No. 817,180. PATENTED APR. 10, 1906.

J. F. METTEN.

COOLING SYSTEM FOR BRAKING AND CLUTCH MECHANISMS.

APPLICATION FILED APR. 15, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

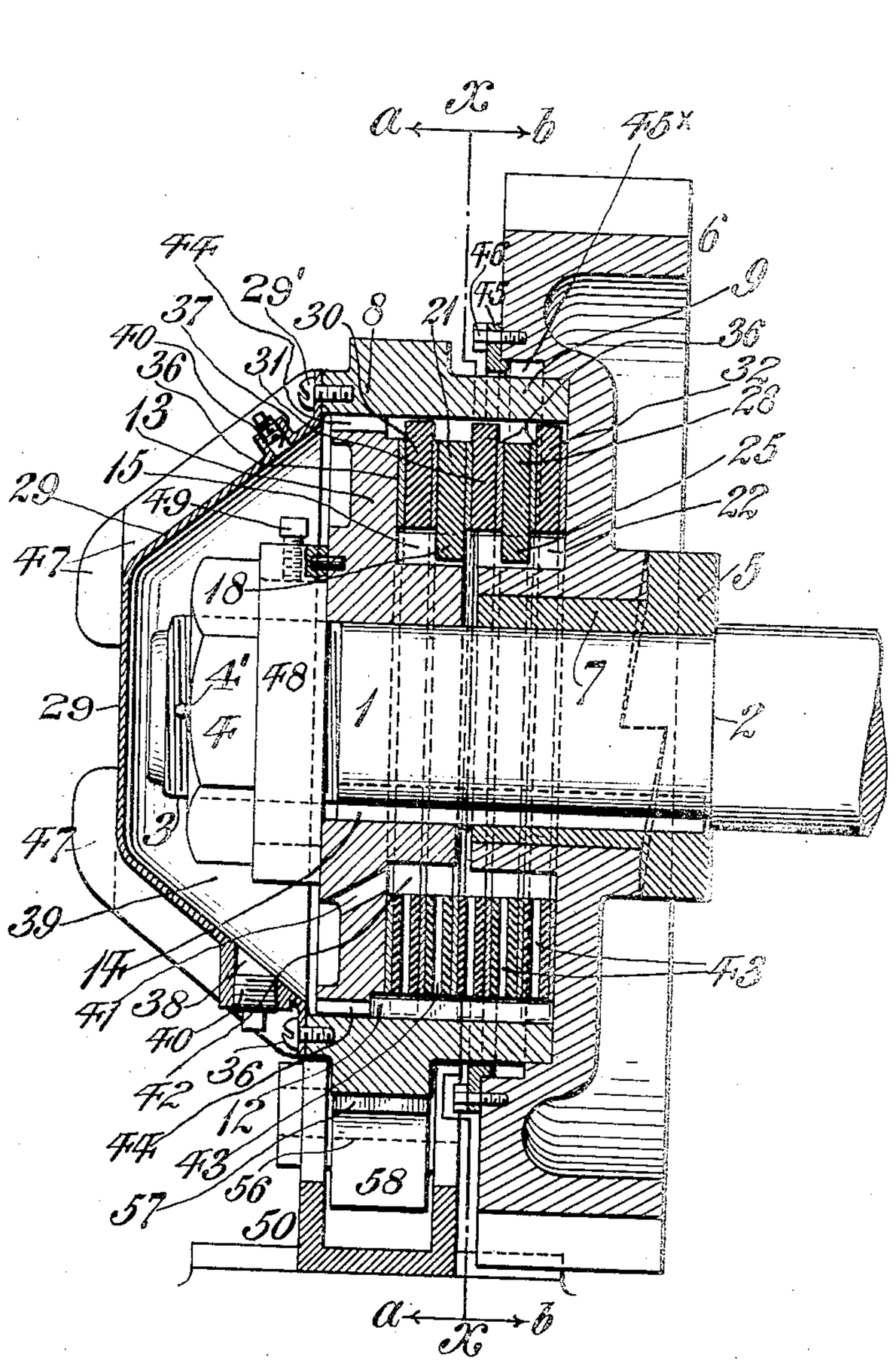
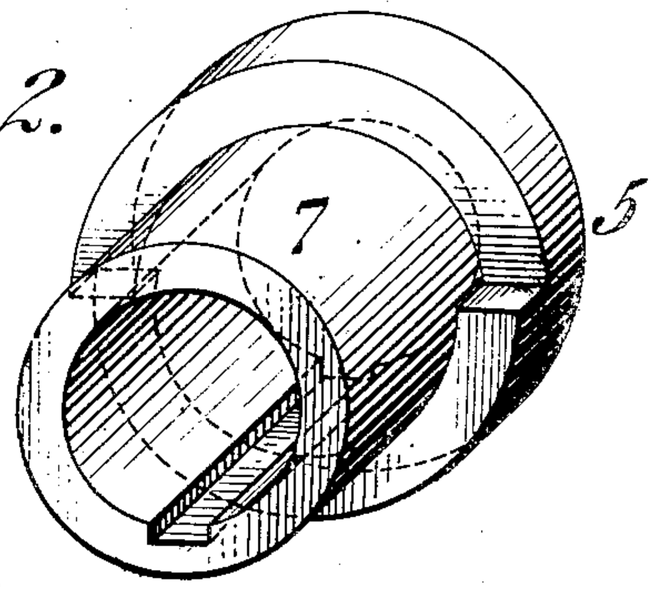


