(No Model.)

2 Sheets—Sheet 1.

S. A. MORSE & C. TYSON.

SPUR GEARED HOISTING MACHINE.

No. 344,053. Patented June 22, 1886.

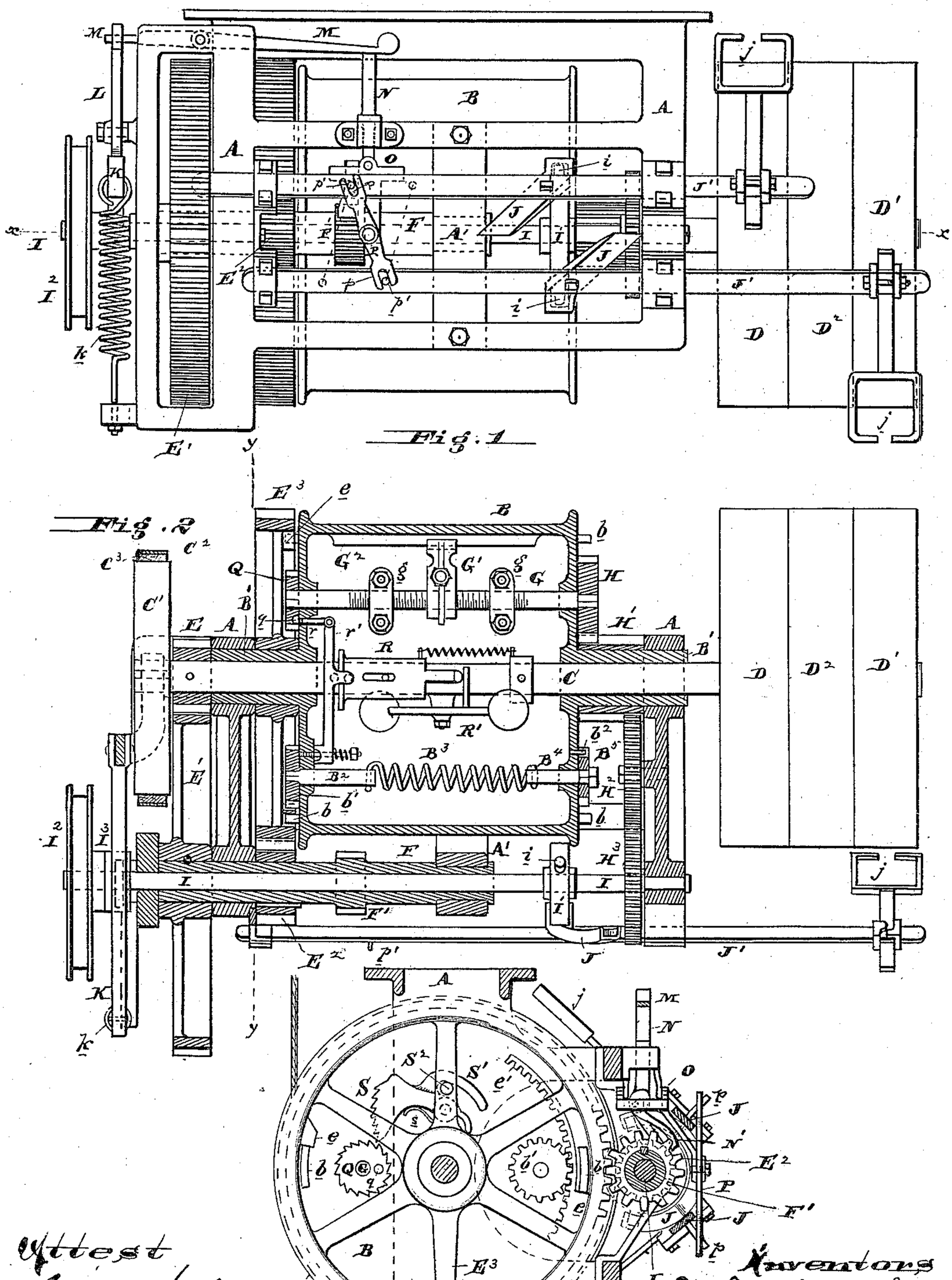

Fig. 1

Fig. 2

Fig. 3

Witnesses
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James Barber

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(No Model.) 2 Sheets—Sheet 2.

