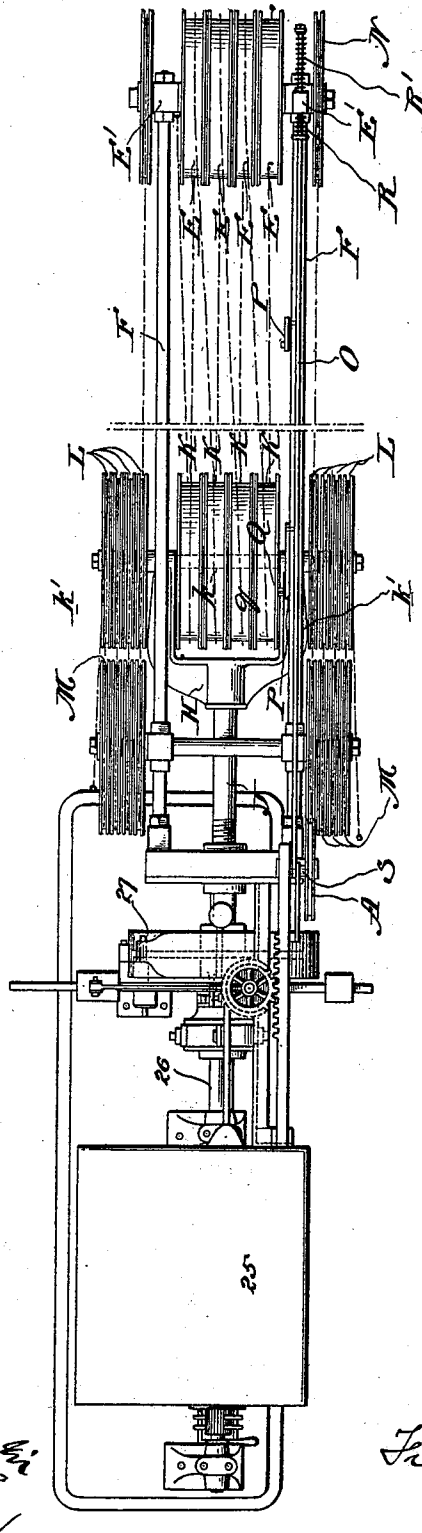

Fig. 4.

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(No Model.)

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ELEVATOR.

