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G. A. ARMINGTON.

SAFETY BRAKE FOR HOISTING DEVICES.

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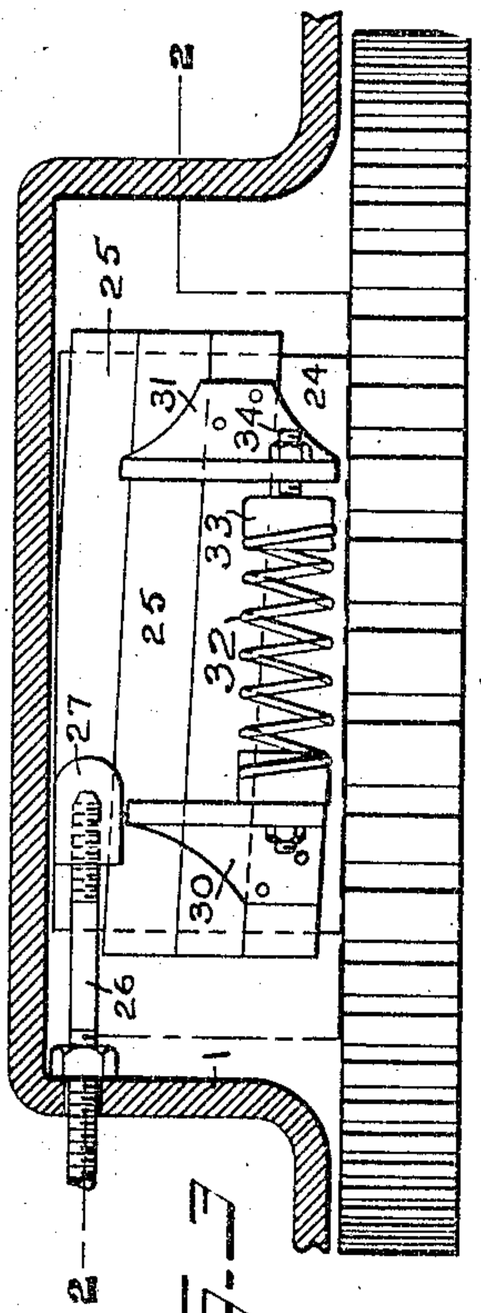


Fig. 1.

