

No. 697,393.

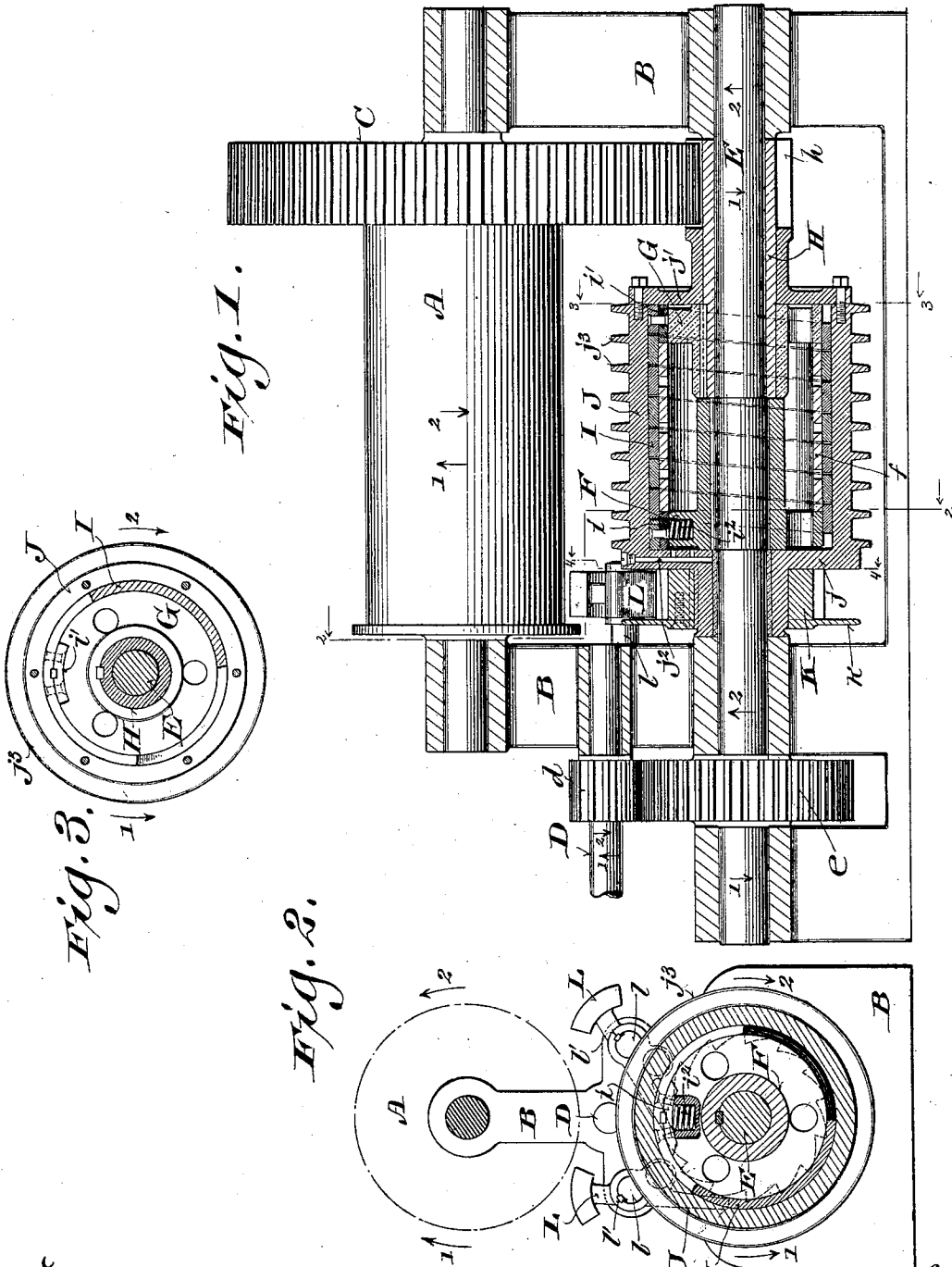
Patented Apr. 8, 1902.