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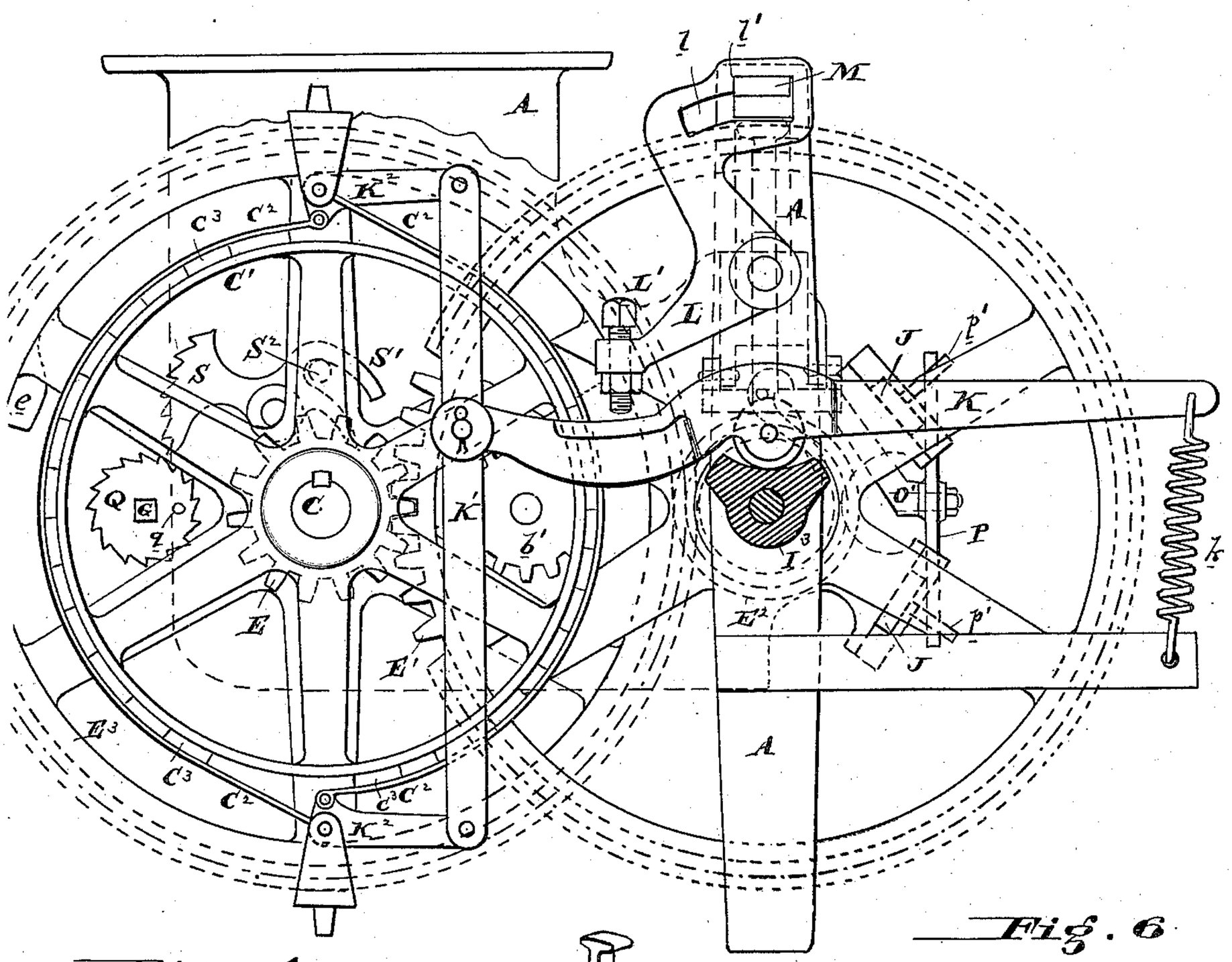