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Fig. 6

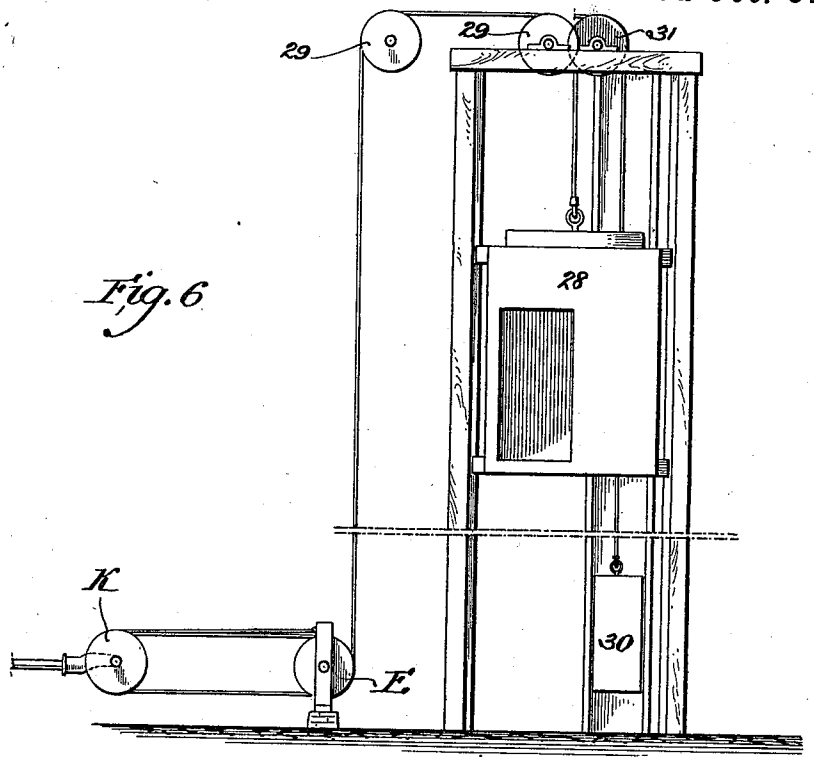
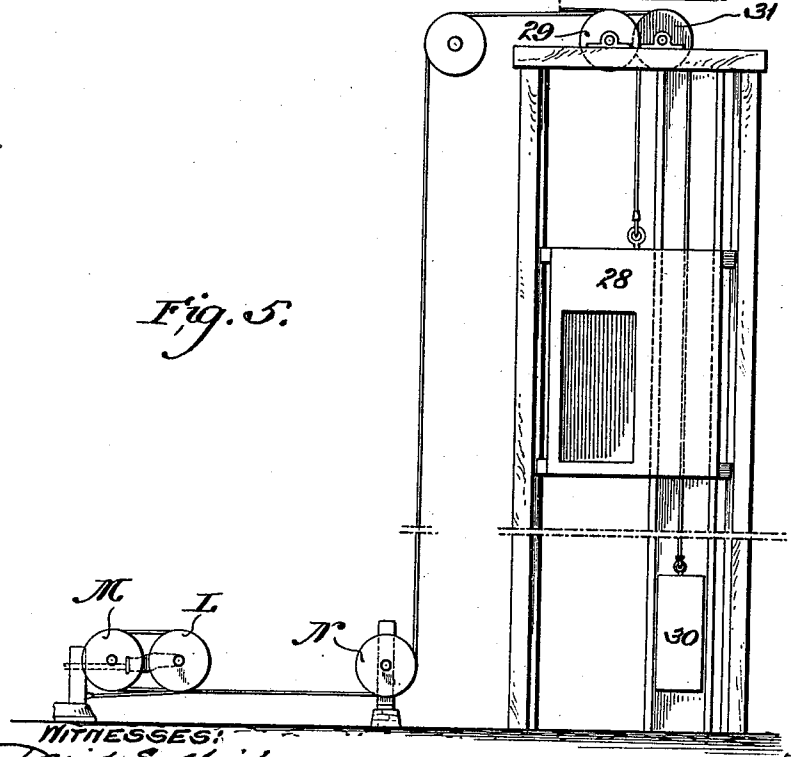


Fig. 5.



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(No Model.) 4 Sheets—Sheet 4.

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ELEVATOR.

