(No Model.) 5 Sheets—Sheet 1.

C. G. MAJOR.

LIFT OR HOIST.

No. 338,536. Patented Mar. 23, 1886.

Fig. 1.

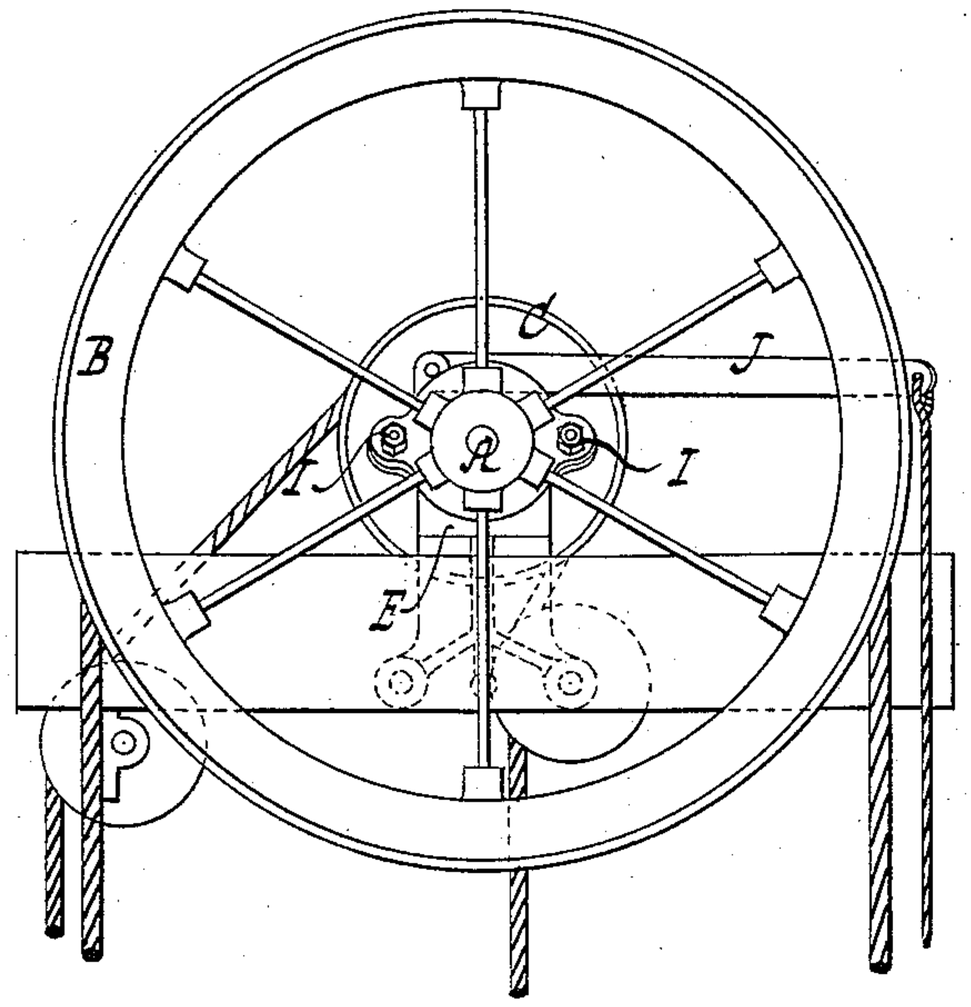

Fig. 2.

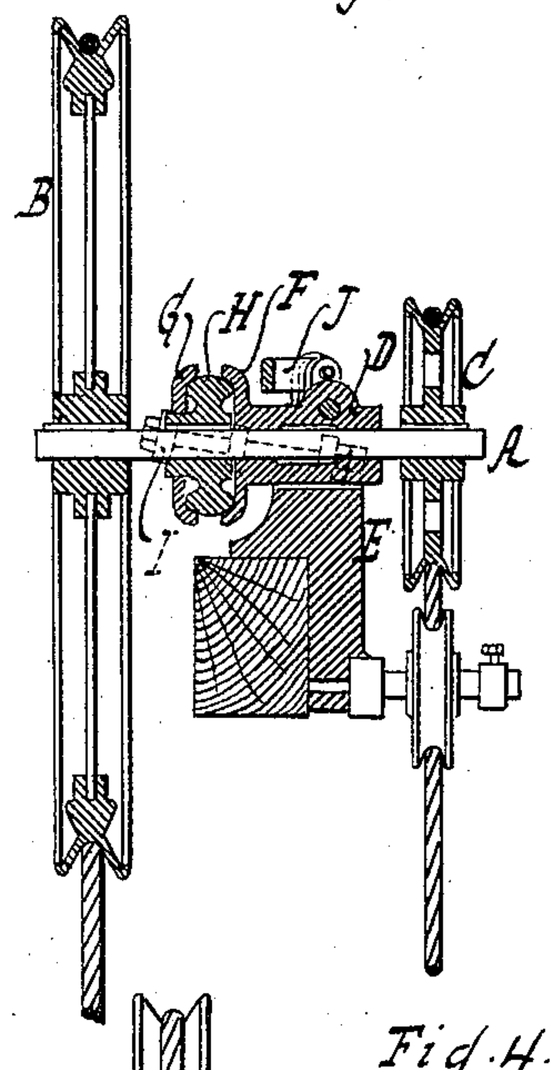

Fig. 3.

