J. M. HOWARD.

HOISTING DEVICE.

APPLICATION FILED DEC. 30, 1909.

**1,035,442.** Patented Aug. 13, 1912.

2 SHEETS—SHEET 1.

*Fig. 1.*

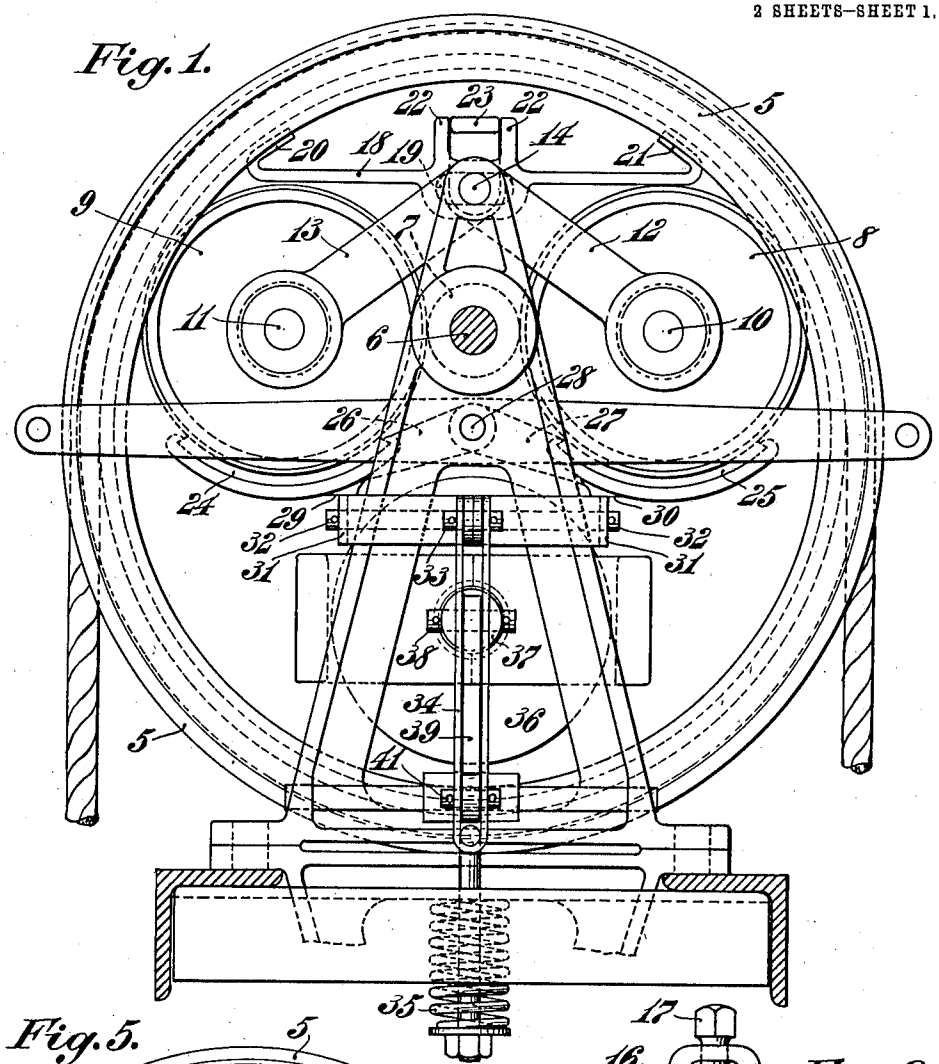



*Fig. 5.*

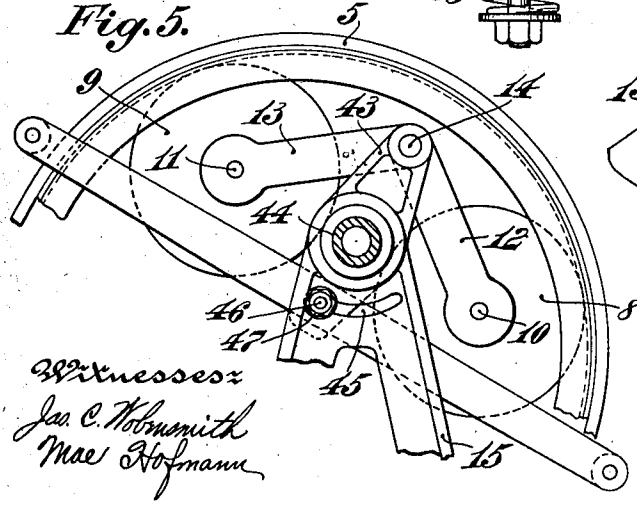
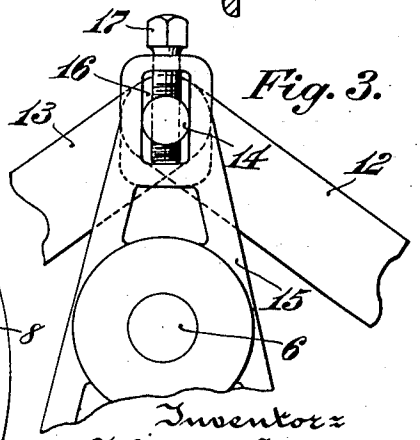