Fig. 1

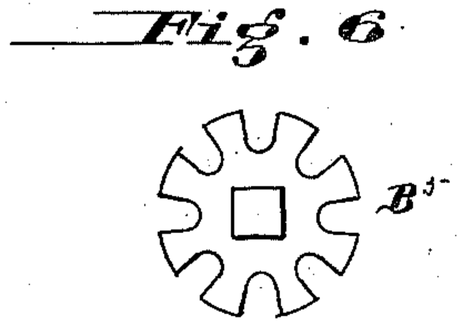

Fig. 6

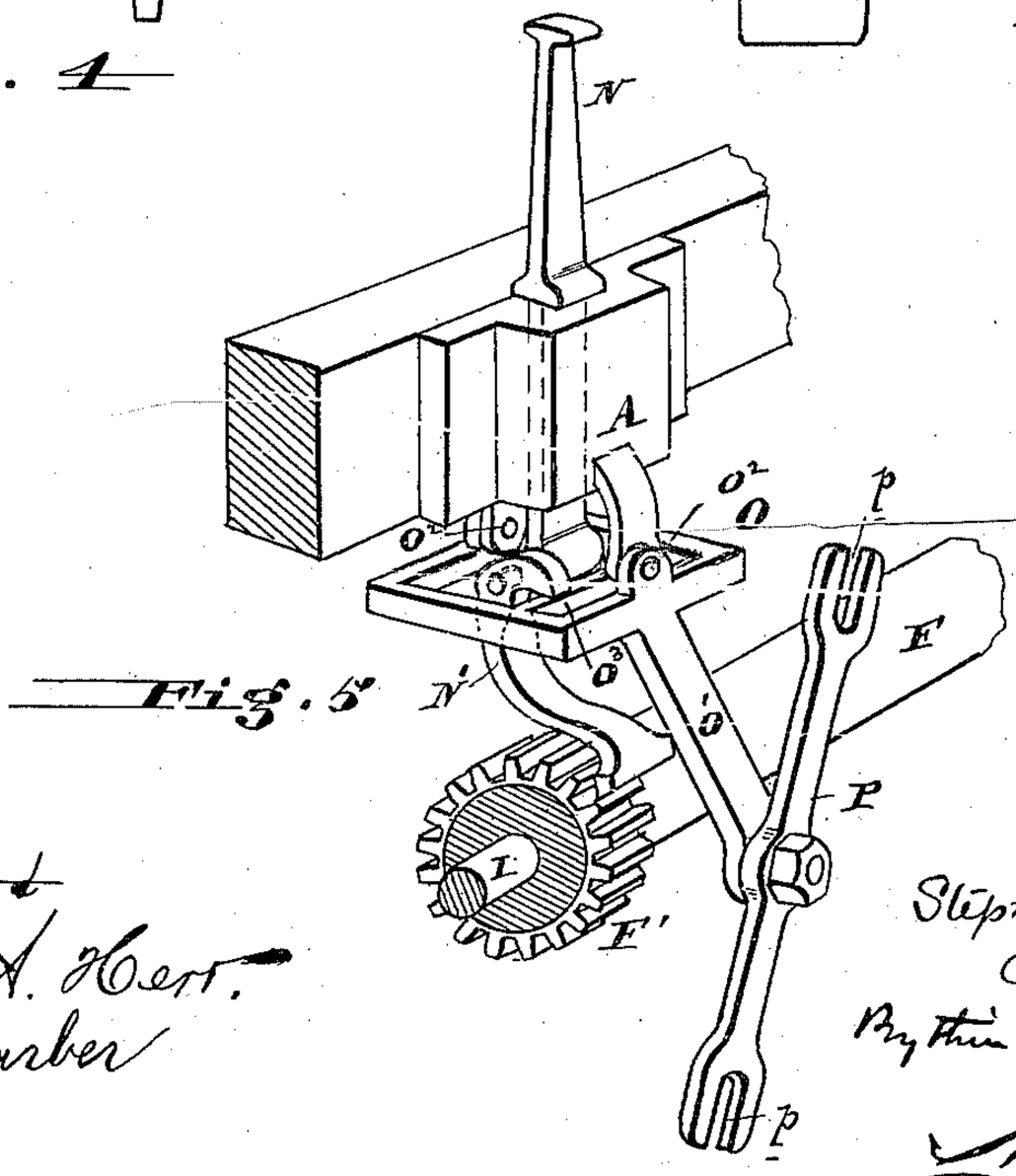

Fig. 5

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UNITED STATES PATENT OFFICE.