M. A. BECK.
AUTOMATIC BRAKE.

(Application filed Jan. 9, 1899.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

Fig. 5.

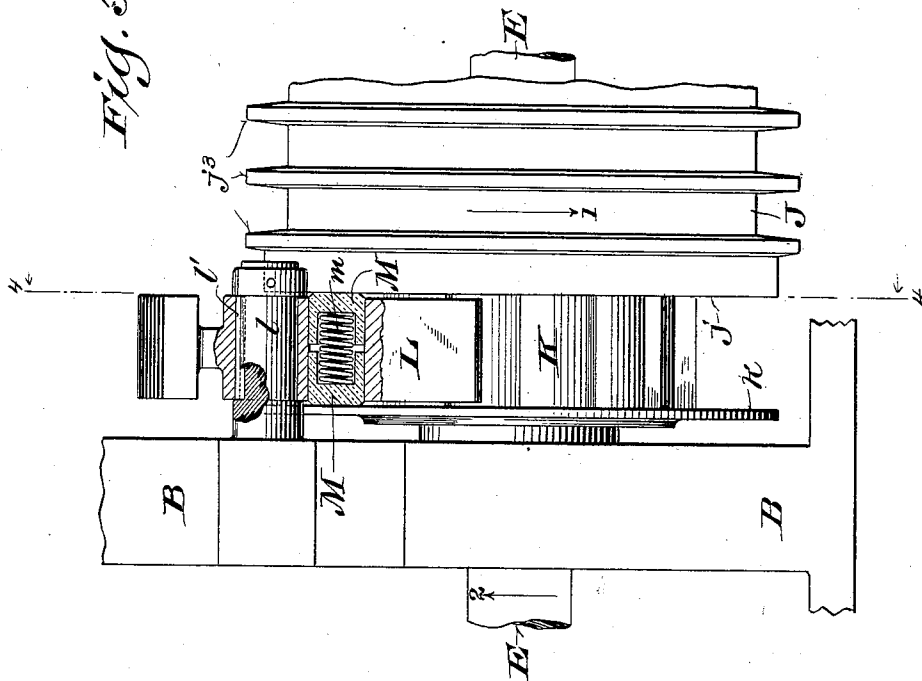
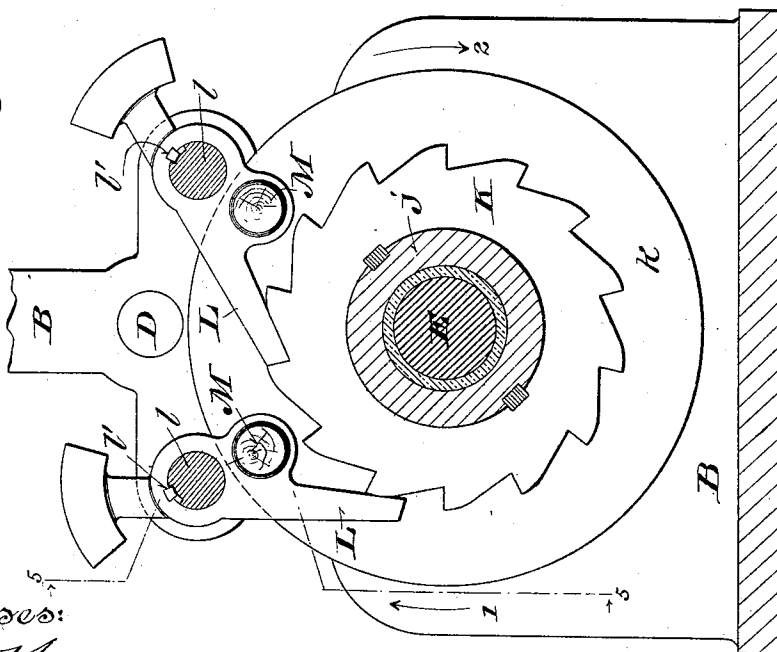


Fig. 4.



