No. 676,931. Patented June 25, 1901.

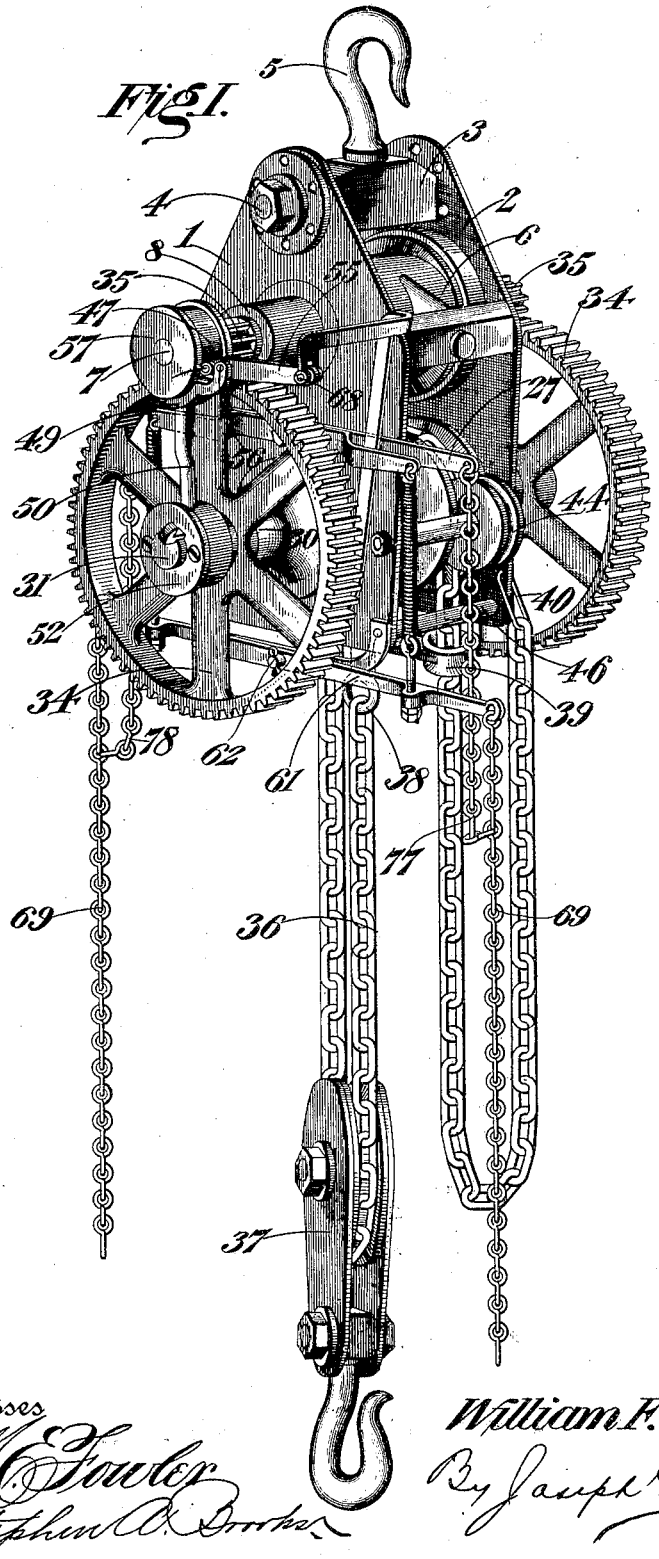
W. F. BARRETT.

HOIST.

(Application filed May 26, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

Fig. II.