STEPHEN A. MORSE AND CHARLES TYSON, OF PHILADELPHIA, PA.

SPUR-GEARED HOISTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 344,053, dated June 22, 1886.

Application filed December 19, 1884. Serial No. 150,746. (No model.)

To all whom it may concern:

Be it known that we, STEPHEN A. MORSE and CHARLES TYSON, of the city and county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Spur-Geared Hoisting-Machines, of which the following is a specification.

This invention has reference to hoisting-machines; and it consists in certain improvements, fully set forth in the following specification and shown in the accompanying drawings, which form part thereof.

The object of this invention is to provide a spur-geared hoisting-machine with suitable mechanism by which it may accomplish the following results: First, that should the cage or platform accidentally become caught upon an obstruction or pinched between the guide-posts, and thus be arrested in its downward descent, the reduced tension of the cable will automatically cause the machine to be stopped, thus preventing an excessive quantity of loose cable, which, should the platform suddenly descend by the removal of this obstruction, would cause the breaking of said cable and the fall of the cage; second, that should the driving-belt break when lowering the cage and the speed of the revolving drum become too great, a governor shall automatically operate suitable brake devices, by which the machine is brought to rest; third, should the driving-belt break when lifting the cage, any tendency of the machine to run backward will be automatically utilized to apply the brake and arrest any further rotation of the machine; fourth, to arrest the movement of the elevator-cage gradually, so as to bring it to a stationary position without the least jar or thumping; fifth, to improve the general construction of spur-geared hoists as an entirety.

In the drawings, Figure 1 is a front elevation of a spur-geared hoist embodying our improvements. Fig. 2 is a sectional elevation of same on line X X. Fig. 3 is a cross-sectional elevation of same on line Y Y, looking toward the winding-drum. Fig. 4 is an end elevation of same, with part of the framing broken away and the shifting-wheel removed to expose the brake-operating cam. Fig. 5 is a perspective view of the device which operates the brake mechanism to automatically apply the brake should the driving-belt become broken and the elevator-cage attempt to run down; and Fig. 6 is an elevation of a star-wheel, the function and use of which will be more specifically referred to hereinafter.

A represents the main frame of the machine.

B is the winding-drum, and is provided with sleeve-bearings B′, which work in the frame A, as shown in Fig. 2.

C is the drive-shaft, and passes through the sleeve B′, being journaled therein, and has secured upon one end the pinion E and the brake-wheel C′, and upon the other end the loose belt-pulleys D D′ and fast pulleys D^2. The pinion E meshes with a large spur-wheel, E′, secured upon a hollow shaft, F, supported in the frames A and A′, and to which is secured the pinion E^2, which in turn meshes with the large spur-wheel E^3, which is loosely supported upon one of the sleeves B′; and this wheel E^3 is furnished with lugs *e*, which catch upon lugs *b*, projecting from the heads of the cylinder or winding-drum B, and by which it is positively rotated. The lugs *b* are located upon each end of the drum B, so that the machine may be made right or left handed. By this means the rotation of the shaft C will positively rotate the drum B in one direction, or so as to wind up the cable and lift the cage. As the shaft C is revolved in the opposite direction the weight of the cage keeps the lugs *b* of the drum constantly pressed against the lugs *e*, thus preventing the drum rotating with a greater speed than that of the spur-wheel E^3.