Fig. 2.



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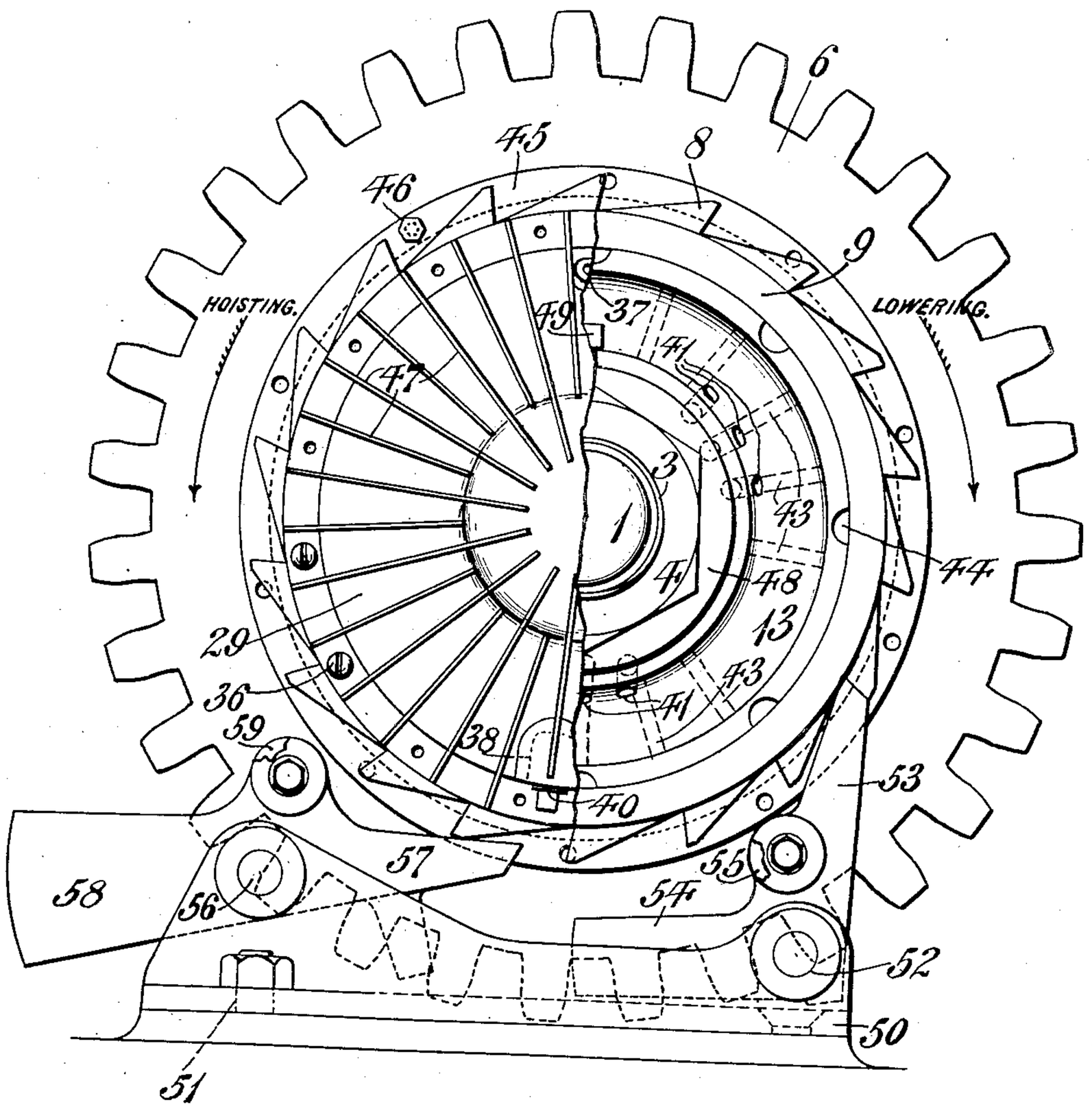
2 SHEETS—SHEET 2.