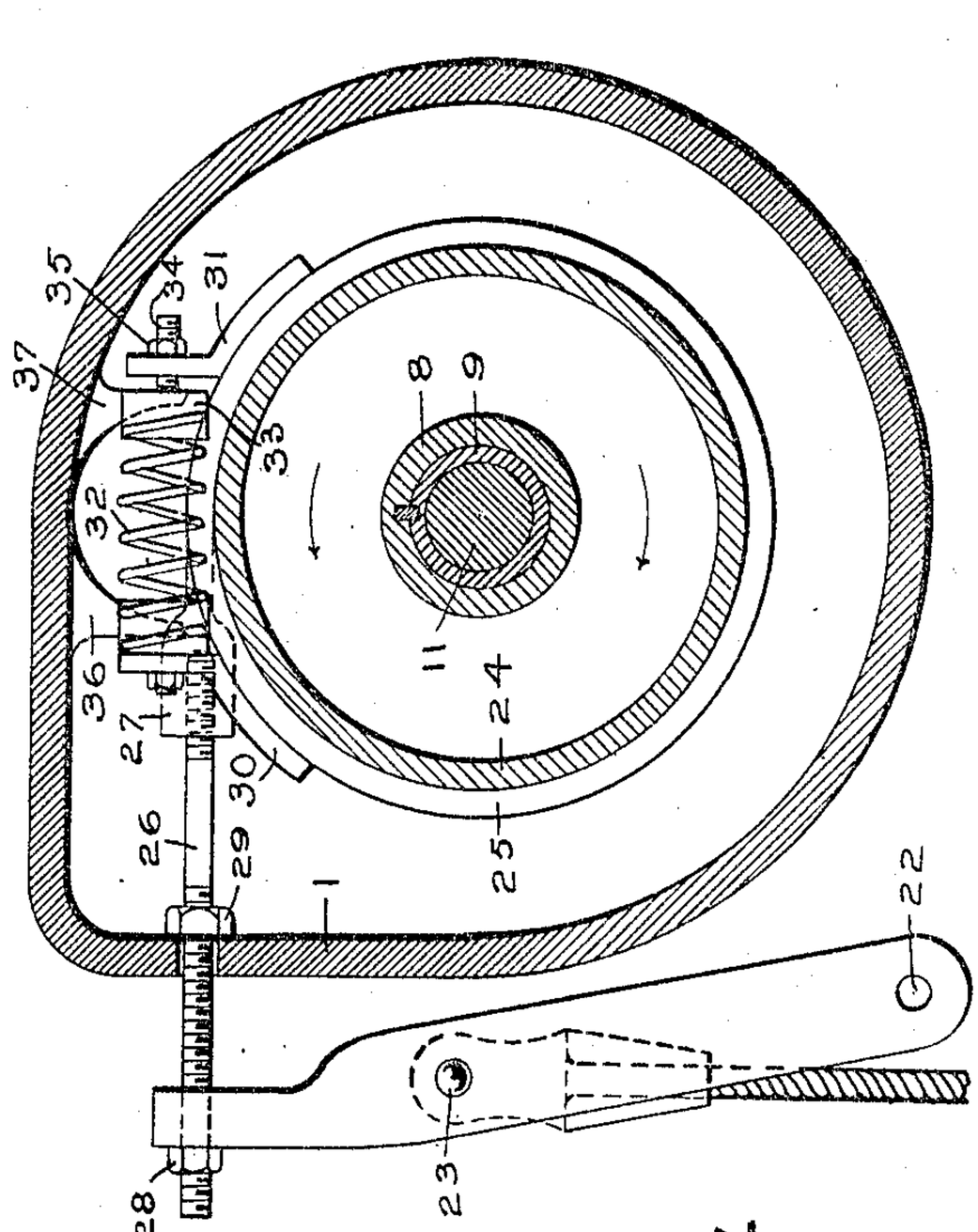
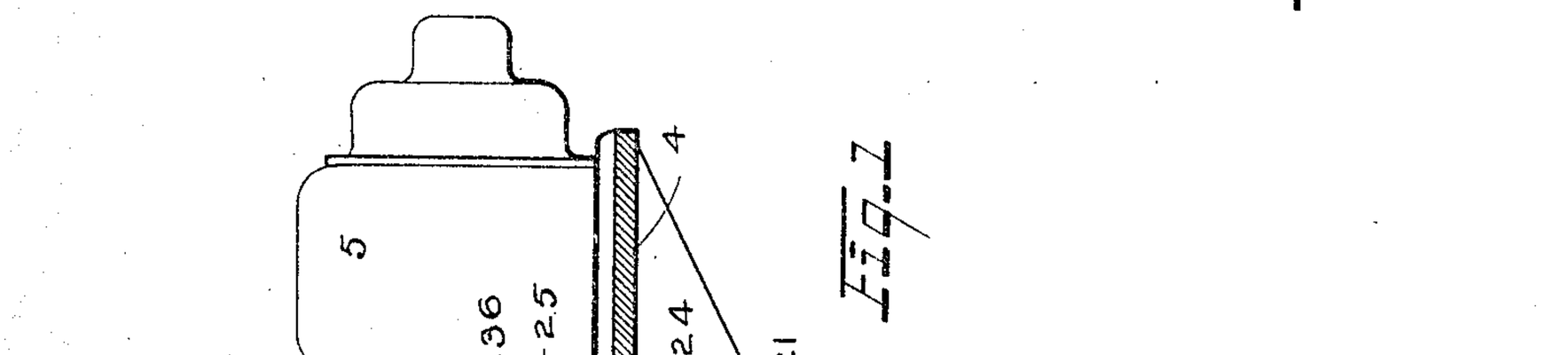


Fig. 2.



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SAFETY-BRAKE FOR HOISTING DEVICES.