e′ is a rack or internal gear secured to the spur-wheel E^3 and meshes with the pinion *b′*, secured upon the shaft B^2, journaled in one of the heads of the drum B, and connected by means of a coil-spring, B^3, with another shaft, B^4, also journaled in the drum B, but in the opposite head thereof, and which latter shaft is provided with the star-wheel B^5, (shown in Fig. 6,) by which the tension of the spring B^3 may be regulated and retained through the agency of a stop-pin, b^2. The object of this spring B^3 is to cause the pinion *b′* to act upon

the rack e' of the spur-wheel E^3, to make the lugs e thereto tend to leave the lugs b on the winding-drum should the cable become broken, to the end that the machine may be automatically stopped in a manner fully specified hereinafter. If the cable should break, the spring B^3 tends to uncoil itself and, operating through the pinion b' and rack e', causes the drum to move faster or advance upon the wheel E^3. This movement moves the ratchet-pawl S over the pin S^2 on wheel E^3, and it is forced down upon the ratchet-wheel Q, arresting its rotation and also that of the pinion H, and this pinion, through a train of gears, as it moves about the shaft C, rotates the shaft I, which shifts the belts to stop the machine. These parts are fully set out in detail further on. The star-wheel B^5 is used to lock the shaft B^4 after the spring B^3 has been sufficiently twisted to insure the proper power.

G is a shaft carried by the drum B and provided with a screw-thread, around which are clamped the fixed ends g and the loose or traveling end G', which is prevented from rotating with the shaft by means of a guide, G^2, on the interior of said winding-drum. When the end G' rotates either of the fixed ends g, the rotation of the shaft G is arrested and the belts shifted automatically, which actions take place when the platform has reached its highest and lowest working levels. One end of the said shaft G is provided with a pinion, H, which meshes with a loose pinion, H', supported upon one of the sleeves B' of the drum B, and this pinion H' is secured with a pinion or segment, H^3, on the shifting-wheel shaft I by means of an intermediate H^2. The shifting-wheel shaft I works through a hollow shaft, F, hereinbefore referred to, and is pivoted on one end with the shifting or chain wheel I^2, for stopping, starting, or reversing the machine, and is provided with the brake-cam I^3, (see Fig. 4,) and also carries secured to it the wheel I', provided with pins i, which work in cams J, secured upon the shifting-bars J', to the ends of which are secured the belt-shifters j. The rotation of this shaft I in one direction will throw one belt into action, or the rotation in the other direction will throw the other belt into action to rotate the machine in either direction.

K is a brake-lever, and is provided with a roller which rests upon the cam I^3 on the shifting-wheel I^2, and has one of its ends connected with the link or bar K', which is hinged at its upper and lower ends to the lever K^2, to which steel brake-bands C^2 are secured, as shown in Fig. 4, the said bands being provided with wooden bearing-blocks C^3. The free or outer end of said lever K may be loaded with weights or drawn down by a spring, k, the latter being shown.

L' is a stop, made adjustable in one arm of a bell-crank, L, which is pivoted to the frame A, the function of which stop is to provide a fulcrum, against which the lever K is forced when the shifting-wheel and its cam I^3 is turned when putting the machine in operation, so as to remove the pressure of the brake-bands. When the machine is at rest, the lever K rests upon the cam I^3, and this applies the brakes to prevent the running down of the machine.