Fig. 3



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UNITED STATES PATENT OFFICE.

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COOLING SYSTEM FOR BRAKING AND CLUTCH MECHANISMS.

No. 817,180. Specification of Letters Patent. Patented April 10, 1906.

Application filed April 15, 1905. Serial No. 255,820.

To all whom it may concern:

Be it known that I, JOHN F. METTEN, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Cooling System for Braking and Clutch Mechanism, of which the following is a specification.

The purpose of my invention is to provide means for carrying off the heat generated in the rings or collars of crane-brakes of the Weston type and the like, in which the necessary friction for controlling the load is obtained by series of rings so arranged as to multiply friction due to pressure by the number of frictional surfaces in contact. This type of mechanism is commonly used in the mechanism of traveling shop-cranes and offers no resistance against the turning of the motion-shaft in lifting the load, but is arranged to automatically hold said load against the force of gravity when driving-motor is stopped, turning in either hoisting or lowering direction. The mechanisms of these brakes are also arranged so that when lowering the load the driving-motor is made to do positive work against a frictional resistance in order to retain absolute control of the load and prevent dangerous acceleration of speed. My invention does not relate to the mechanical combination by which control of the load is effected, as these features are not new *per se*, but consists in the employment of additional features by which the principal disadvantages of this type of brake is overcome. Owing to the frictional resistance being obtained by a number of comparatively thin moving rings alternating with a number of stationary rings, it will be apparent that the bearing or friction surface is very great in proportion to the external or radiating surface. Thus when the collars are forced together the frictional or heat-generating surface is equal to the area of the sides of the rings multiplied by the number of rings, while the radiating-surface is only equal to the area of the built-up cylinder formed by the whole number of rings. In practice the radiating-surface is considerably less, as the outer walls are effective only. For this reason the surfaces of the intermediate rings heat very rapidly, and the brakes as usually constructed will not work more than a few minutes under full load without excessive heating and cutting of the surfaces.

My invention consists of an outer oil-tight case surrounding the friction-collars, which is provided with a large number of thin ribs or projections in order to obtain sufficient surface for the radiation of heat generated in the rings. Each ring is made with numerous openings radiating from the inner periphery to the outer periphery, and openings are provided in the solid end rings, so that the central space contained within the inner opening of the rings is in free communication with the space between the oil-tight casing and outer periphery of rings. The radiating-case is filled completely with oil, which fills the radial openings in the rings, including the space between rings and casing. Thus when the rings are revolving a very rapid circulation is set up in the oil, owing to the centrifugal action of the oil contained in the radial passages of rings. By this means the oil is drawn in at the center and discharged into the space between the outer portion of the rings and the casing. It will be seen that the heat is constantly being abstracted by the oil flowing through the collars and communicated to the outer casing, from which it is radiated by the outer surface of the same.