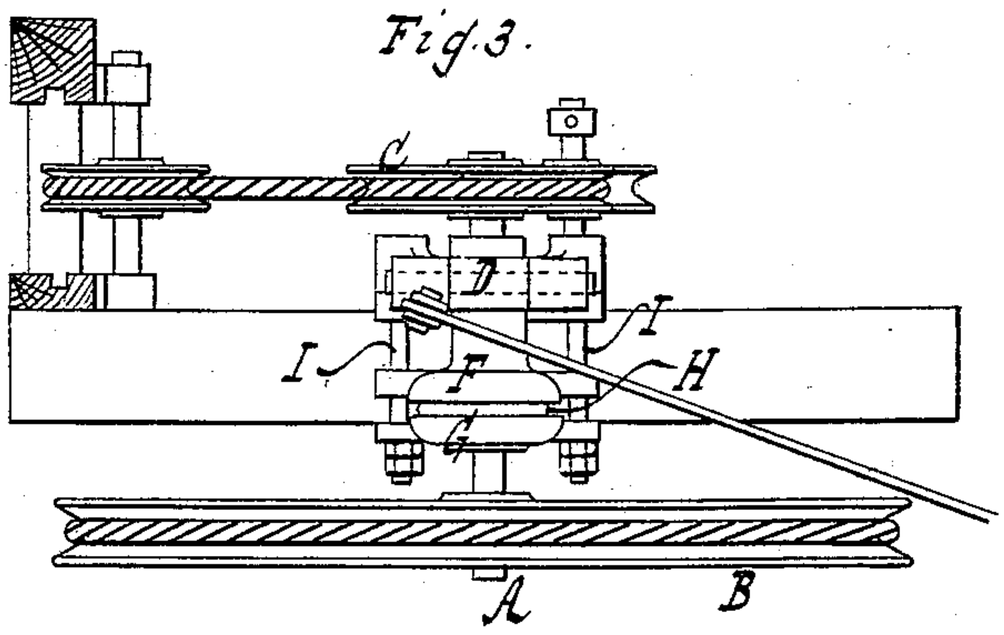

Fig. 4.

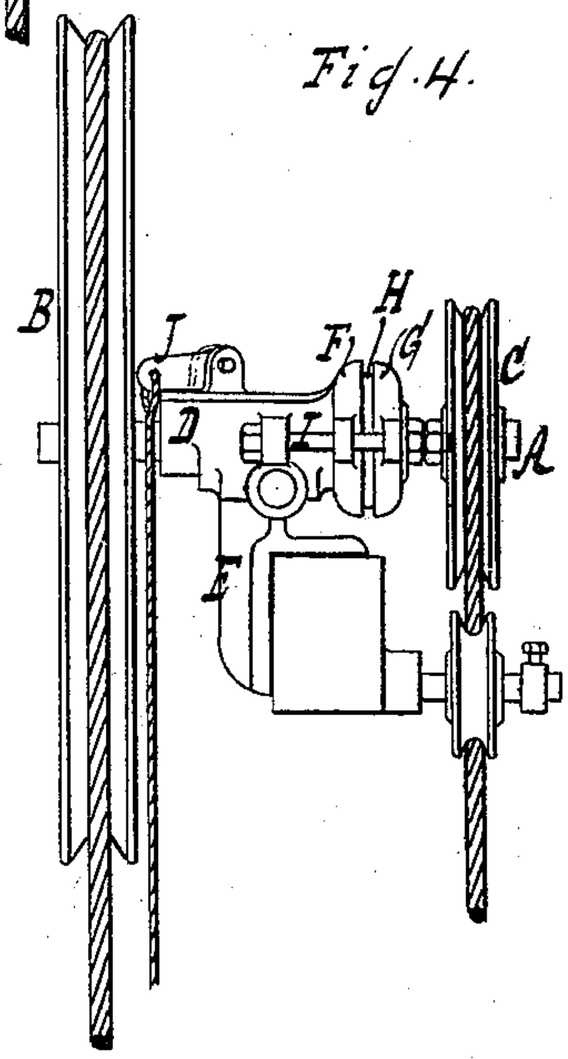

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Fig. 5.

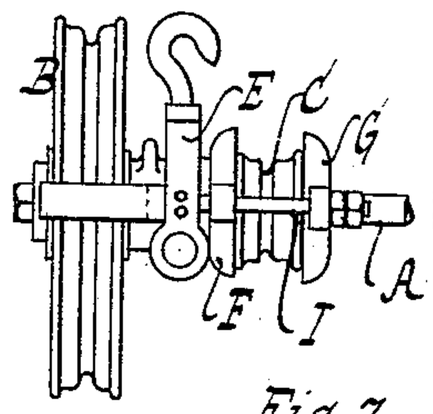

Fig. 6.

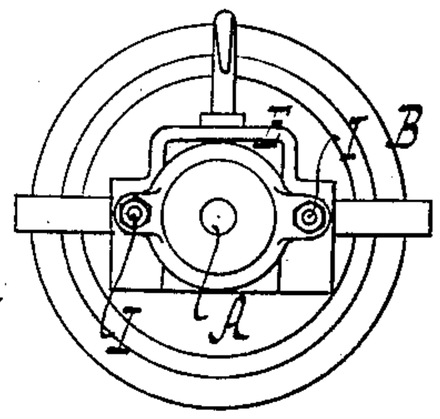

Fig. 10.

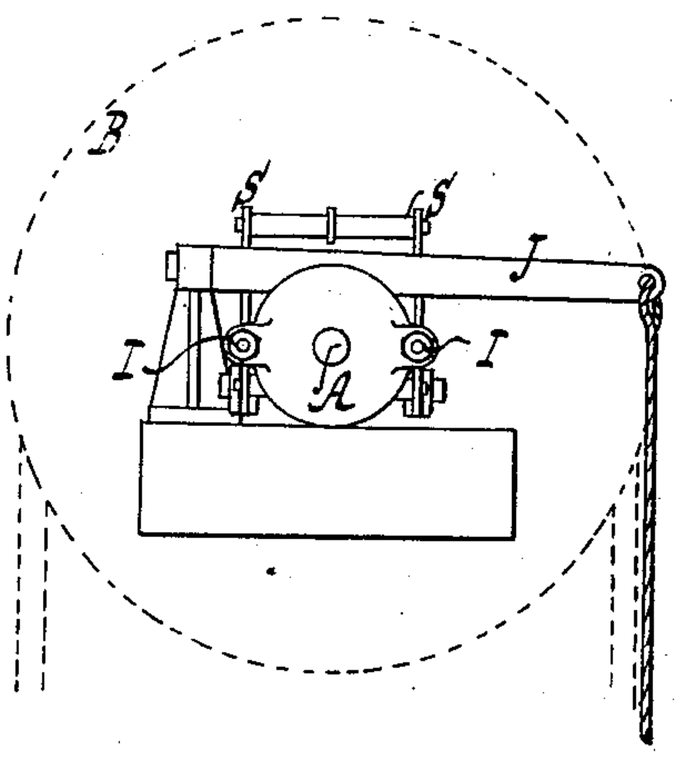

Fig. 7.

