(No Model.)

L. LUCKHARDT.

FLY WHEEL BAND BRAKE.

No. 515,915. Patented Mar. 6, 1894.

Fig: 1.

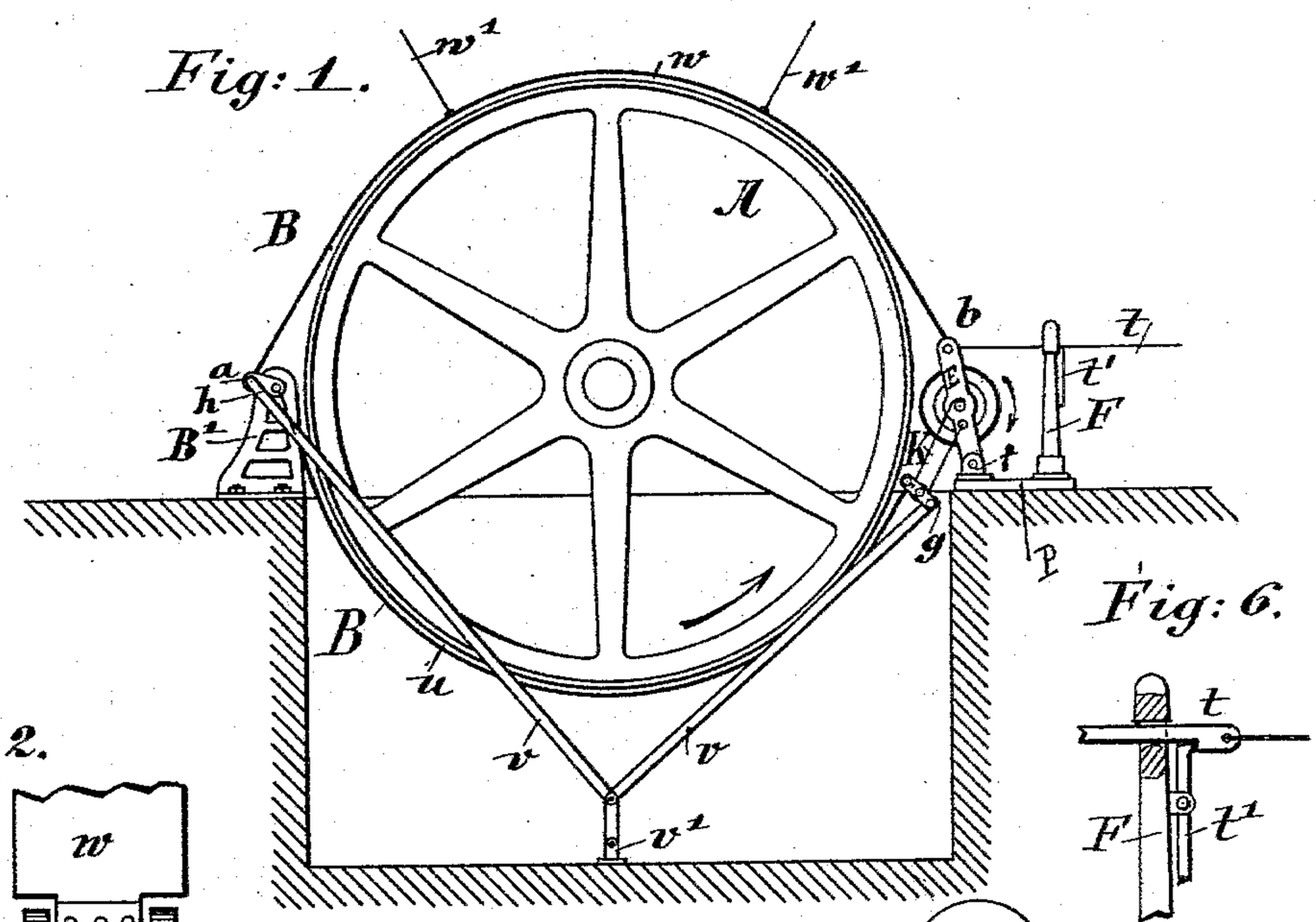


Fig: 6.

Fig: 2.