To the above ends my invention consists, broadly, of a novel construction of appliance which can, with slight modifications and adaptations, be applied to existing mechanisms of this character for purpose of effecting the carrying off of the heat generated in the rings or collars employed, as above described, and so far as I am aware I am the first in the art to produce a concrete unitary structure of the general type described for the above purposes.

The invention further consists of other novel features of construction, all as will be hereinafter fully set forth.

Figure 1 represents a central longitudinal cross-section of a brake for a hoist embodying my invention, certain of the parts being shown in elevation. Fig. 2 represents a perspective view of a cam and its adjuncts in detached position. Fig. 3 represents an end elevation, partly broken away, looking in the direction of arrows *b b*.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates the shaft upon which the frame of the hoisting mechanism is mounted, one end thereof being of reduced diameter, forming a shoulder 2

and having its end 3 threaded to accommodate the nut 4, which is secured in place by pin 4′ or its equivalent.

5 designates a cam splined on the shaft 1 and having lateral movement limited upon the side away from the reduced end by shoulder 2. The cam may conveniently be rigidly fixed upon the shaft or have its longitudinal movement limited in any other way.

6 designates a gear-wheel to which motive power is supplied and which is loosely mounted upon the shaft 1 by means of the cylindrical extension 7 of the cam 5. The gear-wheel adjoining the cam-face is provided with a hub having a corresponding double-face cam, coöperating with the double-face cam 5, to secure longitudinal relative movement of these parts with relative revolution of the same.

8 designates a ratchet-wheel, the outer rim 9 of which has tongues 10, 11, and 12, shown here as three in number, but which may, as is the case also with the other tongues and grooves hereinafter mentioned, evidently be of any desired number, said tongues extending inwardly.

13 designates a collar keyed on the shaft 1 at 14 and adapted to fit loosely within the ratchet-wheel 8, said collar being provided with recesses 15, 16, and 17, corresponding with the tongues 18, 19, and 20 on the friction-plate 21 and into which these tongues project. Recesses 22, 23, and 24 in the hub of the gear-wheel 6 are adapted to receive tongues 25, 26, and 27 of the friction-plate 28.

30, 31, and 32 designate friction-plates, all having recesses 33, 34, and 35 therein adapted to receive tongues 10, 11, and 12 of the ratchet-wheel. The number of the friction-plates in all of these positions may be increased or diminished according to requirements.

36 designates vulcanized fiber placed between the friction-plates. A casing 29 is provided for the purpose of restricting the flow of the supply of oil, hereinafter referred to, and provides supports for a plurality of blades 47 for the purpose of distributing the heat communicated to the casing by the supply of oil. The casing 29 is secured to the ratchet-wheel 8 by screws 29′ or in any other suitable manner. The casing 29 is provided with the opening 37 upon one side thereof, which is provided with a suitable closure, while upon the opposite side thereof is an opening 38 for the supply of oil to the interior 39 of the casing, said openings being closed by the plugs 40 or any other suitable or equivalent means.

41 designates inlet-passages in the collar, (best seen in Figs. 1 and 3,) through which the oil or other lubricant passes to reach chamber 42, from which extend ducts or passages 43, connecting with passages 44, nearer the circumference than passages 41, the oil returning to chamber 39 through passages 44.

45 designates a packing-gland for the stuffing-box $45^{\times}$, which protects the opening between the parts 9 and 6, thereby preventing the leakage of oil from the brake. The gland is secured to the gear 6 by screws 46, which may be cap-screws or of any other suitable form.

The blades 47, previously referred to, or their equivalents, are used for cooling purposes and may be placed in any suitable manner upon the outer surface of the casing 29 or ratchet-wheel 8 and may extend either radially, as shown, or in any other suitable manner or direction which will provide increased radiating-surface.

The collar 48 is locked upon the nut 4 by the set-screw 49, said collar being doweled to the collar 13, thus allowing end movement of collar 13, being adjusted by nut 4 and providing means for locking nut firmly in any position. The nut 4 regulates the amount of play relatively which the gear 6 and cam 5 have, thereby determining the amount of movement to set and release the brake.