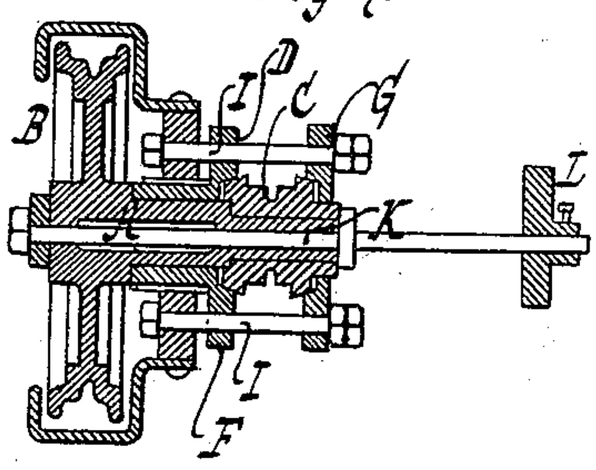

Fig. 8.

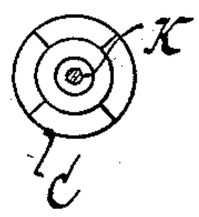

Fig. 9.

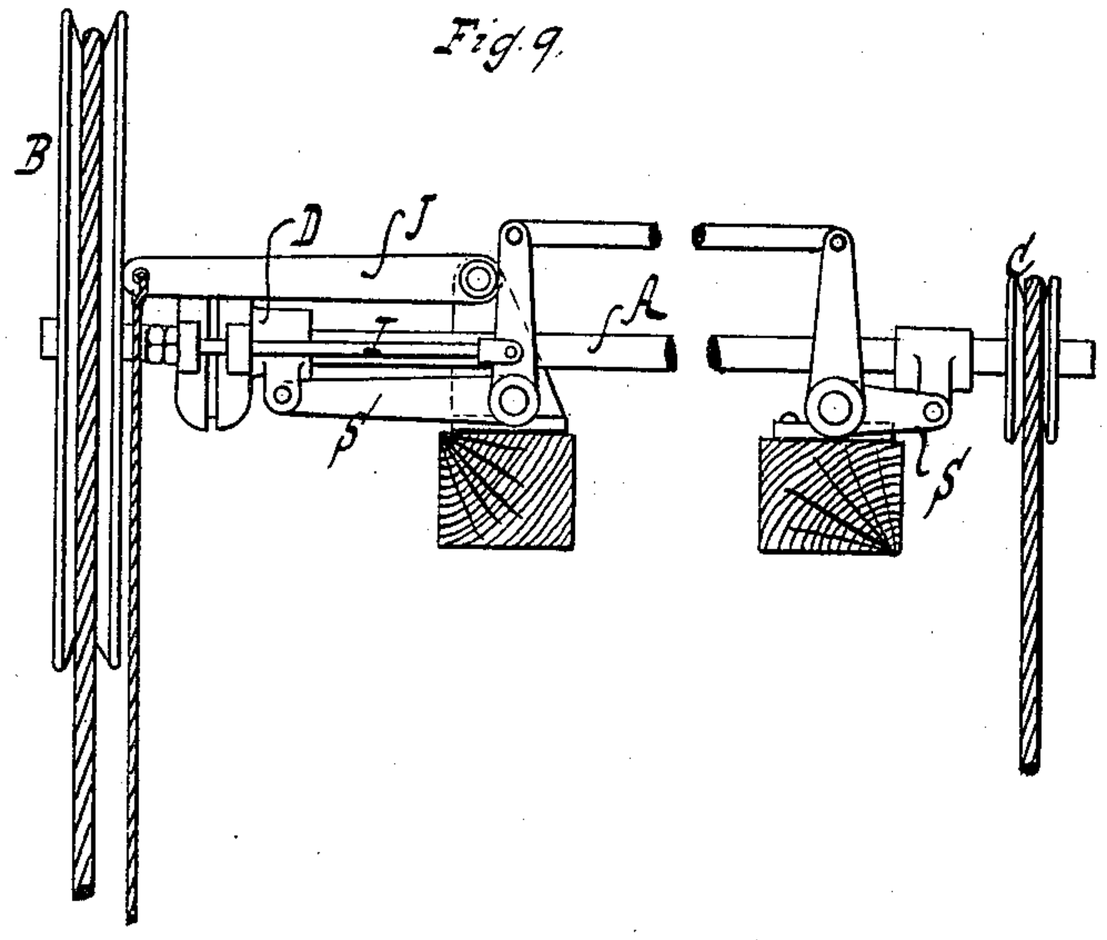

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Fig. 11.