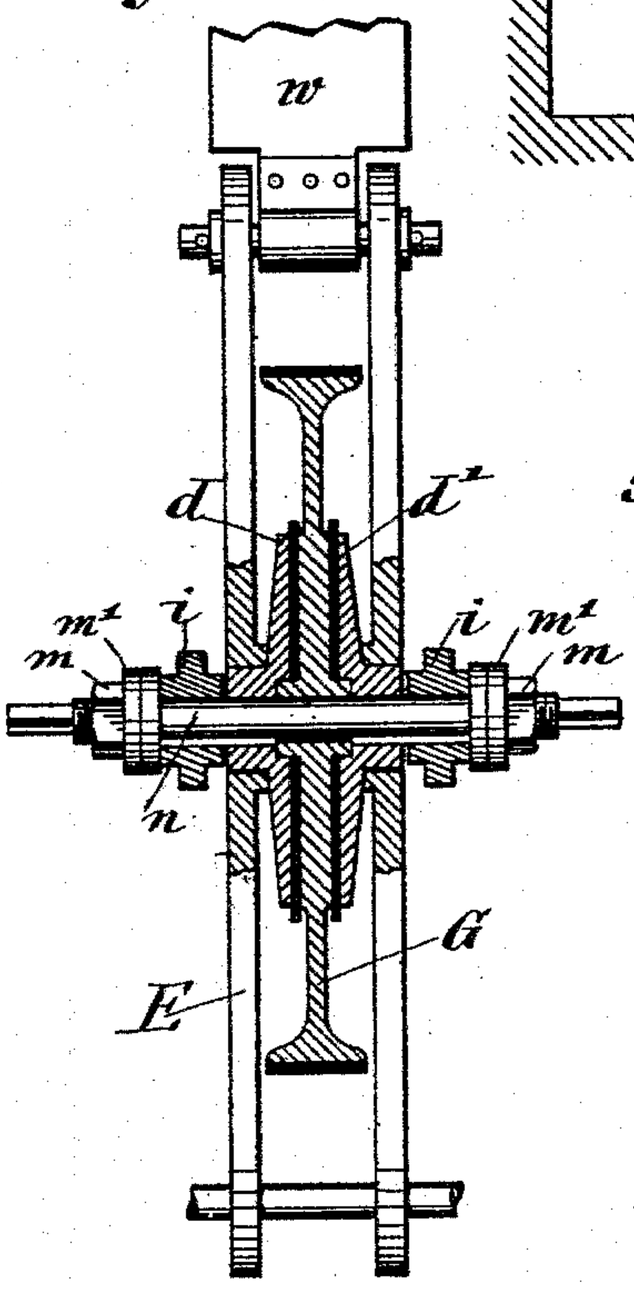


Fig: 4.

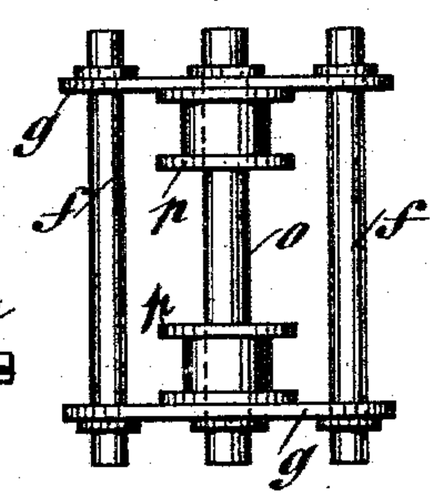


Fig: 3.