*Fig. 3.*

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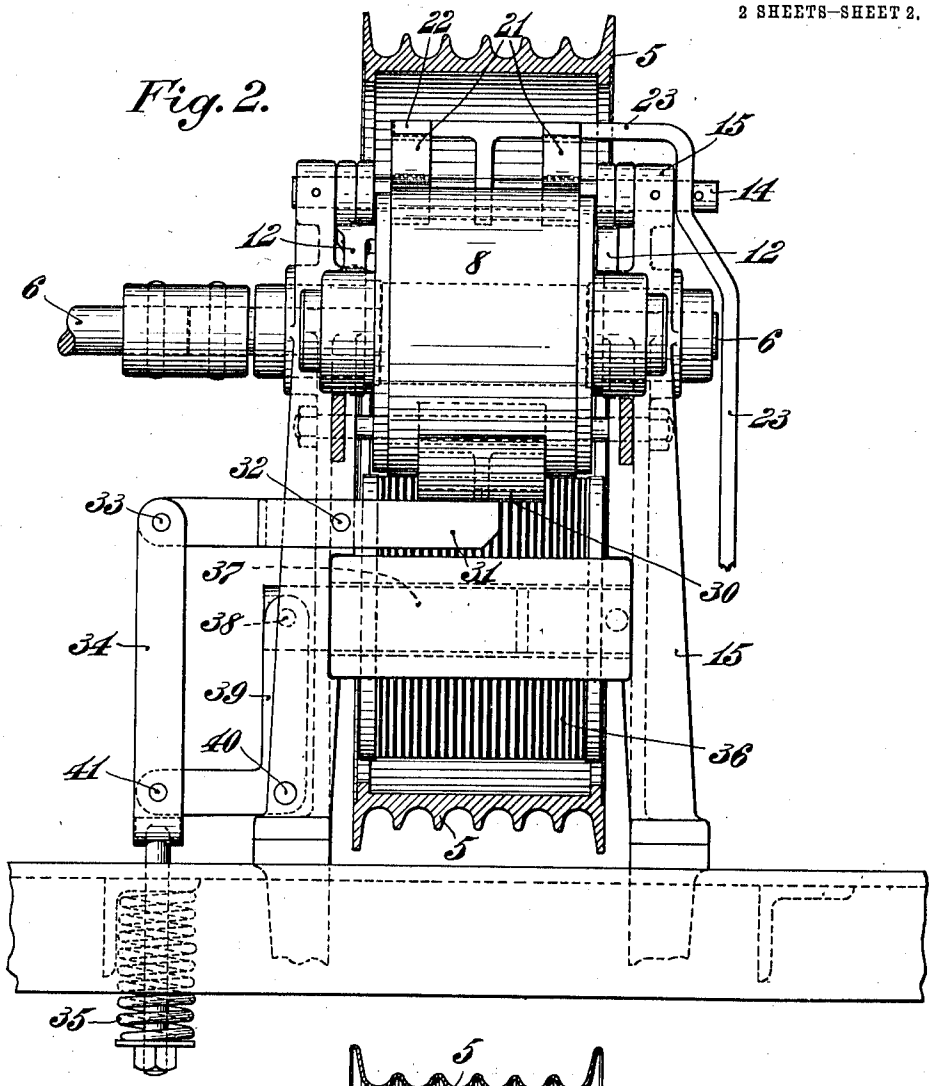
2 SHEETS—SHEET 2.

Fig. 2.



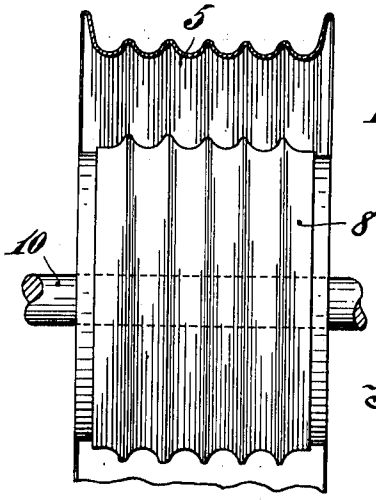




Fig. 4.