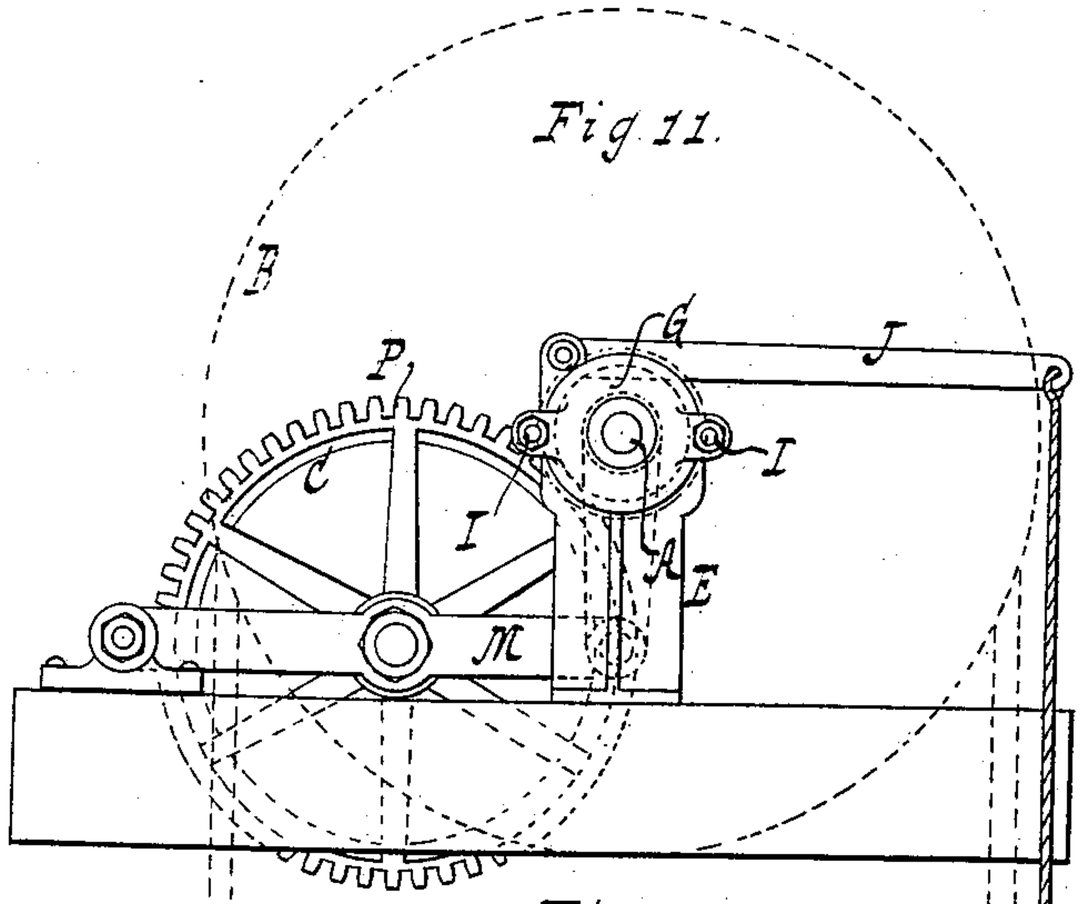
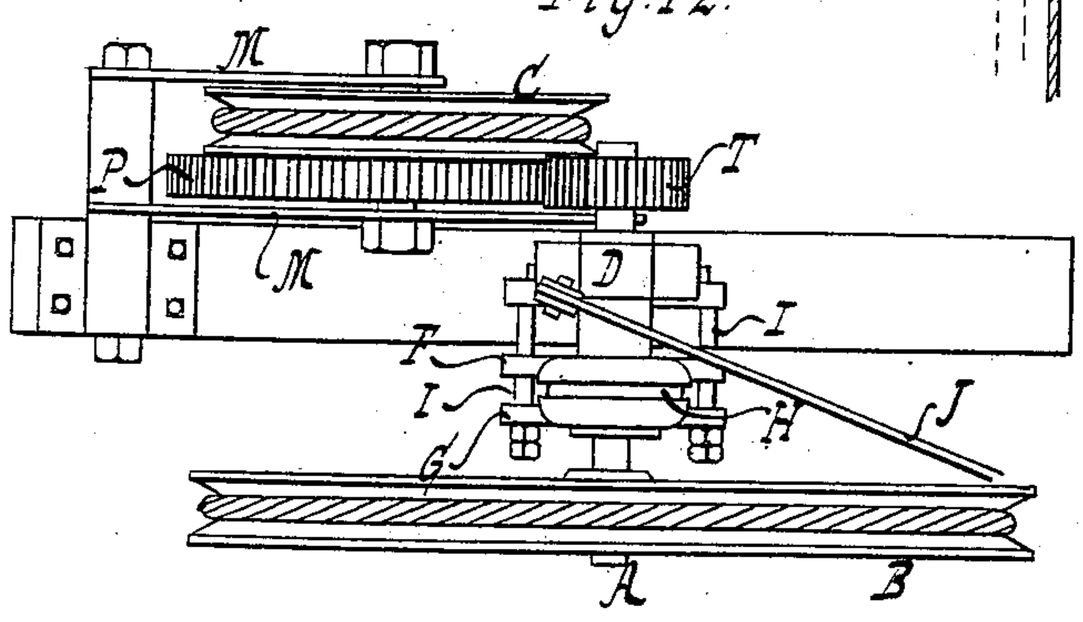


Fig. 12.



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LIFT OR HOIST.

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Fig. 13.