To arrest the rotation of the machine, or prevent its running backward should the bands or driving-belt break, the following construction is resorted to: The shifting-bars J' are provided with pins p', which project through slots p in the lever P, which is pivoted to the arm O', projecting down from the frame O, which is hinged to the frame A, as at O^2. (See Fig. 5.) By this means the shifting of one of the belts into working position for lifting the cage will cause the frame O to be worked so as to lower the spur O^3 from under the pawl N', pivoted to the vertical sliding bar N, allowing the said pawl to fall in contact with a pinion, F', secured to shaft F. By this means, should the machine attempt to run backward after the belt is broken, the pawl N' will be caught by the rotating pinion F' and raised, causing the pawl N' to be thrust backward, which action rocks the lever M and throws its free end down from the catch l' into the slot l of the bell-crank L, and this allows the stop or fulcrum L' to automatically rise, changing the true fulcrum of the lever K to the cam I^3, and thus automatically applying the brake to the brake-wheel C'. One end of the shaft G is provided with a ratchet-wheel, Q. Secured to the drum and working on a pivot, so as to come in contact with the said ratchet-wheel Q, is a ratchet-segment, S, which is kept out of contact with said ratchet-wheel by a spring, s, and is provided with a cam-extension, S', against which a pin, S^2, on the spur-wheel E^3 presses under certain conditions, to throw the said segment into contact with the said ratchet-wheel, and thus arrest its rotation, and thereby, as before described, shift the belts and apply the brakes. Under normal conditions the pin S^2 does not affect the segment S; but should the cable break, the spring B^3 causes the drum B to be independently rotated, which action causes the pin S^2 to strike the extension S' of the segment S and cause the latter to come in contact with the ratchet-wheel Q, arresting the rotation of the shaft G and applying the brake and shifting devices, as before explained.

Should the belt break when the machine is running down, the following mechanism will automatically operate the shifting devices and apply the brake, arresting the machine: R is a sliding sleeve carried by the shaft C, and operated by a governor, R', which shifts it longitudinally upon the shaft C. r' is a lever which is actuated by the said sleeve, and actuates a pin, r, which may project into an aperture, q, of the ratchet-wheel Q on the shaft G, and thus arrest the rotation of the said shaft. Under normal speed the governor R has no effect; but

should the machine attempt to run too fast, then the governor shifts the sleeve R and causes the pin *r* to arrest the rotation of the ratchet-wheel Q, and this causes the pinion H′, which normally is stationary, to be carried around, and this movement operates the shaft I, applying the brake, and thus arresting the rotation of the machine.

From the above description it is perceived that provision is made for arresting the machine by the application of the brake, should either belt break when the machine was either raising or lowering the platform or elevator-cage; also, that should the speed be abnormally increased by the breaking or slipping of a belt, the machine will also be automatically brought to rest; and, finally, should the cable become broken or the cage be accidentally arrested in its descent, the brake will be applied and the belts automatically shifted to instantly arrest the rotation of the machine.

It is evident that the general construction of this machine may be greatly modified without in any way departing from our invention, and therefore we do not limit ourselves to the specific details of the construction shown.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a spur-geared hoisting-machine, a winding-drum, driving-belts, driving-wheel, idler-wheels, and connecting gearing, by which the driving-wheel rotates the winding-drum, in combination with belt-shifting mechanism, planetary gearing connecting with the winding-drum and belt-shifter, and mechanism, substantially as described, to rotate said gearing to actuate the belt-shifter by the movement of the drum should the driving-belt become broken or slack, substantially as and for the purpose specified.

2. In a spur-geared hoisting-machine, a winding-drum, driving-belts, driving-wheel, idler-wheels, and connecting gearing, by which the driving-wheel rotates the winding-drum, in combination with belt-shifting mechanism, gearing connecting with the winding-drum and belt-shifter, and a governor to rotate said gearing and actuate the belt shifter to arrest the rotation of the drum should the speed thereof increase above the normal, substantially as and for the purpose specified.

3. In a hoisting-machine, the winding-drum, driving-shaft, belt-driving mechanism therefor, a brake-wheel and a brake, in combination with a locking device to hold the brake from being applied, normally stationary gearing connecting with the locking device for the brake, rotary gearing carried by the drum and connecting with the stationary gearing, and a stop to arrest the rotary gearing should said drum revolve faster than that due to the power-shaft, and automatically apply the brake by unlocking the brake, said effect taking place in case the driving-belt should become loose or break, or should the lifting-cable become broken or slack, substantially as and for the purpose specified.

4. In a spur-geared hoisting-machine, a winding-drum, lifting-cable, driving-belts, driving-wheel, idler-wheels, and connecting gearing, by which the driving-wheel rotates the winding-drum, in combination with belt-shifting mechanism, planetary gearing connecting with the winding-drum and belt-shifter, and mechanism, substantially as described, to rotate said gearing to actuate the belt-shifter by the movement of the drum should the lifting-cable become broken or slack, substantially as and for the purpose specified.