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# UNITED STATES PATENT OFFICE.

JOHN M. HOWARD, OF WALLINGFORD, PENNSYLVANIA.

## HOISTING DEVICE.

1,035,442. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed December 30, 1909. Serial No. 535,636.

*To all whom it may concern:*

Be it known that I, JOHN M. HOWARD, a citizen of the United States, residing at Wallingford, in the county of Delaware and State of Pennsylvania, have invented a new and useful Hoisting Device, of which the following is a specification.

My invention relates to improvements in hoisting devices.

The object is to provide improved means for communicating power to actuate the hoisting drum and improved means for braking or controlling the movement of the drum.

One of my objects is to so relate the driving pinion, the idlers and the drum that there will be no slip between coöperating parts.

This invention is an improvement over the invention described in U. S. patent to me No. 648,410, May 1st, 1900. Referring to Figure 8 of that patent, it will be noted that the friction wheels $E^2$ and rollers $F^2$ are supported on shafts capable of translative movement on horizontal bearing boxes. These horizontal bearing boxes prevented to a large extent, the efficient wedging action of the idlers between the drum and pinion. In my present invention by mounting the idlers on swinging supports I can so proportion the idlers with respect to the drum and pulley, and so locate the fixed support of each idler supporting means as to get the necessary pinch between the idlers and the pulley to secure a maximum and balanced efficiency.

My invention also comprises improvements in details of construction.

Referring to the drawings:—Fig. 1 is a front elevation of my improved hoisting device. Fig. 2 is a side elevation with drum in section. Fig. 3 is a detail in elevation. Fig. 4 is a sectional view showing an alternate form of drum. Fig. 5 is a detail of a modified construction showing means for lateral adjustment of the bracket supporting shaft.

Similar numerals refer to similar parts throughout the several views.

Referring to Fig. 1, 5 indicates the drum or ring carrying the hoisting rope or cable. Shaft 6 is the main driving shaft, driven from any suitable source of power. Driving pinion 7 is mounted on shaft 6. Against this pinion engage the two idlers 8 and 9. These idlers 8 and 9 are supported on the shafts 10 and 11 respectively. The shaft 10 is supported by the swinging arms 12 while shaft 11 is supported on the swinging arms 13. Said arms in turn are supported at their upper ends by the rod or shaft 14, secured in the stationary framework 15. This shaft 14 is preferably provided with means for vertical adjustment, relatively to said supporting structure 15. For example, as shown in Fig. 3, the shaft is vertically movable in the openings 16, and the movement is secured by means of the screws 17.

Upon the idlers 8 and 9 rests the drum or ring 5. The pressure of the drum upon the idlers 8 and the consequent pressure against the pinion or driver 7 is relative to the load on the drum. The position of the shaft 14 controls the efficiency of contact between the idlers 8 and 9 and the pinion 7. That is to say, when the shaft 14 is elevated the idlers rest against the pinion 7 above the horizontal plane of its axis. As the shaft is lowered and the point of contact of the idlers approaches and passes below the plane of said axis of the pinion, the pinch or efficiency of contact between the idlers and the pinion is increased. Thus the prevention of slip between pinion and idlers is amply secured by the adjustment of the shaft 14. It will be understood that the entire weight of the drum is carried by the idlers 8, and as these are supported by the brackets 12 and 13 which freely swing on shaft 14, practically the entire weight of the drum is communicated through idlers 8 and 9 to the pinion 7. As the axes of the idlers approach to a position horizontal with or slightly below the axis of the pinion, it will be seen that the tendency is for the drum to wedge the idlers against the pinion with a very high efficiency of contact. If it is found that there is a slip between the idlers and the drum, then the shaft 14 may be elevated. It will thus be seen that the efficiency of contact between the idlers and the drum and the idlers and the pinion may be so balanced as to secure the parts against any slipping.

As an emergency control for braking or stopping the movement of the drum in either direction, either when the hoisting device has made the complete movement in one direction or the other, or in case of too great speed of movement, I provide the following mechanism. The skid 18 is provided with the elongated horizontal opening 19 and is

loosely supported on the shaft 14, said shaft passing through said opening 19. Skid member 18 has its two extensions 20 and 21 bent upwardly and backwardly in directions approximately that of the interior periphery of the drum. Said skid member 18 is also provided with the centrally located lugs 22 adapted to embrace the lever 23. This lever 23 projects downwardly on the outside of the frame at any suitable point, and is adapted to be moved in either direction by the engagement therewith of any suitable mechanism not shown. For example, the lever may be operated either upon the movement of the car past a predetermined point in either direction, or by some governing mechanism, operating upon predetermined speed of movement of the car. The skid being thus actuated in the direction of movement of the idlers will be crammed between the periphery of one idler and the inner periphery of the drum thereby effectually braking and stopping the movement of the drum.