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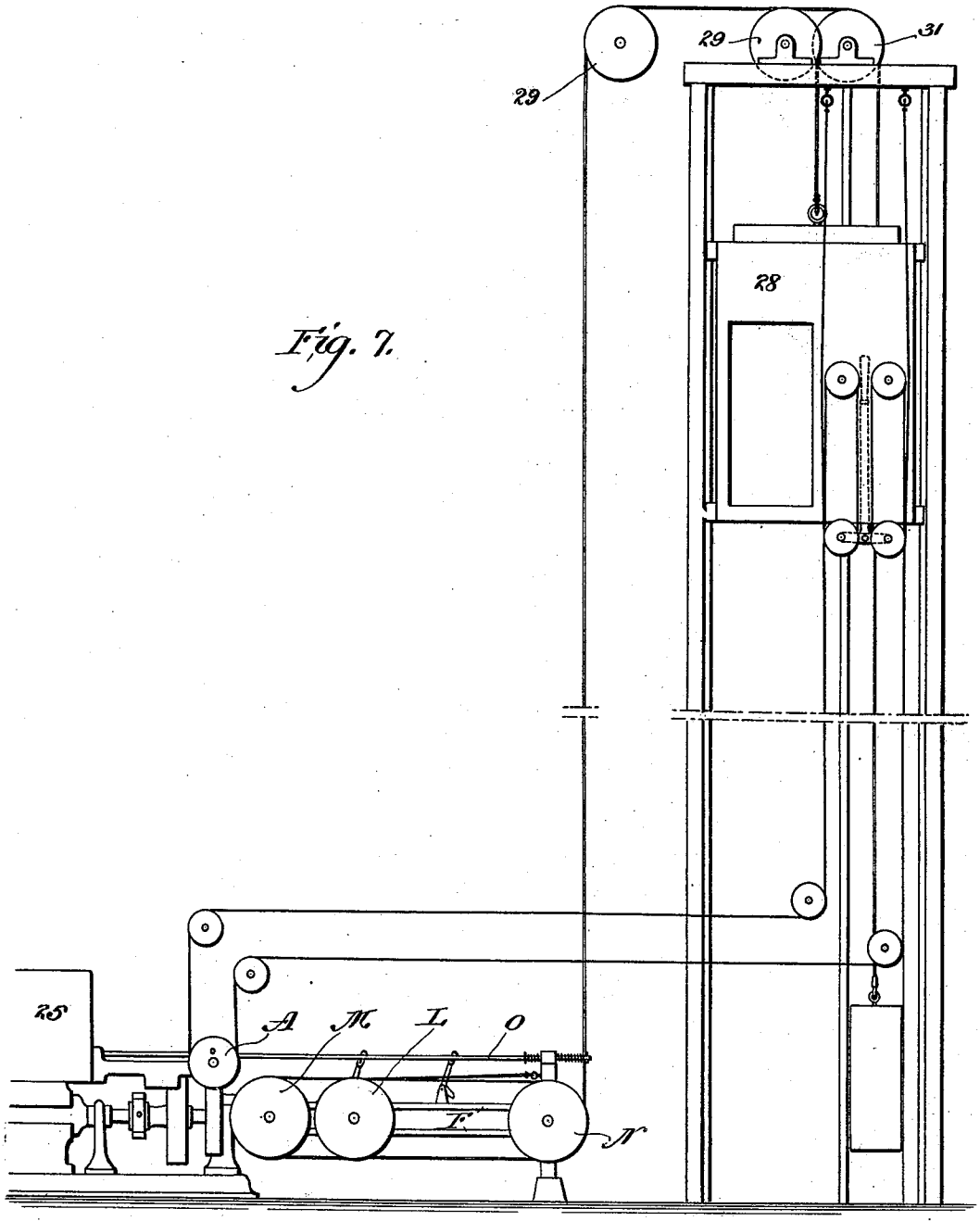
Fig. 7.



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UNITED STATES PATENT OFFICE.

FRANK E. HERDMAN, OF INDIANAPOLIS, INDIANA.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 507,617, dated October 31, 1893.

Application filed November 22, 1892. Serial No. 452,786. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. HERDMAN, a citizen of the United States, residing at Indianapolis, county of Marion, and State of Indiana, have invented a new and useful Improvement in Elevators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to that class of elevators in which traveling sheaves are used and consists in certain combinations to be hereinafter particularly set out whereby an improved result is obtained.

I will describe my construction as applied to an elevator driven by an electric motor, although, except wherein that class of motor is essential, the same may be used with other sources of power than electric.

In the drawings:—Figure 1 is a side elevation of the elevator driving apparatus. Fig. 2 is a detached sectional view on the line *x*—*x*, Fig. 4. Fig. 3 is a detached side elevation of elevator driving mechanism on enlarged scale. Fig. 4 is a plan view of elevator driving mechanism. Fig. 5 is a front elevation of elevator shaft and counter-balance mechanism. Fig. 6 is a front elevation of elevator shaft and connection between the elevator and elevator driving mechanism. (In Fig. 6 the counterbalance sheaves are removed so that the driving sheaves may be shown.) Fig. 7 is a view, in side elevation, of the elevator shaft, showing connection between the car and the operating sheave.

25 is an electric motor of which 26 is the shaft.

27 is a brake wheel for the motor shaft.