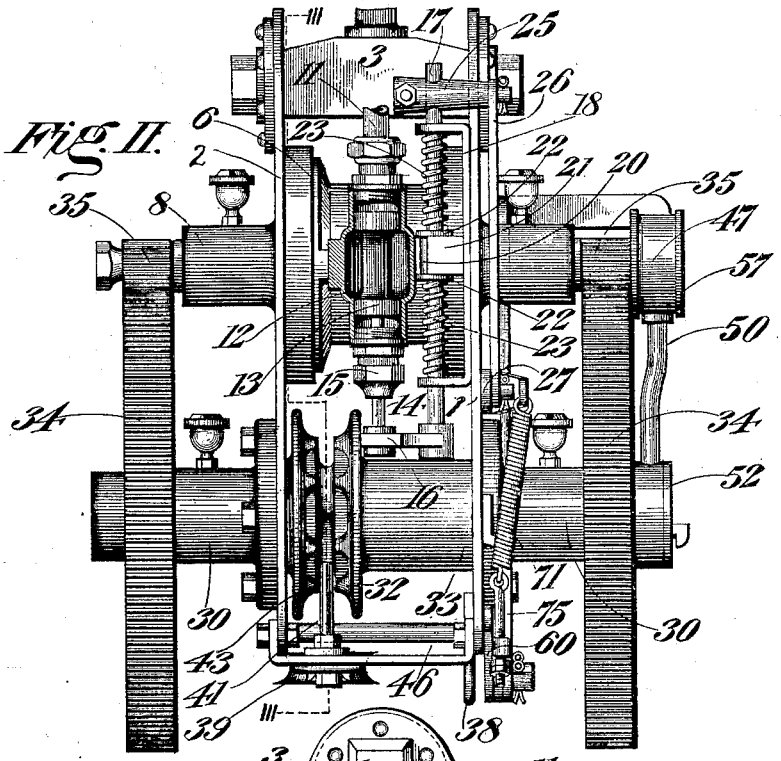
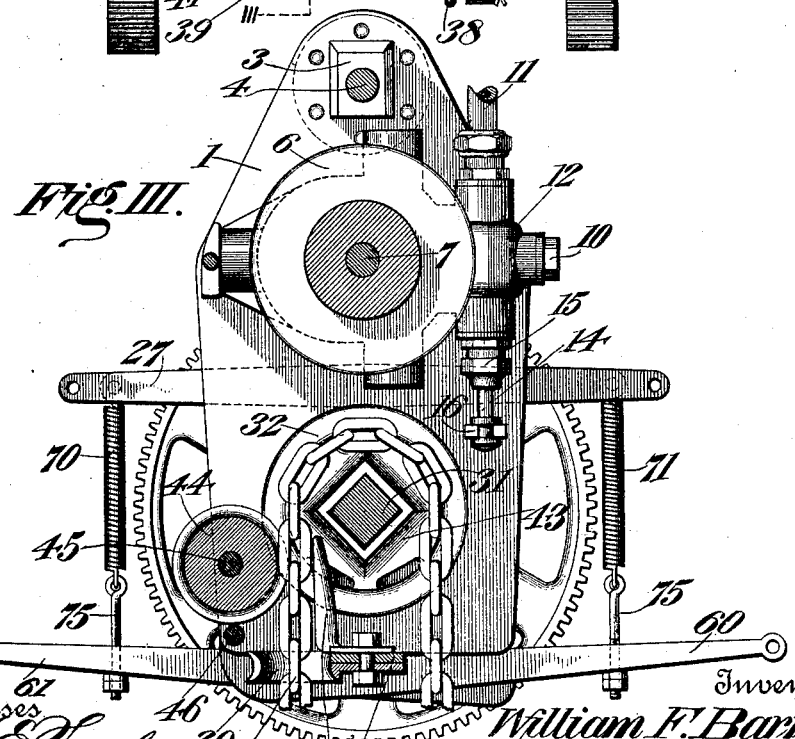


Fig. III.