I also provide an automatically operating brake actuated simultaneously with throwing the current into the motor or cutting it out. The brake-shoes 24 and 25 are supported on the arms 26 and 27 respectively pivotally supported at 28. These shoes are provided with seats or projections 29 and 30 respectively, which are adapted to rest on the bifurcated lever 31. This lever 31 is pivotally supported at 32 and is connected at its other or free end by pivot 33, with a connecting arm which is normally pulled downwardly by the spring 35. The solenoid 36 has a movable core 37, to the outer end of which, at 38, is pivoted one end of the bell lever 39 having its fulcrum at 40. Said lever pivoted at the other end at 41 to the connecting arm 34. When the spring 35 operates normally to pull the connecting arm 32 and the free end of lever 31 downwardly, the brake-shoes are lifted to engage with the idlers 8 and 9, which not only tends to prevent the rotation of the idlers, but also tends to lift the idlers slightly away from the pinion 7 which doubly assures the stopping of the actuation of said idlers 8 and 9. When however the current is thrown into the motor to cause the rotation of shaft 6, the solenoid is simultaneously energized to pull the core 37 inwardly or to the right as shown in Fig. 2, which causes the actuation, through the bell lever 39, of the connecting rod 34 to move the same upwardly, which results in the depression of the lever 31 to the right of pivot support 32 and the consequent release of the brakes.

The periphery of the drum or ring is preferably corrugated, which serves to increase its strength and at the same time add to the efficiency of engagement of the ropes or cables. I prefer to make this drum or ring of corrugated sheet metal such as shown for example in Fig. 4, where the corrugation extends to the inner periphery of the ring, in which case the peripheries of the idlers 8 and 9 and of the pinion 7 are correspondingly corrugated for coöperative engagement with each other and the drum. By forming the drum as shown in Fig. 4, a very strong and stable structure is made, which at the same time is light in weight, using a minimum quantity of metal.

Operation: In operating the device, the shaft 6 is rotated by a motor, or from any other suitable source of power, in the desired direction. The idlers 8 and 9 being pressed, by the weight of the ring or drum 5 resting thereon, against the pinion 7 are caused to rotate in the direction opposite to the pinion, and in turn communicate, through their contact with the inner periphery of the drum, movement to the drum in the direction of the pinion. The idlers are so placed that they engage with the drum at points very close to the engagement of the rope or cable with the drum, that is, at the point where power or work is exerted on said drum. The idlers 8 and 9, being supported on brackets swinging from shaft 14, have a tendency to swing downwardly in the arc of a circle of which the shaft 14 is the center. The point of engagement between the drum and the idler is approximately in line with the direction of this movement of the idler, or the movement which the idler would have, were it not counteracted by the pinion 7. The position of shaft 14, and consequently the position of axes 10 and 11 relatively to axis 6, affect the power exerted by the drum on the idlers, to crowd said idlers past the pinion 7, which tendency is very similar to that of the wedge, and hence it is possible to secure any desired relative efficiency of contact between the pinion and the idlers 8 and 9.

In Fig. 5, I show the shaft 14 supported in a rocking frame 43 pivoted to the stationary framework at 44. The stationary frame 44 is also provided with the arc shaped slot 45 through which projects the bolt 46 from the rocking frame, coöperating with the nut 47, for securing said rocking frame in any desired position of adjustment. This structure is desirable where the stationary frame is either mounted on, or suspended from, an inclined surface, or where the ropes or cables are designed to extend from the drum in a direction other than vertically.

Other electrically operated means for operating the brake mechanism may obviously be used in place of a solenoid and core.

What I claim is:—

1. In a hoisting device, the combination of a drum or hoisting ring, a pair of idlers sup-

porting the same, a pinion interposed between the idlers, swinging supports for the idlers having a common axis.

2. In a hoisting device, the combination of a drum, interiorly disposed pulleys engaging therewith, swinging supports for said pulleys supported within the periphery of the drum and a pinion operating between said pulleys.

3. In a hoisting device, the combination of a drum, interiorly disposed pulleys engaging therewith, adjustably supported swinging supports for said pulleys and a pinion operating between said pulleys.