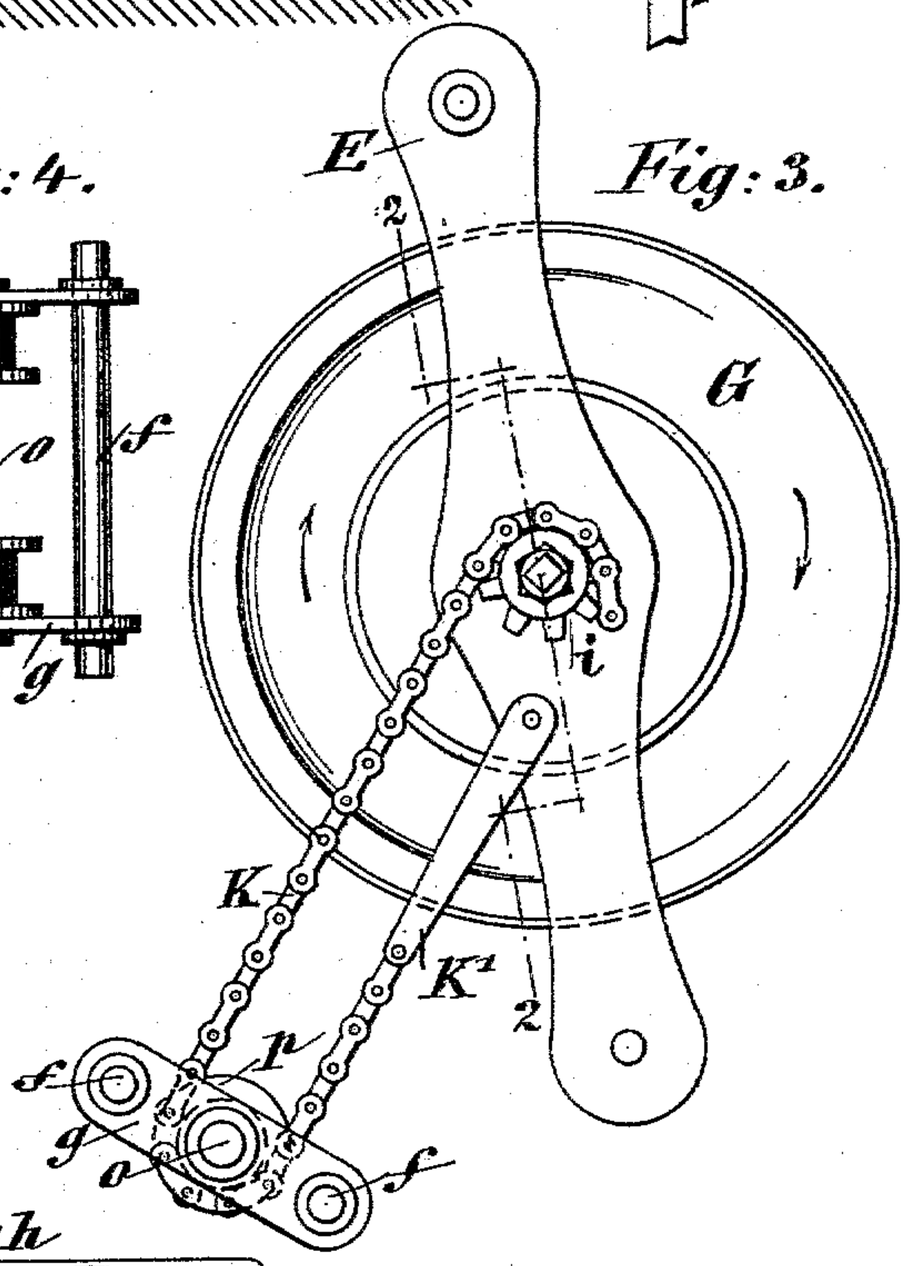
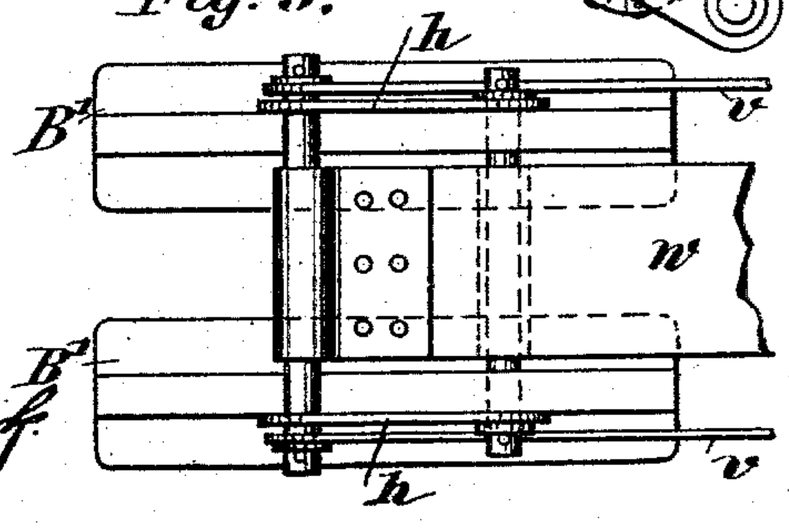


Fig: 5.



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FLY-WHEEL BAND-BRAKE.

SPECIFICATION forming part of Letters Patent No. 515,915, dated March 6, 1894.

Application filed November 10, 1893. Serial No. 400,527. (No model.) Patented in Germany March 26, 1891, No. 61,228, and September 11, 1891, No. 65,403, and in Austria-Hungary October 27, 1891, No. 50,897.

To all whom it may concern:

Be it known that I, LUDWIG LUCKHARDT, a subject of the Emperor of Germany, residing at Cassel, in the German Empire, have invented certain new and useful Improvements in Fly-Wheel Band-Brakes, (for which I have obtained Letters Patent in Germany, No. 61,228 and No. 65,403, dated, respectively, March 26, 1891, and September 11, 1891, and in Austria-Hungary, No. 50,897, dated October 27, 1891,) of which the following is a specification.