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UNITED STATES PATENT OFFICE.

MATTHIAS A. BECK, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO PAWLING AND HARNISCHFEGER, A COPARTNERSHIP COMPOSED OF ALONZO PAWLING AND HENRY HARNISCHFEGER, OF MILWAUKEE, WISCONSIN.

AUTOMATIC BRAKE.

SPECIFICATION forming part of Letters Patent No. 697,393, dated April 8, 1902.

Application filed January 9, 1899. Serial No. 701,588. (No model.)

To all whom it may concern:

Be it known that I, MATTHIAS A. BECK, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Automatic Brakes, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

16 This invention relates particularly to hoisting-machines and machines for analogous purposes.

15 The main object of the invention is to automatically control with certainty and precision the descent of the load by the operation of the motor.

20 It consists of certain novel constructions, arrangements, and combinations, as herein-after particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

25 Figure 1 is a view, partly in vertical longitudinal section and partly in side elevation, of a hoisting-machine to which my invention is applied. Figs. 2 and 3 are vertical cross-sections on the lines 2 2 and 3 3, Fig. 1; and Figs. 4 and 5 are detail views, on an enlarged scale, of the pawl-and-ratchet mechanism for holding the friction-brake shell from turning in one direction, Fig. 4 being a vertical cross-section on the line 4 4, Figs. 1 and 5, and Fig. 5 a view, partly in side elevation and partly 35 in section, on the line 5 5, Fig. 4.

40 While I have shown my improved brake as applied to a hoisting-machine, with which it is designed, primarily, to be employed for controlling the descent of the load, it may with little or no modification be used in connection with other machines for similar or analogous purposes.

45 Referring to the accompanying drawings, and particularly to Fig. 1, A designates a hoisting-drum journaled in a suitable frame B and provided with a gear C.

50 D is a motor-shaft, which may be the armature-shaft of an electric motor. In the present instance it is arranged parallel with the hoisting-drum and is provided with a pinion d.

E is a shaft supported in bearings provided therefor in the frame B below and parallel with the hoisting-drum. It is provided with a gear e, which meshes with the pinion d on the motor-shaft.

55 The brake comprises two members F and G. The driving member F is fixed upon the shaft E and consists of a disk-shaped head formed with a hub or sleeve, through which the shaft E passes. The driven member G is 60 fixed upon one end of a sleeve H, which is loosely mounted on the shaft E, and is provided at its other end with a pinion or gear h, meshing with the gear C on the hoisting-drum.

65 I is a spiral friction-band for connecting the brake members F and G and transmitting power and motion from one to the other. It is supported inside by a loose barrel f and is attached at or near its ends to the driving and driven members by means of blocks i and i', 70 which are riveted or otherwise secured to the inner side of said band and are fitted in recesses in the peripheries of the members F and G, as shown in Figs. 2 and 3. To relieve the rivets connecting said blocks with said 75 band of shearing strain, keys, as shown in Figs. 2 and 3, are inserted between the band and said blocks in recesses formed partly in each. One or both ends of the block i and the ends of the recess in the brake member F, 80 in which said block is inserted, are beveled, as shown in Fig. 2, for a purpose which will be hereinafter explained.

85 J is a cylindrical shell surrounding the friction-band I, which is closely fitted therein. It is provided with closed heads or ends j and j', which have outwardly-extending hubs fitted to turn one upon the shaft E and the other upon the sleeve H. The end of the friction-band I to which the block i is attached 90 may be constantly pressed outward against the shell J by a spring i², inserted in a recess formed for its reception in the driving member F, as shown in Fig. 2. The head j may be cast integrally with the shell; but 95 the head j' is made detachable for the purpose of assembling the parts.