4. In a hoisting device, the combination of a drum, interiorly located supporting idlers, swinging supports for said idlers, a driving pinion coöperating with the idlers, and means for changing the angle between the radius of the idler to point of contact with drum, and the radius to point of contact with pinion, to secure the required relative or balanced frictional engagement between pinion and idlers and between idlers and drum.

5. The combination of a hoisting drum, supporting pulleys therefor and a driving pinion coöperating with the pulleys, a swinging bracket for supporting one of said pulleys, said bracket having an adjustable point of support.

6. The combination of a hoisting drum, supporting pulleys therefor and a driving pinion coöperating with the pulleys, a swinging bracket for supporting one of said pulleys, said bracket having a vertically adjustable point of support.

7. The combination of a hoisting drum, supporting pulleys therefor and a driving pinion coöperating with the pulleys, a swinging bracket for supporting one of said pulleys, said bracket having a laterally adjustable point of support.

8. The combination of a hoisting drum, supporting pulleys therefor and a driving pinion coöperating with the pulleys, a swinging bracket for supporting one of said pulleys, said bracket having a rotatably adjustable point of support.

9. The combination of a hoisting drum, two supporting pulleys therefor interiorly located, swinging brackets for said pulleys having a common supporting shaft located within the periphery of said drum and a driving pinion operating between said pulleys.

10. The combination of a hoisting drum, two supporting pulleys therefor interiorly located, swinging brackets for said pulleys having a common supporting shaft adjustably positioned within the periphery of the drum and a driving pinion operating between said pulleys.

11. A hoisting drum, interiorly located supporting pulleys therefor, a driving pinion operating between the pulleys, and a skid between the pulleys and the inner periphery of the drum and adapted to be moved in the direction of travel of said pulleys to wedge between a pulley and the periphery of the drum.

12. A hoisting drum, interiorly located supporting pulleys therefor, a driving pinion operating between the pulleys, and a skid loosely mounted between the pulleys and the inner periphery of the drum and adapted to be moved in the direction of travel of said pulleys to wedge between a pulley and the periphery of the drum.

13. A hoisting drum, interiorly located supporting pulleys therefor, a driving pinion operating between the pulleys and a skid located within the periphery of the drum and adapted to be moved in the direction of travel of said pulleys to wedge between a pulley and the periphery of the drum, and means for operating said skid.

14. In combination with a drum, a pair of supporting pulleys therefor, and a driving pinion coöperating with the pulleys, a brake-shoe for coöperating with each pulley, a spring controlled pivoted lever for supporting both brake-shoes, and electrically operated means for operating the lever in opposition to the spring.

15. A hoisting drum, a pair of supporting pulleys therefor, braking mechanism comprising brake-shoes for the supporting pulleys, a single spring controlled lever for actuating the brake-shoes, and a solenoid and core for actuating the lever to release the brake.

16. In a hoisting device, the combination of a hoisting drum formed with its inner and outer peripheries corrugated, supporting pulleys therefor, a driving pinion interposed between the pulleys, and swinging supports for the pulleys supported from a common shaft.

17. In a hoisting device, the combination of a hoisting drum provided on its inner and outer peripheries with corresponding corrugations, supporting pulleys coöperating therewith having corresponding corrugated peripheries, a driving pinion coöperating with the supporting pulleys having a correspondingly corrugated periphery, and swinging supporting arms for the pulleys having a common axis.

18. In a hoisting device, the combination of a drum, interiorly located supporting pulleys, swinging supports for said pulleys, and a driving pinion operating between the pulleys, the position of the axis of one of said swinging supports being such that the distance between parallel lines, one passing through said axis and one through the axis of its supported pulley, perpendicular to the line passing through the axis of the two pulleys, shall not be less than the distance

between the axis of the pinion and the axis of the pulley.

19. In a hoisting device, the combination of a drum, interiorly located supporting pulleys, swinging supports for said pulleys, and a driving pinion operating between the pulleys, the position of the axis of one of said swinging supports being such that the distance between parallel lines, one passing through said axis and one through the axis of its supported pulley, perpendicular to the line passing through the axis of the two pulleys, shall not be less than the distance between the axis of the pinion and the axis of the pulley, and means for adjusting the position of the axis of said swinging support to secure the required balanced efficiency of engagement between drum and pulleys and between pinion and pulleys.

20. In a hoisting device, the combination of a drum, interiorly located supporting pulleys, swinging supports for said pulleys and a driving pinion coöperating with the pulleys, axes of the swinging supports located so as to offer a minimum resistance to the pressure of the pulleys against the pinion, and means for adjusting the position of the axis of one of said swinging supports to secure the desired pinch of the pinion between the pulleys.

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