My invention refers to an improved band-brake for steam-engines, gas-motors, turbines, &c., by which in case of accidents, breakdowns or other interruptions in working, the brake may be set in action from any point in the shop or factory, so that the fly-wheel is quickly stopped and accidents to life and limb avoided. In fly-wheel brakes which act on one side of the fly-wheel an injurious influence is exerted on the center of the fly-wheel. This is avoided by my improved band-brake, as in the same, the breaking action is exerted on the circumference of the fly-wheel from several dimetrically-opposite points, which are located outside of the fly-wheel and the momentum of which is used for applying and tightening the brake. By this arrangement a rapid brake action is obtained without any back-lash on the shaft of the motor engine and without any injurious effect on the same.

The invention consists of a band-brake for fly-wheels, which is so arranged that at the moment when it is released it is applied by a friction-disk and balance-frame to the circumference of the rotating fly-wheel, so as to strongly grip and quickly stop the same.

The invention consists further of certain details of construction by which the band-brake is applied to the circumference of the fly-wheel and by which the friction-disk is permitted to turn on its shaft after the brake-band is applied to the fly-wheel, as will be described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side-elevation of my improved band-brake for fly-wheels, showing the same applied to a fly-wheel. Fig. 2 is a vertical transverse section on a larger scale on line 2—2, Fig. 3, showing the friction-disk by which the band-brake is applied, and the frictional connection with its shaft, parts being shown in elevation. Fig. 3 is a side-elevation of the friction-disk, also on a larger scale, and the connection of its forked supporting-frame with one section of the brake-band, and Figs. 4, 5 and 6 are details of minor parts of my improved construction.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents the fly-wheel of a motor, the direction of motion of which is indicated by an arrow.

B is the brake-band which is made in two sections, the ends of each section being fixed respectively to a supporting point and a draw point. The supporting point *a* of the band-brake is located at the left-hand side of the fly-wheel A at the upper end of the two upright frames B′ while the draw-point *b* is located on the right-hand side of the fly-wheel A, at the upper end of a forked-frame E, the lower end of which is pivoted to lugs *r* on a fixed bed-plate P.

The two sections of the brake-band B inclose almost completeiy the circumference of the fly-wheel, the upper section *w* extending over the upper half of the fly-wheel, and the lower section *u* extending around the lower part of the fly-wheel.

The two sections *u* and *w* of the brake-band are not directly connected with each other at the supporting-point *a*, and are applied to the ends of a balance-frame *f*, *g*, as shown in Figs. 1 and 5. The top-section *w* of the brake-band ends in a link-frame *h*, which is pivoted to a supporting-frame B′, said link-frame being connected by draw-rods *v* with the balance-frame *f*, *g*, and said draw rods being strapped below the fly-wheel to eyes or lugs *v′* at the bottom of the well in which the fly-wheel is arranged. The balance-frame *f*, *g* is suspended by means of pulleys *p p* that are arranged on a center pin *o* of the balance-frame *f*, *g*, on sprocket-chains K which pass around said pulleys and sprocket wheels *i i* on the shaft of the friction-disk G which is supported by the forked-frame E, as shown in Figs. 1 and 3. The upper ends of the

sprocket-chains are attached to the forked-frame E at one side of the sprocket-wheels, while the opposite ends of said sprocket-chains are pivoted by links K′ to the forked-frame E below the shaft of the friction-disk G, as shown in Fig. 3, so that at the required moment the chains K are wound up by the sprocket-wheels *i* and the frame *f*, *g* is thereby raised. The raising of the balance-frame *f g* will not only draw up the bottom-section of the brake-band, but it will also by the intermediate draw-rod connection *v v* exert a strain on the top-section *w* of the brake-band and bring both sections to bear on the circumference of the fly-wheel. This operation is effected by the turning of the friction-disk G, the circumference of which has a covering of soft rubber or leather, as shown in section in Fig. 2, and in side view Fig. 3.

The friction-disk G is mounted on a shaft *n* which is supported in bearings of the forked-frame E and interposed between clamping-disks *d*, *d′*, which are placed on the shaft *n* and which like the chain-wheels *i i*, are applied by a key or spline to the shaft *n*, so that the clamping-disks *d*, *d′* and the chain-wheels *i*, *i*, turn with the shaft *n* on its axis while they can be also shifted on the shaft *n* and applied with more or less friction to the friction-disk G by means of screw-nuts *m* and washers *m′*, which are applied to the threaded ends of the shaft *n*, as shown in Fig. 2. The friction-disk G is placed loosely on the shaft *n* so that it can turn on the same when it has overcome the frictional resistance produced by the clamping-disks, which resistance is regulated by the screw-nuts *m*. Leather-disks are interposed between the center-portion of the friction-disk G and the clamping-disks *d*, *d′*, so that the friction at the contact surfaces is increased.