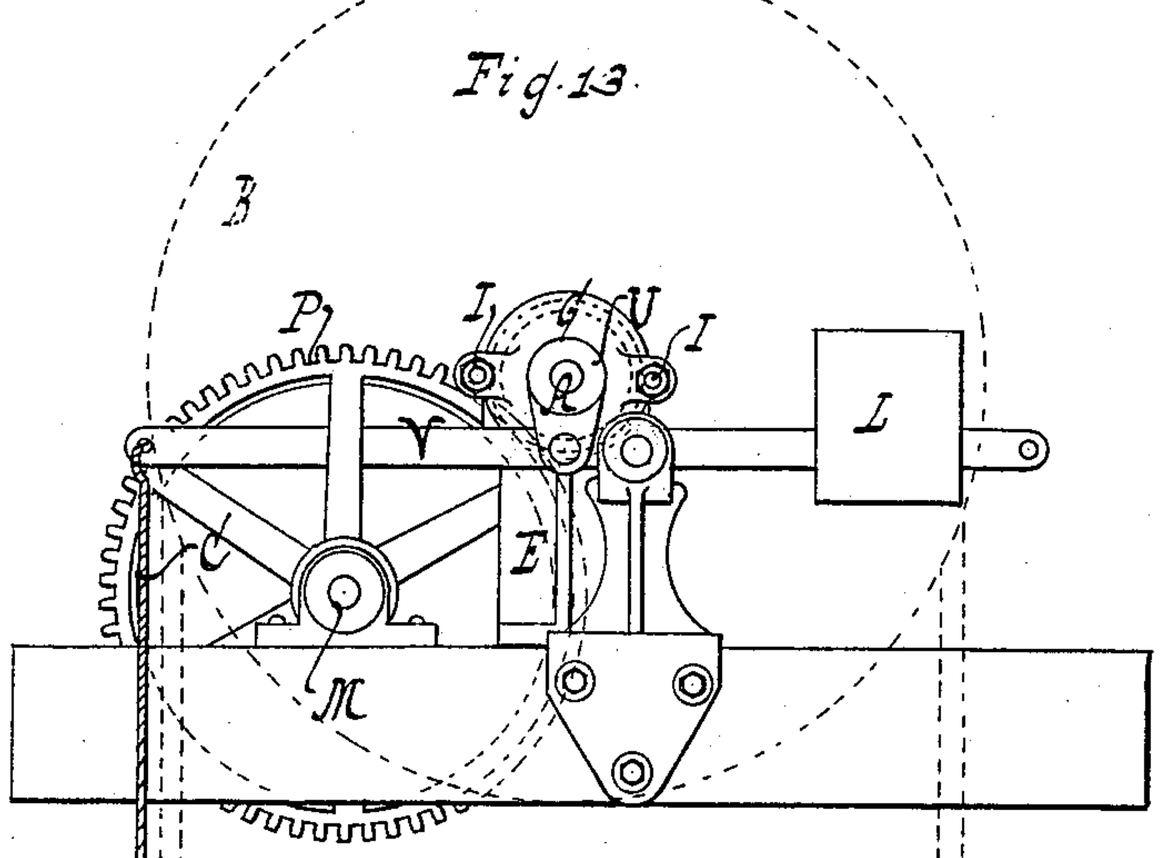
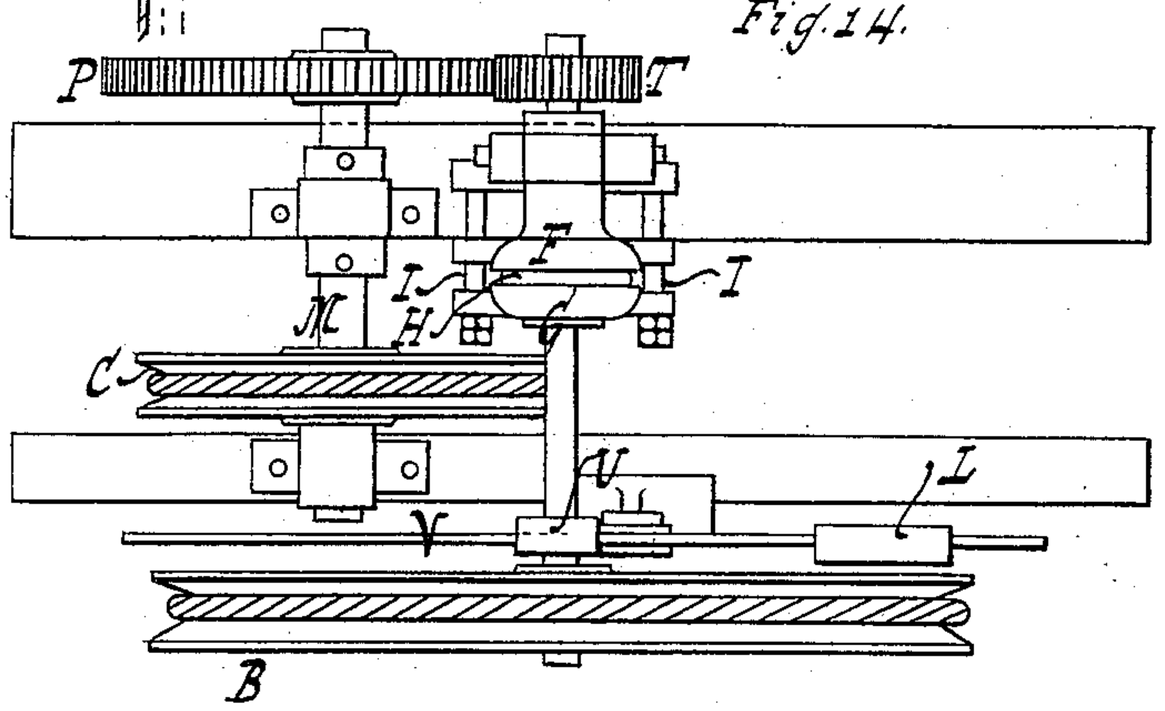


Fig. 14.



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LIFT OR HOIST.

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Fig. 15.

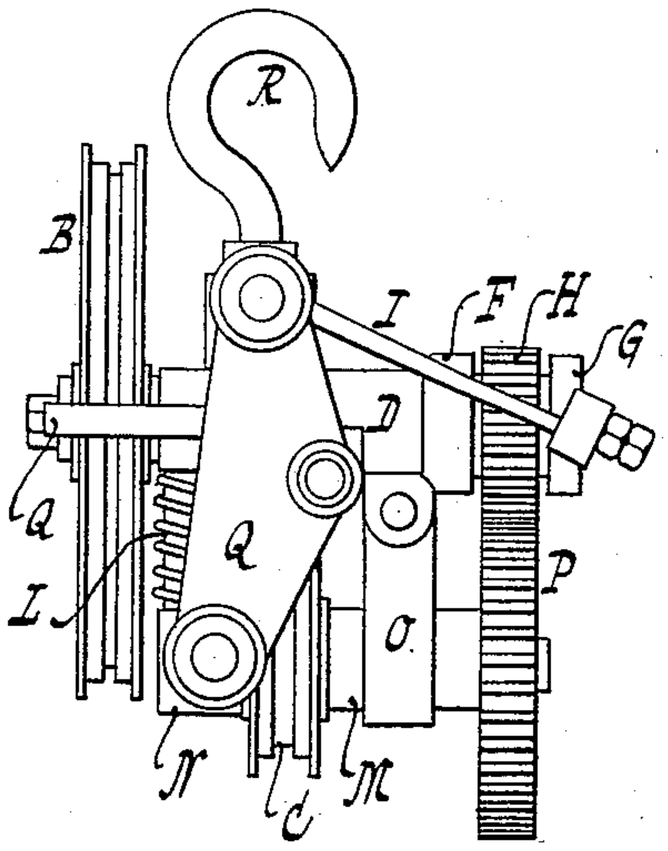


Fig. 16.