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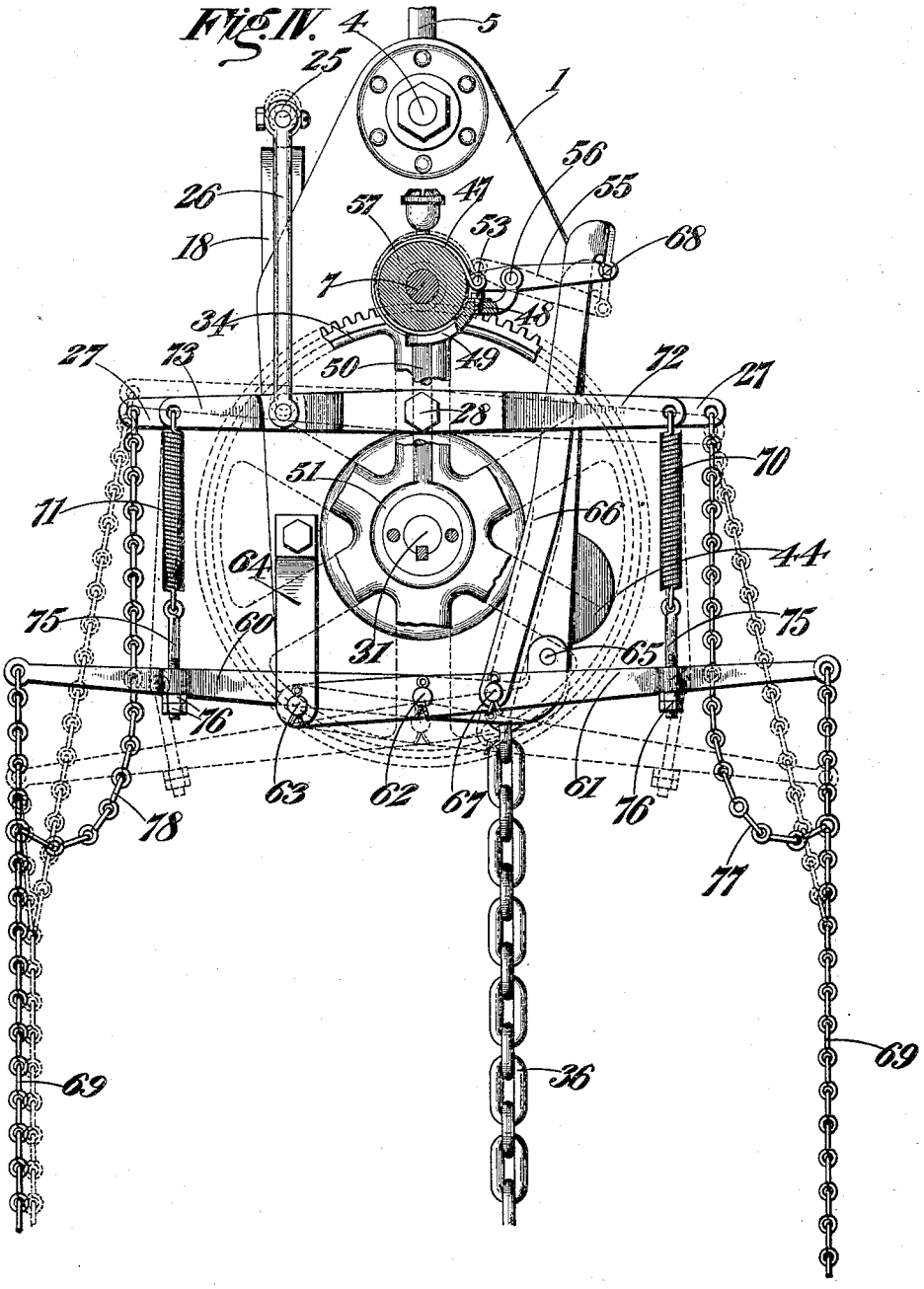
(No Model.) 3 Sheets—Sheet 3.

Fig. IV.



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UNITED STATES PATENT OFFICE.

WILLIAM F. BARRETT, OF ORANGEBURG, NEW YORK, ASSIGNOR TO THE EMPIRE ENGINE AND MOTOR COMPANY, OF SAME PLACE.

HOIST.

SPECIFICATION forming part of Letters Patent No. 676,931, dated June 25, 1901.

Application filed May 26, 1899. Serial No. 718,405. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. BARRETT, of Orangeburg, in the county of Rockland, State of New York, have invented certain new and useful Improvements in Hoists, of which the following is a complete specification, reference being had to the accompanying drawings.

The object of my invention is to produce an improved, preferably suspensible, hoist adapted through the incorporation within it of suitable driving mechanism to quickly lift heavy loads and to sustain the weight of the same at any point of elevation through the operation of automatic load-sustaining mechanism, to be hereinafter described.

My hoist is essentially, in many respects, a new type of machine. It is designed to be employed in place of the well-known differential pulley-block. Hoists of the differential-pulley-block variety are adapted, through the application of hand-power, to lift heavy loads; but in order to obtain the increase of power secured by those blocks the lifting speed of the machine is necessarily very slow.

In dispensing with the power-multiplying mechanism heretofore employed in analogous hoists it is necessary to provide special load-sustaining mechanism to arrest the free-running members of the lifting mechanism proper at any point of elevation of their load.

The features of the load-sustaining mechanism will be hereinafter more fully described and claimed and are only alluded to here as being comprised within the scope of that invention which is comprehended in the foregoing general statement.