No. 871,552. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed January 15, 1907. Serial No. 352,381.

To all whom it may concern:

Be it known that I, GEORGE A. ARMINGTON, a citizen of the United States, residing at Wickliffe, in the county of Lake and State of Ohio, have invented a certain new and useful Improvement in Safety-Brakes for Hoisting Devices, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to hoisting devices and it has particular reference to a safety brake which is applied thereto for the purpose of sustaining the load and for providing against the too rapid lowering of the same, the brake being so constructed that it automatically arrests the load and holds the same until the mechanism is positively driven in a reverse direction, by which operation the load is lowered.

In the accompanying drawings forming a part of this application, Figure 1 is a view, partly in section and partly in elevation, of a hoisting device having my automatic safety brake applied thereto. Fig. 2 is a transverse section taken through Fig. 3, substantially on the line 2—2 of that figure, and Fig. 3 is a plan view of the brake, the upper part of the inclosing casing being cut away in order that the brake mechanism may appear.

In Fig. 1, 1 represents the outside casing or frame within and upon which the hoisting mechanism is contained or mounted. This frame is suspended from a suitable support, as a trolley, by means of a hook 2 and connections 3 between said hook and the frame. The frame is provided with a projecting table or support 4, upon which is mounted the driving means, which, as shown in the drawings, is an electric motor 5 having an armature shaft 6. Keyed to this shaft is a small pinion 7, which meshes with a gear 8 that is keyed to the hub 9, of a pinion 10, which pinion is loosely journaled upon a shaft 11. This shaft is mounted at its left hand end in the casing 1, and, toward its right hand end, in a transverse web or partition 12 of the casing. The pinion 10 meshes with a gear 13 that is keyed to a shaft 14, said shaft being parallel with the shaft 11 and being journaled in the same parts of the frame. Secured to the shaft 14 is a pinion 15, said pinion meshing with a gear 16 that is secured to, or cast integral with, the hoisting drum 17. The hoisting cable 18 is wound upon this drum and has one of its ends secured thereto, said cable thence passing about a sheave 19 for the hook 20, to which hook the load is to be applied. From this sheave the cable is suitably secured to a vertically extended strut arm 21, said strut arm being pivoted to the casing 1 at a point 22. As will be seen from Fig. 2, the cable is attached to said strut arm at a point 23 between the ends of said arm and toward the upper end thereof. With the exception of the manner of attaching the cable to the strut arm, the hoisting mechanism thus shown is one only of a great many forms to which my invention may be applied, and it has been thus described for the purpose of showing the manner in which my safety brake may be employed in connection with devices of this character.

The brake is shown in detail in Figs. 2 and 3, and in section on a smaller scale in Fig. 1. From the latter figure it will most clearly appear that the gear 8 is provided with an annular flange 24 projecting from one side thereof, in connection with which the coiled brake band 25 is adapted to operate. One end of this brake band is secured to the upper end of the strut arm 21 through the medium of a connecting rod 26, said rod being threaded at its inner end in order that it may be screwed into an enlarged member 27 on the end of the brake band. The rod is also screw threaded at its opposite end for the purpose of receiving a nut 28, which connects it with the strut arm, and for also receiving a nut 29 inside of the casing 1, said latter nut being adapted to engage with the casing and thus prevent the load from setting the brake with too great force. The end of the brake band, opposite that to which is secured the member 27, is provided with an angle plate, or other suitable form of projection 30, and a similar angle plate or projection 31 is secured to the brake band intermediate its ends. A spring 32 connects the two angle iron projections thus described, said spring being normally under sufficent stress to pull said projections together for setting the brake. At one of its ends the spring is attached directly to its respective projection, while at the opposite end the spring is connected to a cylindrical member 33 in which is swiveled a bolt 34, said bolt being pivoted with a nut 35 for engaging the other projection, whereby the tension of the spring may be adjusted.

Projecting inwardly from the casing 1 are angular lugs 36 and 37, said lugs extending

between the angular projections 30 and 31 on the brake band so as to be engaged on their outer surfaces by the said projections. The relative distances between the said outer surfaces of these lugs and the inner surfaces of said projections is such that the said angular projections and brake band may have a limited amount of movement about the shaft 11 before there will be an engagement with the lugs.