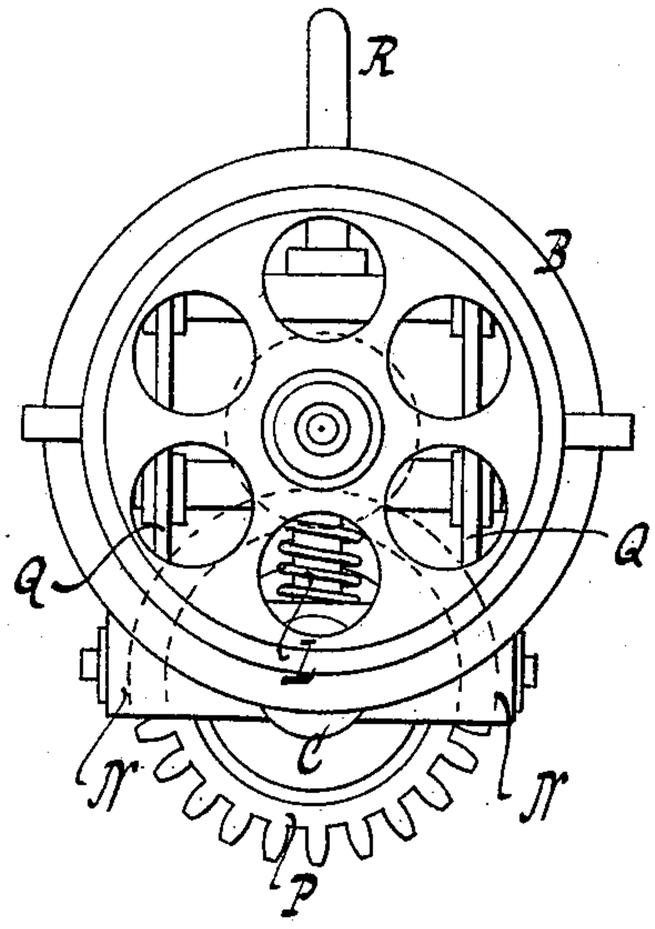


Fig. 18.

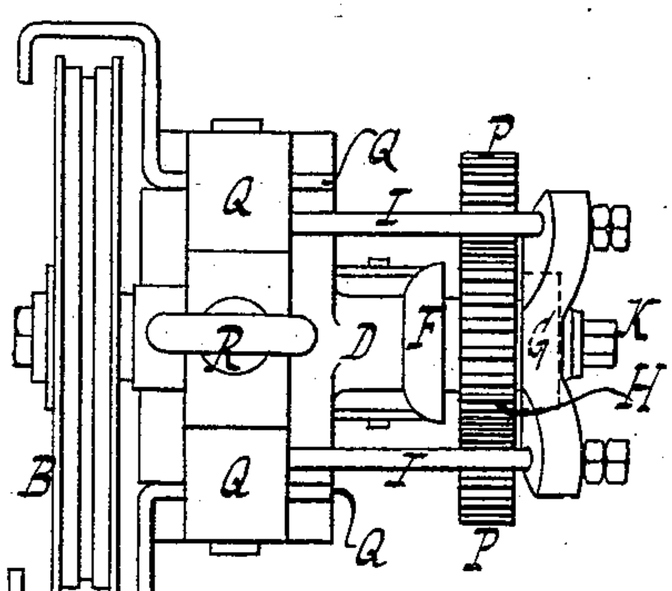
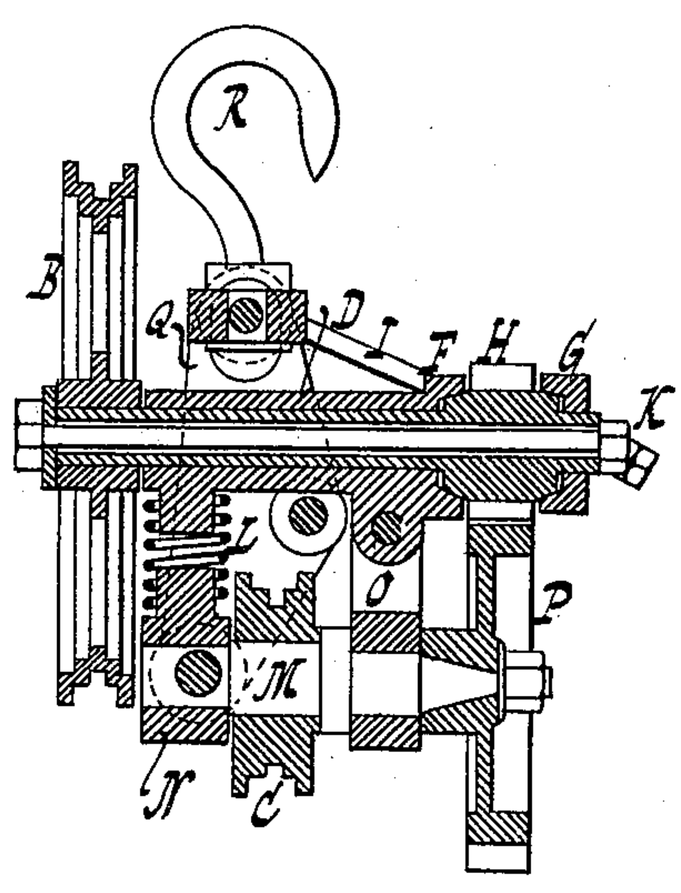


Fig. 17.



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UNITED STATES PATENT OFFICE.

CHARLES GEORGE MAJOR, OF LONDON, ENGLAND, ASSIGNOR OF ONE-HALF TO JOHN DREW, OF SAME PLACE.

LIFT OR HOIST.

SPECIFICATION forming part of Letters Patent No. 338,536, dated March 23, 1886.

Application filed December 10, 1885. Serial No. 185,264. (No model.) Patented in England February 24, 1885, No. 2,482.