The ratchet mechanism, mounted upon a bed 50, may be suitably secured to any platform carrying bearings for the brake-shaft by bolts 51, and said bed has pivoted thereon at one end, as seen in Fig. 3 at 52, a ratchet 53, which is provided with a weighted arm 54 and side bearing-blocks or friction-pieces 55, which engage the face of the gear 6, swinging the ratchet about its pivot-point in one direction or the other, according to the direction of revolution of the gear 6. At the other end of the bed 50 is pivoted at 56 a ratchet 57, similarly provided with a weighted arm 58 and a side bearing-block or friction-piece 59, which also engages with the side of gear 6. The bearing of the friction-surfaces 55 and 59 is made as near the circumference of the gear 6 as possible, and the distance between the parts 55 and 52 for the one ratchet and 59 and 56 for the other are made as short as practicable in order that by the great speed of revolution of the gear at this point and the short leverage of the friction-surfaces about the pivot-points the ratchets may be applied or released as rapidly as possible.

It will be evident to those skilled in the art that I may employ in lieu of the precise structure shown a brake-band or any other mechanical device which will permit the ring 9 to revolve in hoisting direction and hold the same stationary during the lowering operation.

The operation is as follows: As the general operation of hoisting apparatus of the general type described will be familiar to those skilled in the art, I deem it unnecessary to describe in detail the precise construction seen. The present invention appertains

wholly to the means for carrying off the heat generated in the rings or collars of the braking devices, and I have therefore only shown and described such operation of the braking or clutch mechanism and their adjuncts as I have deemed necessary to show one manner of assembling and utilizing the novel features I have hereinbefore described. It will, however, be evident to those skilled in the art that the heat generated by the frictional engagement of the friction-surfaces is communicated to the oil or other lubricant contained within the casing 29, which has access to the interior of the friction-plates, as seen in Fig. 1, and is communicated by the oil to the casing 29 and to the radiating blades or their equivalents attached thereto. The free communication of the heat from parts of the oil to other parts thereof and to the casing is greatly accelerated by the circulatory system which I establish, the oil entering by passages 41 and being forced through the apertures 43 by centrifugal action, as will be apparent to those skilled in the art.

It will be seen from the foregoing that by the combination of the driving and driven members and the fluid-circulating cooling system and the metal radiating system a very compact and efficient device is obtained wherein the injurious effects from excessive or abnormal friction are completely obviated.

It will be apparent to those skilled in the art that my invention is equally applicable to friction brakes and clutches and to automobile constructions, a swell as to hoist-brakes, and while I have shown one application of my invention which I have found in practice to give very satisfactory results it will be evident that its principle can be applied with equal facility to other apparatus.

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

1. In a device of the character described, the combination of a braking device, a casing therefor and a wholly-confined centrifugally-actuated fluid-circulating, cooling system therefor.

2. In a device of the character described, a driving member, a driven member, means for containing a fluid wholly within the casing of said members, and metallic means for distributing the heat generated from the friction within the device.

3. In a device of the character described, the combination of a driving member, a driven member, a fluid-circulating cooling system contained wholly within the casing of said members and a metal radiating system.

4. In a hoist-brake, a driving member, a driven member, disks between said members, a casing supported in proximity to said members and a liquid contained wholly within said casing.

5. In a hoist-brake, the combination of a driving part, a driven part, intermediate friction-plates and fluid means confined wholly within the casing of said members for distributing the heat generated from the friction thereof.

6. In a hoist-brake, a driving member, a driven member, plates intermediate said members, apertures in said plates and fluid means for distributing the heat arising from the friction of said plates.

7. In a device of the character described, a driving member, a driven member, an intermediate member transversely recessed, relatively movable plates attached to different members, and means for retaining a fluid within the device and maintaining access of said fluid to opposite ends of the transverse apertures.

8. In combination with a braking apparatus, a fluid-retaining casing secured to the ratchet-wheel thereof, angularly-disposed vanes upon the surface of the casing with an opening therein between said vanes, and means for securing the casing to the apparatus.

9. The combination of a braking device, a plurality of plates therefor, a casing adapted to contain a cooling fluid, and means for causing by centrifugal action a constant radial flow of said fluid through each individual plate.

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