B is a nut coupled to the brake wheel and motor shaft so as to revolve with the motor shaft. This nut has a flange C, the purpose of which is to take the end thrust bearing in either direction. The flange C is placed in a chamber or box D which contains oil. The shaft 26 is made hollow, as will hereinafter be fully described. To the right of the elevator operating mechanism are placed the sheaves E, the said sheaves being mounted on the stand E′. The stand E′ holding these sheaves is connected by rods F F to the casing or frame work of the machine. Between these rods is a cross-head H provided with rollers I I which travel upon said rods F, F. To the crosshead H is attached the rod J threaded at one end, and on which threaded end the nut B works.

k is a shaft secured to the crosshead H by frame *k′ k′*. On this shaft *k* are placed the sheaves K. It can be readily seen, as the motor operates in either direction, the revolution of the nut B causes the screw J to travel in one direction or the other, according to the direction of the motor, which moves the crosshead H in the corresponding direction, and with it travel sheaves K. Lifting cables from the car 28 pass down from overhead sheaves 29 around one of the sheaves E and back and around one of the sheaves K and thence around the next sheave E, and continues thus until the desired gear of the machine is obtained, the cables being finally attached to a lug on the frame carrying the shafts of the sheaves E. If the operator desires that the elevator shall ascend, the motor is operated so as to draw the sheaves K from the sheaves E, thus drawing the cables and lifting the car. If he desires to descend, the motor is operated so as to cause the sheaves K to travel toward the sheaves E, thus allowing the car to fall.

In order to arrange for partially counterbalancing the load so that when lifting a full load the motor need only operate to lift a proportionate part of that load and the counterbalance carry up the remaining part, and when descending, the motor has to act only against the counterbalance, the following mechanism is used: To the shaft *k*, carried by the cross-head H, on either side are placed the sheaves L, and upon a shaft to the rear of the cross head are placed sheaves *m*. Upon each end of the shaft carrying the sheaves E are placed sheaves N. Cable or cables (preferably two) pass from a counterbalance, 30, around the sheaves 31, down from the top of the shaft, one around one sheave N, and one around the other sheave N. These pass directly back and in each case around one sheave M, thence around one sheave L, and continue around these two sets of sheaves, L and M, until the desired gear is made, when the ends of the cables are attached to the bed plate of the machine. By this arrangement a constant draw is obtained on the sheaves L toward the sheaves M and consequently tends

to force the crosshead of the screw in that direction. If the car with its load tends to draw the sheaves K toward the sheaves E, in consequence the work done to lift the car is the difference between this draft and the one due to the counter balance between the sheaves L and M. If the car comes down empty of course, there is no draw between the sheaves E and K, and, in consequence, the sheaves K must travel toward the sheaves E. For the car to descend, the motor must do an amount of work sufficient to lift the counterbalance attached to the cablespassing around sheaves L and M; and in ascending, the motor must do work equal to the difference of the load in the car and the weight of this counterbalance, and by this means, a partial counterbalancing of the load in the car is obtained, which lessens the maximum strain upon the motor. The following mechanism is provided to automatically stop the elevator at its greatest height and at the lowest point of its travel. A rod O is placed in the line of travel of the crosshead H, and upon this rod at points corresponding to the extreme end of the travel of said crosshead, in either direction, are placed bell-cranks P. To the crosshead is attached an arm Q, in such position that it is adapted to strike the arm of the bell-crank P. The arm Q can, if desired, have at its end a roller *q*. The end of the rod O passes through the orifice in the stand *o* and has surrounding said rod, springs R and R′. The rod O is also provided with a slot through which a pin S, upon the operating sheave A, passes, this operating sheave A being connected in the ordinary manner with the elevator and with the source of power. When the rod O is in its central position this slot is so located that the operating sheave can be thrown to its full extent in either direction. The lower arm of each bell crank P when in the central position has sufficient incline downward, so that when the sheaves K reach that end of the travel the arm Q of the crosshead strikes the lower arm of this bell crank and straightens it, and in this way, carries the rod O in the opposite direction to the throw of the operating sheave A. As either throw of the operating sheave A is sufficient to carry the pin to the end of the slot in the rod O, the movement of the rod O brings this pin back to the central position and consequently stops the elevator. The rod O is held in this position until the elevator is started in the opposite direction. To operate it in the opposite direction, of course, the pin on the operating sheave is free to move in the slot in the rod O in that direction, and as soon as the arm Q on the cross head is free from the bell crank P the springs R and R′ bring the rod to its central position. The springs R and R′ may be dispensed with as the rod O is free to move when the arm Q has left the bell crank P, and, in consequence, when the cross-head reaches the other end of the travel the arm Q strikes the other bellcrank P and the power is again shut off in the manner before described.