To all whom it may concern:

Be it known that I, CHARLES GEORGE MAJOR, a subject of the Queen of Great Britain and Ireland, and a resident of London, England, have invented certain Improvements in Lifts, Hoists, and Pulley-Blocks, (for which I have obtained a British patent, No. 2,482, dated February 24, 1885,) of which the following is a specification.

My invention relates particularly to that class of lifting machinery known as "self-sustaining," in which an automatic brake comes into operation by means of the pull exerted by the load, and is thrown out of operation by the application of motive power at the driving end of the mechanism.

The object of my invention is, first, to produce an automatic brake apparatus which shall be effectual in either direction—*i. e.*, whether the load tends to set the machine in motion in one direction or the opposite; second, which shall at the same time be free from the jerks and irregular motion common to many previous forms of self-sustaining brakes, which shall always be free to receive motion in either direction at the driving end of the mechanism, the brake being automatically thrown out of action; third, which shall be so arranged that the brake may be thrown out of action by means of a lever, leaving the mechanism free to revolve in either direction under the influence of the load and without applying further motive power. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a front view of the lift, hoist, or pulley-block. Fig. 2 is a sectional elevation of the same; Fig. 3, a plan view of the same; Fig. 4, a side view of the same, showing the friction-flanges. Fig. 5 is a simple portable form of self-sustaining hoist; Fig. 6, a side view of same; Fig. 7, a sectional view of same. Fig. 8 is the shoulder notched as for a coupling. Fig. 9 is a side view of a fixed hoist with long shaft having a bearing at each end; Fig. 10, a front view of the same; Fig. 11, a front elevation of a double-purchase lift or hoist, with power increased by means of toothed wheels; Fig. 12, a plan view of the same; Fig. 13, a front elevation of a simple form of double-purchase arrangement, in which the mechanism turns in one direction only; Fig. 14, a plan view of the same; Fig. 15, a side elevation of portable hoist for heavy loads; Fig. 16, a front elevation of the same; Fig. 17, a sectional elevation of the same; Fig. 18, a plan view of the same.

Similar letters refer to similar parts throughout the several views.

A shaft, A, (see Figs. 1, 2, and 3,) has secured to it at one end a large wheel, B, suitably formed for the reception of a driving rope or chain, or to receive motion from any other medium, and at the other end a smaller grooved or other wheel, C, is secured, over which is passed the rope or chain for suspending the load. The shaft A is carried in one long bearing, D, placed between the wheels B and C, and mounted upon a bracket, E, in such a manner as to allow a small amount of oscillation of the bearing and shaft. One end of the long bearing D terminates in a flange or mouth, F, of relatively large diameter, suitably turned (machined) to form one cheek of a friction-clutch. A similar flange, G, is mounted loosely on the shaft A, with its face toward the bearing. Between the two flanges a third and double-faced flange, H, is placed, and is secured to the shaft. The loose flange G is provided with bosses or lugs at the side, from which two bolts, I I, are carried in an inclined direction to two corresponding lugs upon the fixed bracket E. These bolts are adjustable as to length and provided with lock-nuts. They pass through another pair of lugs placed on the side of the enlarged end of bearing D. A limited amount of play is provided in all the lugs. The bolts are adjusted to such a length as will just allow the center flange, H, to run freely.

The action is as follows: The weight of the load or of the lift-cage and balance-weight deflects that end of the shaft from which it is suspended, and the arrangement of bolts I I is such that they draw the loose flanges G, the center flange, H, and the enlarged end of the bearing F into contact and with considerable force. The bearing D cannot revolve, the outer flange, G, cannot revolve, and the flange H is gripped between them with sufficient force

to prevent it from revolving, and the whole machine is therefore held fast. The greater the load the more tightly are the frictional surfaces forced into contact. On the other hand, when the hand or driving rope (or chain) is pulled in a downward direction, that end of the shaft is deflected, and as this tends to straighten the links or bolts I I the friction-flanges are released sufficiently to allow the machine to revolve. This action takes place quite irrespectively of the direction in which the machine is to be worked. So long as the hand-rope is pulled the machine is free, but immediately it is released the weight of the load reapplies the brake.

For lowering quickly by the brake I mount a lever, J, on the fixed bracket E, or in any other suitable position, so that by depressing one end of the lever it may be made to raise the end of bearing D nearest the load, or depress the opposite end, thus releasing the brake to any desired extent. Liberation of the lever J allows the brake to go on again. A cord may be carried down from the lever through several floors to give control at all levels.

The friction-flanges F G H may be placed at the opposite end of bearing D, (see Fig. 4,) the only difference being that the links I I must then be inclined downward toward the loose flange G, instead of upward. The same results are obtained if the links I I are placed horizontally and parallel with the shaft and the center of oscillation placed either above or below the center line of shaft, as in Fig. 4.

By mounting the hereinbefore-described arrangement in a light suspending frame (see Figs. 5, 6, 7, and 8) I construct a simple portable form of self-sustaining hoist. In this arrangement the hand-wheel B is made in one piece with a long sleeve A, which takes the place of the shaft. The load-wheel C is mounted on this sleeve and held tightly up to a shoulder by means of the bolt K. The shoulder is notched, as for a coupling, (see Fig. 8,) and the two wheels are thus locked together. In this hoist, as there is no permanent weight of cage and balance to counteract the downward pull of the hand-chain, the latter would, owing to its greater distance from the center of suspension, overbalance the load-chain and hold the brake off. If a load were then attached, the machine would revolve in preference to depressing the load end of the apparatus. It is therefore requisite that the brake should be normally on independently of the load, the latter only intensifying the action. For this purpose I extend the bolt K and place upon it a weight, L, sufficient to overbalance the weight of hand-wheel B and its chain.