In the accompanying drawings, Figure I is a perspective view of my hoist complete as in the suspended position, showing the sheave-block partially elevated and (the machine being at rest) the sheave sustained by the operation of the load-sustaining mechanism. Fig. II is a side elevation of my hoist, taken from the side opposite to that exposed in Fig. I, the hoist being stripped of its chains, its suspension-hook being broken away, and its valve mechanism shown in partial section. Fig. III is a section on the line III III of Fig. II and showing a fragment of the lifting-chain in place upon the lifting-sheave. Fig. IV is an end elevation of the machine looking toward the end upon which is applied the load-sustaining mechanism, the gear-wheel being illustrated partially in dotted lines and the brake-drum and a portion of the brake-strap support illustrated in section. In this figure portions of the lifting-chain and suspension-hook are illustrated. The inoperative positions of the levers are illustrated in full lines, the positions which they occupy when the machine is in operation being illustrated in dotted lines.

Referring to the numerals on the drawings, 1 and 2 indicate the two side pieces, which assembled, as by means of the lifting mechanism which they carry, as will be hereinafter more fully specified, constitute the frame of my machine. The side pieces 1 and 2 preferably consist of metal plates of suitable shape, weight, and dimensions and constitute a suitable frame, whose weight is preferably equally distributed, so as to cause it to hang true from the point of suspension, the means thereof being preferably a cross-head 3, secured, as by its trunnions 4, in the respective side pieces and provided with a suspension-hook 5.

Carried upon the frame and preferably between the upper part of the side pieces 1 and 2 I provide as a means of applying a driving power a mechanical motor. The motor which I prefer to employ is a rotary engine of any suitable type adapted to be driven by steam, compressed air, or the like.

In the drawings, 6 indicates the cylinder of the motor, which, being of well-known construction and constituting in its special features no part of this invention, does not require detail structural illustration. It is deemed sufficient, therefore, with this brief statement to illustrate and describe the cylinder 6, above referred to, within which rotates in the well-known manner a piston, (not illustrated,) whose shaft 7 is shown as projecting from opposite sides of the plates 1 and 2 and as carried in boxes 8, projecting from opposite sides of said plates, respectively.

The driving fluid by which the motor is actuated may be admitted through an inlet 10 and exhausted through an outlet 11, both

communicating with the interior of a valve-shell 12, within which works a suitable valve 13, adapted through its movement within the valve-shell 12 to permit the supply of a fluid to the piston through one opening and its exhaust through the other. The respective functions of the inlet and outlet 10 and 11 may be exchanged one for the other, it being entirely immaterial, so far as the operation of the machine is concerned, whether air be admitted through the inlet and exhausted through the outlet, as described, or the reverse.

The details of the valve described being of well-known description do not appear to require further explanation. It is provided with a stem 14, which, passing through a stuffing-box 15, that closes the end of the shell 12, is united, as by a connecting-piece 16, to a rod 17, working in apertures provided for it in a guide-frame 18, secured to the interior of the side piece 1. The rod 17 is spring-balanced, so as to hold the valve 13 in that position (illustrated in Fig. II) in which the driving fluid is excluded from the piston. It is for that purpose preferably provided with a fixed medially-located collar 20, working in a grooved block 21, secured to the frame 18. Upon opposite sides of the block 21 are loose washers 22, that are respectively urged into contact with the collar, as by coiled springs 23, surrounding the rod 17 upon opposite sides of the collar 20 and bearing, respectively, against the ends of the guide-frame 18.

The rod 17 is connected, as by a connecting member or hub 25 and link 26, with an oscillatory lever 27, pivoted, as indicated at 28, to the frame side piece 1. The movement of the lever 27 is adapted, through the connections described, to actuate the valve 13 in one direction, and its movement in the opposite direction is adapted to actuate the valve in the opposite direction. The two movements of the valve serve to reverse the movement of the piston, and the lever 27 may therefore be called a "valve actuating" or "reversing" lever.

The cylinder 6 is preferably firmly secured to the side pieces 1 and 2, respectively, thereby preferably constituting, with the side pieces, a portion of the frame.

In suitable bearings 30, preferably secured to and projecting from the outer faces of the plates 1 and 2, respectively, and preferably located in the lower part of said plates, is revolubly mounted a pulley-shaft 31. This shaft carries a lifting sheave or pulley 32, preferably forming a part of a hub or sleeve 33, that is fixed to the shaft 31 and works between the side pieces 1 and 2. The shaft 31 is operatively connected with the shaft 7, as by gears 34, fixed to the shaft 31 adjacent to its respective extremities, and pinions 35, meshing with the respective gears and respectively fixed to the shaft 7 near its opposite extremities.