By my arrangement of causing the nut to revolve and the screw to be fixed I am able to keep the nut which has the greatest work to perform always in a bath of oil. If a construction were used where the screw revolved, and the nut were placed in the crosshead so that it, not the screw, traveled, it is very difficult to keep it properly lubricated, and by causing the nut to revolve, as before stated, and the screw to travel, I can always keep the nut perfectly lubricated, and the shaft, being hollow, the screw can pass directly back through the center of this bath, as the sheaves draw toward the motor. The chamber D containing oil, the nut and the end thrust bearings are kept constantly well lubricated.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In combination with a motor, a shaft operated by said motor, a nut secured to and revolving with said shaft, traveling sheaves, a cross head to which said sheaves are connected, a threaded rod, connected to the traveling sheaves and adapted to work in said nut, the end of said motor shaft being hollow and said rod being adapted to enter said hollow shaft, an elevator car and lifting cables connecting said sheaves and elevator car.

2. In combination with a motor, a shaft operated by said motor, a nut secured to and revolving with said shaft, a chamber or box adapted to contain a lubricant in which said nut revolves, traveling sheaves, a cross head to which said sheaves are connected, a threaded rod, connected to the traveling sheaves and adapted to work in said nut, an elevator car and lifting cables connecting said sheaves and elevator car.

3. In combination with a motor, a shaft operated by said motor, a nut secured to and revolving with said shaft, a chamber or box adapted to contain a lubricant in which said nut revolves, traveling sheaves, a cross head to which said sheaves are connected, a threaded rod, connected to the traveling sheaves and adapted to work in said nut, the end of said motor shaft being hollow and said rod being adapted to enter said hollow shaft, an elevator car and lifting cables connecting said sheaves and elevator car.

4. In combination with a motor, a shaft operated by said motor, a nut secured to and revolving with said shaft, said nut being provided with a flange, a chamber or box adapted to contain a lubricant in which said flange is placed, traveling sheaves, a cross head to which said sheaves are connected, a threaded rod, connected to the traveling sheaves and adapted to work in said nut, an elevator car and lifting cables connecting said sheaves and elevator car.

5. In combination with an operating sheave,

connection between said sheave and the elevator car and between said sheave and the source of power, of a rod having a slot which surrounds a pin upon the operating sheave, a lever secured to said rod, traveling sheaves, an arm carried by the traveling sheaves support and in such position that in its movement it is adapted to strike said lever.

6. In combination with an operating sheave connection between said sheave and the elevator car and between said sheave and the source of power, of a rod having a slot which surrounds a pin upon the operating sheave, said slot being of size sufficient to allow full throw of the operating sheave, a lever secured to said rod, traveling sheaves, an arm carried by the traveling sheaves support and in such position that in its movement it is adapted to strike said lever.

7. In combination with an operating sheave, connection between said sheave and the elevator car and between said sheave and the source of power, of a rod having a slot which surrounds a pin upon the operating sheave, a lever secured to said rod, traveling sheaves, an arm carried by the traveling sheaves support and in such position that it is adapted to strike said lever a stand through which said rod passes and a spring upon said rod.

8. In combination with an operating sheave, connection between said sheave and the elevator car and between said sheave and the source of power, of a rod having a slot which surrounds a pin upon the operating sheave, levers secured to said rod, traveling sheaves, an arm carried by the traveling sheaves support and in such position that in its movement it is adapted to strike said levers.

In testimony of which invention I have hereunto set my hand.

F. E. HERDMAN.

Witnesses:
W. V. MARTIN,
E. B. KERR.