If a portable hoist of the last-described form were made for heavy loads, the hand-wheel B would be inconveniently large, and for the purpose of releasing the brake its distance from the point of suspension would be so great as to be impracticable. I reduce the size of the wheel and bring back the hand and load wheels close to the point of suspension in the arrangement shown in Figs. 15, 16, 17, and 18. The hand-wheel B is secured to a hollow sleeve, A, formed in one piece with the toothed pinion H. The sleeve passes through an oscillating bearing, D, fitted with the flanges F and G and tie-bolts I I, as before. The pinion H takes the place of the fixed flange H of previous figures. A second shaft, M, is carried at one end in a swiveling bearing, N, and at the other end in a bearing, O, which is linked up to bearing D, so that oscillations of the latter must be in part transmitted to shaft M. Secured to shaft M are a toothed wheel, P, gearing with pinion H, and also the load-wheel C. A small spring, L, is placed beneath one end of bearing D, to counteract the weight of the wheel B and its chain, and so keep the brake on. The two oscillating bearings are carried in side frames, Q, suspended from a hook, R. The action is similar to that previously described. The downward pull of load on wheel C depresses one end of shaft M, pulls with it the clutch end of bearing D, and tightens up the friction-flanges onto the pinion H. A pull on the hand-chain has the opposite effect and releases the pinion H. A lever action, as already described, is sometimes added. The centers of oscillation are proportioned relatively to the gearing, so that the ratio of oscillating leverage is slightly in excess of the ratio of gearing, and the release of the brake takes place therefore with a lighter pull than that necessary to lift the load.

In some cases of fixed hoists it is desirable to place the hand-wheel at some distance from the load-wheel, leading to the use of a long shaft, for which a single bearing would be quite unsuitable. In Figs. 9 and 10 I place a bearing at each end, carrying each bearing upon the horizontal arm of a bell-crank, S S, the other arm of each bell-crank standing vertically upward. These vertical arms are tied together in any suitable way—for instance, by a light rod, cord, or chain. The deflection of one end of the shaft will then cause the elevation of the other, and vice versa. Either of the bearings may have the friction-clutch arrangement, as previously described, save that the links or bolts I I are carried to the vertical arm of the bell-crank, instead of to the supporting-bracket. The action is in all other respects the same as in Figs. 1, 2, 3, and 4.

In double-purchase lifts and hoists, with power increased by means of toothed wheels, I apply my invention as follows: I take a shaft, A, Figs. 11 and 12, with hand-wheel B, one central bearing, D, and friction-clutch arrangement F G H, all as first described; but the load-wheel is replaced by a pinion, T. The load-wheel C is secured to a toothed wheel, P, which gears with the pinion T. The two wheels C and P run loosely on a pin secured between two parallel bars, M, which bars in-

close the wheels. These bars are secured together, and are at one end pivoted to the frame of the machine, or to any convenient fixed point, while at the other end they are jointed to that end of bearing D next the pinion T. Half of the weight of the load (or any other proportion desired) is thus brought to bear upon the pinion end of shaft A, with results as previously described. It is obvious that a train of toothed wheels in any number of steps or purchases may be similarly mounted between the swinging bars M, giving any amount of lifting-power, and still transferring to shaft A sufficient of the load to put the brake on.

In the case of a double-purchase arrangement, in which the load is always lifted by turning the mechanism in one direction only, I carry out my invention in a more simple form. (See Figs. 13 and 14.) The load-wheel C, together with its toothed wheel P, are secured to a shaft, M, which revolves in ordinary fixed bearings secured to the frame. The shaft A is fitted at its front end with an additional bearing, U, mounted upon a lever, V. On the lever a weight, L, is placed for the purpose of counterbalancing the weight of wheel B and its hand-rope. By sliding the weights along the lever its effect may be adjusted to suit varying weights of rope. The weight is sometimes replaced by a spring. When raising or lowering the load by means of the wheel B, the brake is automatically released, as before described; but if the load tends of itself to run down, the toothed wheel P becomes the driver, and, transmitting its motion to the teeth of the pinion T upon the shaft A by a downward pressure, puts on the brake by depressing that end of the shaft, as before, and to a degree proportionate to the load. This arrangement is also applicable to a train of any number of shafts and toothed wheels. The lever V is extended in both directions, and a cord attached to the weighted end enables the attendant to increase the brake-power by hand for emergencies, while a cord at the other end, if pulled, will release the brake and lower the load.

The devices as described are applicable to all kinds of lifting machinery in which the lifting mechanism is actuated by belts, cords, ropes, or chains, and which can be so arranged that the stress produced by the driving medium on any one shaft shall have the effect of opposing and overcoming the stress produced by the load upon that shaft, and so lead to its oscillation, as described. The stresses may act in any direction, and are not confined to the vertical.

Having now fully described my invention, I would have it understood that I do not confine myself to the precise details described and illustrated, as these may be modified in various ways without departing from the substance of the invention. I do not claim self-sustaining lifts, as such, but do claim the following as points of novelty:

1. The arrangement of single-spindle lifting apparatus with oscillating bearing, combined with the automatic friction-brake, as described, and shown in Figs. 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

2. In a lifting apparatus, the combination of the automatic brake actuated by links, as described, and shown in all the figures, with any oscillating shaft.

3. In a lifting apparatus, the combination of an oscillating shaft, an automatic friction-brake, as described, and a lever, V, for the purpose of releasing the brake, as described, and shown in Figs. 1, 2, 3, 4, 9, 10, 11, 12, 13, and 14.

4. The portable forms of lifting apparatus with automatic brake, as described, and shown in Figs. 5, 6, 7, 8, 15, 16, 17, and 18.

5. The arrangement of lifting apparatus with one long shaft and two bearings mounted in bell-cranks linked together, combined with an automatic friction clutch-brake, as described, and shown in Figs. 9 and 10.

6. The arrangement of lifting apparatus with increased power by means of toothed wheels and extra shafts, in which the load-wheel is carried in a pivoted frame, partly supported by one end of the motive-power shaft, combined with automatic friction clutch-brake, as described, and shown in Figs. 11 and 12.

7. The arrangement of lifting apparatus with increased power by means of toothed wheels and extra shafts, in which the downward effort of the load is transmitted to the driving-shaft through the teeth of the wheels only, combined with the automatic friction-brake, as described, and shown in Figs. 13 and 14.

8. The combination of the automatic friction-brake and oscillating shaft with an adjustable weight, as described, and shown in Figs. 5, 6, 7, 8, 13, and 14.

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