The head j is formed with a radial passage j², which opens into the space inside of the barrel f, and is provided at its outer end with 100

a screw cap or plug for supplying oil to the interior of the brake mechanism. The members F and G are perforated to allow the oil to pass freely through them, and the barrel *f* is also perforated to permit the free access of the oil to the space between said barrel and the shell J, which contains the spiral friction-band I. The shell J is formed on the outside with rings or flanges *j*³ *j*³ for conducting off or radiating the heat developed by the operation of the brake. A ratchet-wheel K, formed with or attached to the head *j*, has a flange *k*, constituting a friction-face, at one end of the ratchet-teeth, opposing a corresponding face on the head *j* at the other end of said teeth. As shown in the drawings, and particularly Figs. 1 and 4, the ratchet-wheel is formed separate from the head *j* of the brake-shell and is secured upon its hub or sleeve by keys, and the flange *k* is also formed separate from the ratchet-wheel and attached thereto by screws.

L L are counterbalanced pawls journaled upon studs, projecting from one side of the frame B. The two pawls are arranged, as shown in Fig. 4, to divide the space between adjoining teeth on the ratchet-wheel. Each pawl is formed with a transverse sleeve or socket parallel with its pivot-pin *l* and open at both ends, and in this sleeve or socket are fitted cup-shaped friction-blocks M, which are pressed outwardly and held in yielding engagement by an interposed spring *m* with the opposing faces of the head *j* and flange *k*, as shown in Fig. 5. The hub or sleeve of each pawl by which it is journaled on its pivot-pin *l* is provided, as shown in Fig. 4, with a key *l'*, which projects into an extended keyway in the pivot-pin, and thus serves as a stop to limit the outward movement of the pawl away from the ratchet-wheel and to retain said friction-blocks in engagement with the head *j* and flange *k*.

On the several figures of the drawings the arrows designated 1 indicate the direction in which the parts are turned for hoisting or lifting the load, while the arrows designated 2 indicate the direction of rotation for lowering the load.

My improved brake, in connection with a hoisting-machine, as herein shown and described, operates as follows: In hoisting, the shaft E, being turned by the motor-shaft D in the direction indicated by the arrow 1 on Figs. 1 and 2, operates, primarily, by the engagement of one of the beveled ends of the recess in the driving member F with the adjacent beveled end of the block *i* to force the end of the friction-band I attached to said block *i* outwardly against the shell J, thereby insuring initial frictional engagement of said band with said shell; secondarily, to uncoil and expand said friction-band in said shell, and thus prevent the one from turning in the other, and, finally, through said friction-band, which is confined in said shell, to turn the driven member G in the same direc-

tion. The friction-band I and the shell J being thus locked together by frictional engagement with each other, the shell is caused to turn with the band I and the members F and G, with which the ends of said band are connected, in the direction indicated by the arrow 1 on Fig. 2. The load to be hoisted or raised, which acts in a reverse direction (indicated by the arrows 2) on the hoisting-drum A and the shaft E, tends to turn the driven member G of the brake in a direction opposite that in which it is turned by the motor in hoisting, and consequently to uncoil and expand the friction-band I within the shell J. The frictional engagement thus produced between said band and shell varies according to the load. The greater the load the greater will be the force tending to expand the friction-band I and to hold it in engagement with the shell J. The ratchet-wheel K being free to turn with the shell J in the direction indicated by the arrows 1 on Figs. 2 and 4, the frictional engagement of the blocks M with the opposing faces of the head *j* and flange *k* causes said head and flange to move and hold the pawls L out of engagement with said ratchet-wheel. The outward movement of said pawls is limited by the keys or stops *l'*, and the friction-blocks M are thus prevented from passing out of engagement with the head *j* and flange *k*. To lower the load, shaft E is turned in the direction indicated by the arrow 2 thereon by reversing the motor. When this is done, the pawls L are instantly thrown, by the head *j* and the flange *k* engaging the blocks M, into engagement with the ratchet-wheel K, which is thereby held from turning with the shaft E. The tendency of the motor when turned in the direction of the arrow 2 on the motor-shaft D is to contract the spiral friction-band I and to reduce its frictional hold against or engagement with the shell J, while the tendency of the load, as above stated, is to increase such frictional hold or engagement, so that the descent of the load depends upon and is governed by the operation of the motor. If the motor is stopped, the load will be instantly stopped and held by the expansion of the friction-band I or the increased frictional engagement thus produced between it and the shell J, which is held from turning until the motor is again started in a backward direction (indicated by arrows 2) to assist the load in overcoming the frictional engagement between the band I and the shell J. Thus the movement of the load in descending as well as in ascending is controlled by the positive operation of the motor, a positive movement backward being necessary to allow the load to descend. Initial engagement between the driving end of the spiral band I and the shell J is insured by the beveled or inclined ends of the block *i* and of the recess in which it is held or by the spring *i*², or by both the inclines and the spring.