The operation of the device is as follows: Assuming that a load is being hoisted, the gear 8 and the flange 24 thereon will be moving in the direction of the upper arrow shown in Fig. 2. The tension on the spring 32 is sufficient to cause the brake band to grip the flange with such force as to produce a bodily rotation of the brake band about the shaft 11, said rotation continuing until the angular projection 31 engages with its respective lug 37. This engagement arrests the projection 31 and that portion of the brake band to which it is attached. The continued rotation of the flange 24 and the friction of the brake band therewith carries the end of the coil having the projections 30 a slightly further distance, with the result that the brake band is partially uncoiled and is thereby loosened from about the flange. This loosening of the brake band relieves the mechanism of the greater part of the friction, and thereby enables the load to be hoisted without material resistance from the brake. In order to further relieve the brake from this friction during hoisting, the nut 29 is so positioned on the rod 26 that, when the brake band rotates at the beginning of the hoisting operation, said nut jams against the interior of the casing and thereby relieves the brake band from the pull on the rod. At the end of the hoisting operation, after the motor has stopped, the load rotates the gear 8 in a reverse direction, or in a direction indicated by the lower arrow in Fig. 2. This movement of the gear 8 tends to cause the flange 24 thereon to carry the brake band about with it, thereby moving the projection 31 away from the lug 37 and permitting the spring 32 to exert its full power. This movement of the brake band at the end that is connected with the rod 26 is resisted by the pull of the cable, with the result that that end of the band is temporarily held against movement while the brake band wraps tightly about the flange. The rod 26 is, therefore, subjected to pulls in opposite directions,—one pull being due to the weight that is sustained by the cable pulling directly on said rod, and the other due to the same weight pulling on the drum and tending to turn the flanged gear wheel, which pull being resisted by the brake band, tends to rotate the band and thereby draw the rod 26 inwardly so as to free the nut 29 from the casing. If the load is heavy the nut will be held by the first mentioned pull against the casing, and the full power of the brake will be exerted while the load is being lowered by the motor; but, if the load is comparatively light, the second pull on the rod due to the brake will overcome the first mentioned pull, with the result that the nut 29 will be drawn away from the casing. Excessive movement of the nut away from the casing is prevented by the engagement of the projection 30 with its respective lug 36. By said engagement, that end of the brake band with which the projection 30 is connected is held against further movement, and any further movement of the opposite end of the band partially uncoils the latter and loosens the brake, thereby relieving the mechanism from surplus or unnecessary friction during the lowering operation.

From the construction thus described, it will be seen that my brake is entirely automatic in its operation and requires no attention whatever from the operator after it has once been adjusted. During the hoisting operation, when resistance from the brake would be detrimental, the brake automatically loosens from the flange, and, during the lowering operation, or whenever the power from the hoisting motor is cut off, the brake will automatically tighten, and thereby hold the load in the position which it may then have assumed. If the load to be lowered is comparatively light the brake band automatically loosens to a greater or less extent, depending upon the weight of the load, so that power is not unnecessarily consumed by the brake.

Having thus described my invention, I claim:

1. In a hoisting device, a drum, means through which said drum is driven, a brake band adapted to frictionally engage said means, a rod connected with one end of said brake band, a strut arm connected to said rod, a cable attached at one of its ends to said drum and at its other end to said strut arm, and means for arresting the motion of said rod for the purpose specified.

2. In a hoisting device, a drum, a gear through which said drum is driven, a flange on said gear, a brake band adapted to frictionally engage said flange, a rod connected with one end of said brake band, a strut arm connected to said rod, a cable attached at one of its ends to said drum and at its other end to said strut arm, and means for arresting the motion of said rod, for the purpose specified.

3. In a hoisting device, a driven member, a coiled brake band for frictionally engaging said member, stationary stops, means on said brake band for engaging with said stops, a hoisting cable, and connections between said hoisting cable and said brake band.