5. In a hoisting-machine, the winding-drum, driving-belts, driving band-wheel, idler-wheels, and connecting gearing, by which the driving-wheel rotates the winding-drum, belt-shifting devices, a brake-wheel and a brake, in combination with a governor rotated by the winding-drum, and connecting mechanism, whereby said governor applies the brake and shifts the belts when the speed of the winding-drum increases above its normal, substantially as and for the purpose specified.

6. In a hoisting-machine, a brake-wheel and brake devices, substantially as set forth, in combination with a brake-applying lever, a removable fulcrum, a cam to actuate said lever, and automatic trip mechanism, substantially as set forth, to remove said fulcrum and apply the brake should the driving-belt break or become loose and the machine attempt to run backward when it should run forward, substantially as and for the purpose specified.

7. The combination, in a hoisting-machine, of the lever K, cam I^3, spring *k*, brake-wheel C′, suitable brake-applying devices bearing against said wheel and operated by said lever K, fulcrum L′, secured to bell-crank L, a lock for said bell-crank, and actuating mechanism, substantially as described, to free said bell-crank and apply said brake automatically should the machine attempt to run backward when it should run forward, substantially as and for the purpose specified.

8. The combination of shifting-bars J′, having pins *p*′, lever P, pivoted frame O, carrying said lever, a vertical sliding bar, N, a pawl, N′, pivoted to the sliding bar N, a lever, M, actuated by said bar N and adapted to lock or unlock the bell-crank L, provided with the fulcrum L′, shaft F, carrying pinion F′, adapted to catch pawl N′, and positively actuated by the driving mechanism, cam I^3, actuated by the chain-wheel, for stopping, starting, or reversing the machine, lever K, spring *k*, or its equivalent, and suitable brake devices, substantially as described, actuated by said lever K, substantially as and for the purpose specified.

9. In a hoisting-machine, the combination of the drum B, carrying screw-shaft G, gears H H′ H^2 H^3, shaft I, brake-applying devices actuated by said shaft I, a governor, R′, and connecting devices, substantially as set forth,

to arrest the rotation of shaft G should the belt break or the machine attempt to run too fast, and thereby cause the brake to be applied, substantially as and for the purpose specified.

10. In a hoisting-machine, the combination of the drum B, carrying screw-shaft G, gears H H′ H² H³, shaft I, brake-applying and belt-shifting devices actuated by said shaft I, a ratchet-wheel, Q, a ratchet segment or stop, S, carried by the drum, and a pin, S², carried by the driving gearing or shaft to automatically throw the segment S into contact with the rotating ratchet-wheel Q, to arrest the rotation of shaft G should the cable become broken or slack, and thereby cause the brake to be applied and the belts to be shifted, substantially as and for the purpose specified.

11. In a spur-geared hoist, the combination of drum B, screw-threaded shaft G, carrying fixed nuts *g* and traveling nut G′, gears, H H′, H², and H³, shaft I, and belt-shifting devices actuated by said shaft, substantially as and for the purpose specified.

12. In a hoisting-machine, the drum B, having lugs *b*, driving-gear E³, having lugs *e*, and rack *e′*, gear *b*, shaft B², coil-spring B³, and means, substantially as set forth, to put said spring under any desired tension, substantially as and for the purpose specified.

13. The combination of a frame, winding-drum B, having sleeves B′, shaft C, passing through said sleeves, band-wheels D, D′, and D², pinions E and E², spur-wheels E′ and E³, hollow shaft F, and belt-shifting shaft I, passing through shaft F, substantially as and for the purpose specified.

14. In a hoisting-machine, brake mechanism, substantially as described, in which the actuating-lever may have one of two fulcrums, one of which is normally the point of application of the power when taking off the brakes, but which acts as the fulcrum when the regular fulcrum is removed should the machine abnormally attempt to run backward, substantially as and for the purpose specified.

In testimony of which invention we hereunto set our hands.

STEPHEN A. MORSE.
CHARLES TYSON.

Witnesses:
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