When upon the application of the brake, the chain-wheels *i*, *i*, have drawn the balance-frame *f*, *g*, together with the brake-bands upward, the latter remain in position with the pull on them, while the disk G having overcome the frictional resistance of the clamping-disks, keep on turning until the power of the fly-wheel is broken. When the brake is in a position of rest and before it is applied to the fly-wheel, the friction-disk G and its supporting-frame E are held in a position away from the fly-wheel by a rod *t*, which passes through a slot in the upper part of a stationary column F near the friction-disk G. When the sections of the brake-band are in a position of rest, they do not form contact with the circumference of the fly-wheel, as the lower section being acted on by gravity, has no tendency to form contact with the same, and as the upper section *w* is hung on suitable spring-bearing rods *w′* by which the contact of the upper section with the fly-wheel is prevented. The connecting-rod *t* is provided at the right-hand side of the stationary column F with a notch which is engaged by a pawl or latch *t′* which may be released by an electro-magnet, said electro-magnet being connected with an electric battery and also with electric contacts which are arranged at different points of the shop or factory, so that from any one of these points, on closing the contact, the fly-wheel and the motor engine may be stopped. In place of the electric connection, the latch *t′* may be released from the rod *t* by means of pneumatic means or by rope pulls or other equivalent mechanical devices.

The braking operation takes place in the following manner: At the moment when the locking latch *t′* of the connecting-rod *t* is released either by actuating an electric contact or the pneumatic or mechanical device, the forked frame E with its friction-disk G is dropped over toward the fly-wheel so that the friction-disk forms contact therewith and is immediately set in rotary motion by the fly-wheel in the direction of the arrow shown in Figs. 1 and 3. By the turning of the friction-disk G, the sprocket-chains are wound up on the sprocket-wheel *i*, *i*, so that the balance-frame *f*, *g*, is raised and the brake-bands tightly applied to the circumference of the fly-wheel. The bottom-section *u* is first placed in contact with the fly-wheel, but as the balance-frame *f*, *g*, is turned on its fulcrum *o* at the same time therewith, the lower section *u* is only slid by the wheel without the latter being firmly engaged or gripped, which effect is only obtained when the top section *w* has been brought by the draw-rods *v* to bear against the circumference of the fly-wheel, that is to say, when the balance-frame *f*, *g*, is loaded equally at both ends. The balance-frame forms thereby a reliable means by which the lower section of the brake-band exerts at the same time and with the same power a grip on the lower half of the fly-wheel equal to that of the band-section *w* on the upper half of the fly-wheel whereby all back lash on the fly-wheel is prevented and the motor-engine quickly and effectively brought to a stop.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with a band-brake for a wheel, said band-brake comprising opposite sections, of a movable frame, a rotatable friction-disk carried by said movable frame and adapted to engage the periphery of such wheel, a balance-frame connected with one of said brake-sections and with the friction-disk, and draw-mechanism connecting the other of said sections to said balance frame, substantially as set forth.

2. The combination, with a band-brake for a wheel, the same comprising opposite sections, of a movable frame, a rotary friction-disk carried by said movable frame and adapted to engage the periphery of such wheel, a balance-frame with which said brake-sections are connected, a guide-pulley mounted in said balance-frame between the connections with said brake-sections, and a draw-

chain connected with said movable frame at one end below the axis of the friction-disk, the said chain also passing around said pulley and being adapted to be actuated from its other end by said friction-disk, substantially as set forth.

3. The combination, with a band-brake for a wheel, the same comprising opposite sections, of a movable frame, a rotary friction-disk carried by said movable frame and adapted to engage the periphery of such wheel, a balance-frame with which said brake-sections are connected, a guide-pulley mounted in said balance-frame between the connections with said brake-sections, a sprocket-wheel adapted to be actuated by said friction-disk, and a draw-chain passing around said pulley, said draw-chain being connected at one end with said movable frame below the said sprocket-wheel, and at the other end passing over the latter and being connected with said movable frame at one side of the sprocket-wheel, substantially as set forth.

4. The combination, with a band-brake for a wheel, the same comprising opposite sections having supporting points and draw points, of a movable frame, a rotary friction-disk carried by said movable frame and adapted to engage the periphery of such wheel, a link-frame to which one of the brake-sections is secured at its draw point, draw-rods connected with said link-frame, and means connected with said movable frame whereby the other brake-section is actuated and applied from its draw point, and said rods are actuated to apply the first brake-section, when the disk is revolved, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

LUDWIG LUCKHARDT.

Witnesses:
S. B. SCHLOSS,
KONRAD DENŸ.