4. In a hoisting device, a casing, a driven gear in said casing, a flange on said gear, a

coiled brake band for frictionally engaging said flange, stationary stops projecting from the casing, means on said brake band for engaging with said stops, a hoisting cable, and connections between said hoisting cable and said brake band.

5. In a hoisting device, a driven member, a coiled brake band for frictionally engaging said member, a projection on one end of said brake band, a second projection intermediate the ends of said brake band, stationary stops between said projections, a hoisting cable, and connections between said hoisting cable and the brake band, whereby the weight of the load on the cable will normally tighten said band, the construction being such that when the member is driven in one direction, one of said projections will engage with its stop to loosen the band and when the member is driven in the opposite direction, the other projection may engage with its stop to again loosen the band sufficiently to permit the load to be lowered without unnecessary friction.

6. In a hoisting device, a casing, a driven gear in said casing, a flange on said gear, a coiled brake band for frictionally engaging said flange, a projection on one end of said brake band, a second projection intermediate the ends of said brake band, stationary stops on the casing and extending between said projections, a hoisting cable, and connections between said hoisting cable and the brake band, whereby the weight of the load on the cable will normally tighten said band, the construction being such that, when the gear is driven in one direction, one of said projections will engage with its stop to loosen the band and, when the gear is driven in the opposite direction, the other projection will engage with its stop to again loosen the band sufficiently to permit the load to be lowered without unnecessary friction.

7. In a hoisting device, a hoisting drum, gears for driving said drum, an annular flange on one of said gears, a brake band coiled about said flange, a cable having one of its ends attached to the drum and its opposite end attached to one end of said brake band, a projection on the opposite end of said brake band, a second projection on the brake band intermediate the ends thereof, a spring connecting said projections and tending to draw the same together, and stationary stops between said projections.

8. In a hoisting device, a hoisting drum, gears for driving said drum, an annular flange on one of said gears, a brake band coiled about said flange, a cable having one of its ends attached to the drum and its opposite end attached to one end of said brake band, a projection on the opposite end of said brake band, a second projection on the brake band intermediate the ends thereof, a spring connecting said projections and tending to draw the same together, means for adjusting the tension of said spring, and stationary stops between said projections.

9. In a hoisting device, a hoisting drum, gears for driving said drum, a flange on one of said gears, a brake band coiled about said flange, a rod secured to one end of the brake band, a pivoted strut arm having its free end connected to said rod, a stop on said rod for limiting its movement in one direction, a cable connecting the drum and the strut arm, a projection on the end of the brake band opposite said rod, a second projection intermediate the ends of the band, a coiled spring connecting said projections and tending to draw them together, and stationary stops between said projections, the construction being such that when the gear having the flange is turned in one direction, the stop on the said rod will hold the end of the band to which it is connected while the friction on the flange will loosen the band, and when the said gear is tu ned in the opposite direction, the said projection on the end of the band will engage with its stop, and the movement of the flange will again loosen the band thereabout so as to permit the load to be lowered without unnecessary friction.

10. In a hoisting device, a hoisting drum, gears for driving said drum, a flange on one of said gears, a brake band coiled about said flange, a rod secured to one end of the brake band, a pivoted strut arm hav ng its free end adjustably connected to said rod, a hoisting cable having one end attached to the drum and its other end attached to the strut arm between the pivot for the latter and the said rod, a stop on said rod for limiting its movement in one direction, a projection on the end of the brake band opposite said rod, a second projection intermediate the ends of the band, a coiled spring connecting said projections and tending to draw them together, stationary stops between the said projections, and means for adjusting the tension on said spring, the construction being such that when the gear having the flange is turned in one direction, the stop on the said rod will hold the end of the band to which it is connected, while the friction on the flange will loosen the band, and when the said gear is turned in the opposite direction, the said projection on the end of the band will engage with its stop, and the movement of the flange will again loosen the band thereabout, so as to permit the load to be lowered without unnecessary friction.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

GEORGE A. ARMINGTON.

Witnesses:
S. E. FOUTS
J. B. HULL.