Various changes in the minor details of construction and arrangement of parts may

be made without materially affecting the operation of the brake or departing from the principle or intended scope of my invention.

I claim—

1. In an automatic friction-brake the combination of driving and driven members connected by a spiral friction-band, and a shell surrounding said friction-band and free to turn in one direction but held from turning in the opposite direction, the driving member and said friction-band being provided with beveled engaging faces adapted, when the driving member is turned in a direction to carry the shell with it, to force said band outwardly into engagement with said shell, substantially as and for the purposes set forth.

2. In an automatic friction-brake the combination of a driving member and a driven member connected by a spiral friction-band, a shell surrounding said friction-band and free to turn in one direction but held from turning in the reverse direction, the friction-band being connected with the driving member by a block held in a recess of said member and having beveled ends which are adapted, by engagement with beveled ends of said recess, to force said band outwardly into engagement with said shell, substantially as and for the purposes set forth.

3. In an automatic friction-brake the combination with a rotary shaft supported by suitable bearings, of a driving member fixed upon said shaft, a driven member loosely mounted on said shaft, a spiral friction-band for transmitting motion from one member to the other, a perforated barrel loosely inserted between said members inside of said band, and a cylindrical shell supported concentrically with said shaft around said friction-band and free to turn in one direction but held from turning in the other direction, substantially as and for the purposes set forth.

4. In an automatic friction-brake the combination of a driving member, a driven member, a shaft extending continuously through both members, one of which is fixed and the other loose on said shaft and having a supporting-bearing outside of each of said members, a spiral friction-band connecting said members, a cylindrical shell surrounding said friction-band and free to turn therewith in one direction, a ratchet-wheel fixed to said

shell and a pawl adapted by engagement with said ratchet-wheel to prevent said shell from turning in the opposite direction, substantially as described.

5. In an automatic friction-brake the combination of coaxial driving and driven members, a spiral friction-band connecting them, a shell surrounding said band and free to turn therewith in one direction, a ratchet-wheel fixed to said shell and provided with friction-faces perpendicular to its axis, and a pawl pivoted to a stationary support for holding said shell from turning in the opposite direction and provided with opposing friction-blocks, a spring pressing said blocks outwardly against said friction-faces and adapted to move said pawl into engagement with the ratchet-wheel when it is turned in one direction, and out of engagement therewith when it is turned in the other direction, substantially as described.

6. In an automatic friction-brake the combination with driving and driven members, one fixed and the other loosely mounted on a shaft, a spiral friction-band connecting said members, a cylindrical shell surrounding said band and free to turn therewith in one direction, and means for holding said shell from turning in the opposite direction, said shell having closed ends and being adapted to contain oil, and the driven member having a hub or sleeve which projects through and is fitted to turn in one end of said shell, substantially as and for the purposes set forth.

7. In an automatic friction-brake the combination of driving and driven members, a spiral friction-band connecting said members, a cylindrical shell surrounding said band and free to turn therewith in one direction, means for holding said shell from turning in the other direction, a sleeve to which the driven member is fixed, extending through and adapted to turn in one head of said shell, and a shaft passing axially through both members of the brake, substantially as and for the purposes set forth.

In witness whereof I hereto affix my signature in presence of two witnesses.

MATTHIAS A. BECK.

Witnesses:

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M. L. EMERY.