The lifting-sheave 32 carries a lifting-chain 36, which, passing through the sheave-block 37, is securely fastened at one end to the frame of the machine—as, for example, to an eyelet 38, bolted to the side piece 1. The extremity of the chain 36 opposite the end 38 after passing through a guide-ring 39 is preferably fastened, as indicated at 40, to the frame—for example, the side piece 2 thereof. The fastening at 38 is designed to assist in sustaining a load carried by the sheave-block 37 and should be amply secure for that purpose. The fastening at 40, however, is intended only for disposing of the slack end of the chain, and possibly under some circumstances it may indicate the limit of downward movement of the sheave-block 37.

The weight upon the chain 36 will suffice to keep that portion of it between the sheave-block 37 and the sheave 32 straight and tense; but for stripping the slack portion of the chain from the sheave 32 suitable stripping mechanism should be employed, preferably consisting of a finger 41, (see Fig. III,) extending from a cross-piece 42, to which is also secured the guide-ring 39. The finger 41 extends from the cross-piece 42 upwardly between the chain 36 and the peripheral grooves 43 of the sheave 32. It coöperates with a grooved roller 44, carried upon a shaft 45, mounted in the side pieces 1 and 2, respectively. The shaft 45 may rotate in bearings in the side pieces, or the roller may rotate upon the shaft, the essential feature merely being that it shall revolubly coöperate with the finger 41 in stripping the slack of the chain from the sheave and passing it straight through the ring 39.

46 indicates a cross bolt or brace uniting the side pieces 1 and 2. It preferably connects the lower corners of the side pieces opposite the eyelet 38. It is intended to stiffen the frame and especially to resist strain occasioned by tension of the sheave-block 37 upon the chain applied adjacent to the opposite side pieces.

From the foregoing description it will appear that by a pull upon one end or the other of the lever 27 the shaft 7 may be caused to rotate in one direction or the other. Power is communicated from the shaft 7 to the shaft 31 through the pinions 35 and gears 34, and actuating the sheave 32 will cause the sheave-block 37 to ascend or descend at a speed proportionate to the speed of the shaft 7, as determined by the size of the gears which unite the said shaft with the shaft 31. In addition, however, to the mere mechanism for operating the lifting-sheave 32, and thereby causing the sheave-block 37, with its load, to ascend or descend, it is desirable and generally essential to provide means for interrupting the ascent or descent of the sheave-block at any point in its travel. As was suggested in the general statement, that in analogous hoists is feasible, owing to the presence therein of certain kinds of power-multi-

plying mechanism or other means for preventing the undesigned movement of the load-lifting sheave. For this purpose I employ, in connection with the mechanism specified or its equivalent, load-sustaining mechanism which consists, essentially, of means for preventing unintended movement of the lifting-sheave 32, and more especially in automatically preventing such movement whenever the driving mechanism or motor comes to a standstill. The special load-sustaining mechanism which I prefer to employ consists of a brake-strap 47, secured at one end, as by a screw 48, (see Fig. IV,) to a curved extension 49, extending concentrically with the shaft 7 from the arm 50, that is loosely mounted, as by aid of a collar 51, upon the shaft 31, it being secured thereto, as by a cap 52, screwed to the end of said shaft. The end of the strap 47 opposite to the end 48 is pivotally secured, as indicated at 53, to a lever 55, pivoted, as indicated at 56, to a bracket projecting from the curved extension 49 of the arm 50. The strap 47 is preferably made of spring-steel and encircles a friction-drum 57, fixed to the extremity of the shaft 7. The resiliency of the strap 47 is employed to normally engage the periphery of the drum 57; but it is necessary to its successful operation that it should be applied against the same with a greater force than can be exerted by that means. The strap-brake, applied in the manner described to the drum, may be made effective to prevent the rotation of the shaft 7, and thereby to restrain the rotation of the shaft 31 by aid of a leverage greater than the radius of the gear 34. This is due to the fact that the gears 34 mesh with the pinions 35 and that the brake applied to the drum 57 is in effect applied to the gears 34 through the mediation of said drum, the shaft 7, and its pinions 35.

As has been specified, it is designed that the load-sustaining mechanism shall automatically perform its function and be timed to properly coöperate with the driving mechanism. I have illustrated in the drawings simple but efficient mechanism for that purpose. It consists of a pair of levers 60 and 61, (see particularly Fig. IV,) pivotally united, as by a pin 62. The short arm of the lever 61 is pivoted, as indicated at 63, to the side piece 1 of the frame through the intervention of a bracket 64, which permits the oscillation between it and the frame of the lever 60. The short arm of the lever 60 is pivoted directly to the side piece 1, as indicated at 65. A connecting-arm 66, pivoted to the lever 61, as indicated at 67, and to the lever 55, as indicated at 68, affords the means of relieving the tension upon the brake-strap 47 whenever required by a pull upon the long arm of either of the levers 60 or 61. A chain 69, connecting the extremities of said levers, may afford means for applying the necessary power to depress the levers. The chain 69 is shown in the drawings as broken away, but is preferably, as described, a continuous chain extending from the long arm of the lever 61 to the long arm of the lever 60.

The system of levers specified through which the brake-strap 47 may be manipulated affords convenient means for exerting that tension upon the brake-strap which, as was above specified, is essential to its efficiency. For that purpose I employ, preferably, two tensile springs 70 and 71, secured at one end, respectively, to lugs 72 and 73 upon the lever 27, and at their other ends to the long arms of the levers 61 and 60, respectively.

I prefer to connect the springs 70 and 71 with their respective levers 61 and 60 by eyebolts 75, by the aid of whose nuts 76 the application of the tension of the springs may be regulated. The lever 27 being secured to the frame of the machine, the springs 70 and 71 are in effect applied to said frame; but when so applied through the mediation of the lever 27 they serve to hold that lever normally in the horizontal position and to supplement the action of the springs 23 in keeping the valve 13 properly balanced.

As has been specified, a depression of one end of the lever 27 causes the motor to drive in one direction and a depression of the other end causes it to drive in the opposite direction. On the other hand, a pull upon either lever 60 or 61 releases the tension of the brake-strap 57. Therefore by connecting the chain 69 near its opposite extremities, respectively, with the lever 27, as by chains 77 and 78, one is enabled by a pull upon the chain 69 both to relax the tension of the strap 47 and to set the machine in motion. The chains 77 and 78 hang slack when the machine is at rest, as illustrated in full lines in Fig. IV. Therefore before tension is exerted through either chain 77 or 78 upon the lever 27 one of the levers 60 or 61 must be first depressed. Consequently any pull upon the chain 69 first relieves tension upon the brake-strap 47 and immediately thereafter sets the driving mechanism in motion in one direction or the other. The length of the chains 77 and 78 should be properly proportioned, so as to cause the relative movements described to follow one another closely in order of time.

The mode of operation of my machine having been incidentally indicated in describing the elements of the mechanism with their respective functions, further description thereof appears to be unnecessary.

What I claim is—

1. In a hoist, the combination with a frame, motor, motor-shaft, pulley, pulley-shaft, and means for operatively uniting the two shafts, of a drum upon the motor-shaft, an arm loosely mounted upon the pulley-shaft, a brake-strap supported by said arm in fixed relations to the drum, and means for actuating the brake-strap.

2. In a hoist, the combination with a frame, motor, motor-shaft, pulley, pulley-shaft, and means for operatively uniting the two shafts,

of a drum upon the motor-shaft, an arm loosely mounted upon the pulley-shaft, a brake-strap supported by said arm in fixed relations to the drum, and means for successively actuating the motor and brake-strap.

3. In a hoist, the combination with a frame, motor, motor-shaft, pulley, pulley-shaft, and means for operatively uniting the two shafts, of a drum upon the motor-shaft, a brake-strap supported in fixed relations to the drum, and spring-actuated means for actuating the brake-strap, substantially as set forth.

4. In a hoist, the combination with a frame, motor, motor-shaft, pulley, pulley-shaft, and means connecting the two shafts, of a drum upon the motor-shaft, a brake-strap supported in operative relations thereto, a motor-controlling lever upon the frame, a pair of coöperating levers, either being adapted to operate the brake-strap, one lever being connected with one end of the controlling-lever, and the other with the other end thereof, and means for operating the three levers, substantially in the manner and for the purpose specified.

5. In a hoist, the combination with a frame, motor, motor-shaft, pulley, pulley-shaft, and means connecting the two shafts, of a drum upon the motor-shaft, a brake-strap supported in operative relations thereto, a motor-controlling lever upon the frame, a pair of coöperating levers, either being adapted to operate the brake-strap, one lever being united by spring connection to one end of the controlling-lever, and the other by spring connection with the other end thereof, and means for operating the three levers, substantially in the manner and for the purpose specified.

In testimony of all which I have hereunto subscribed my name.

WILLIAM F. BARRETT.

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