E. W. MOON.

COMBINED ELECTRICAL AND MECHANICAL BRAKE FOR ELE[redacted]

APPLICATION FILED SEPT. 24, 1906.

1,047,272.

Patented Dec. 17, 1[redacted]

2 SHEETS—SHEET 1.

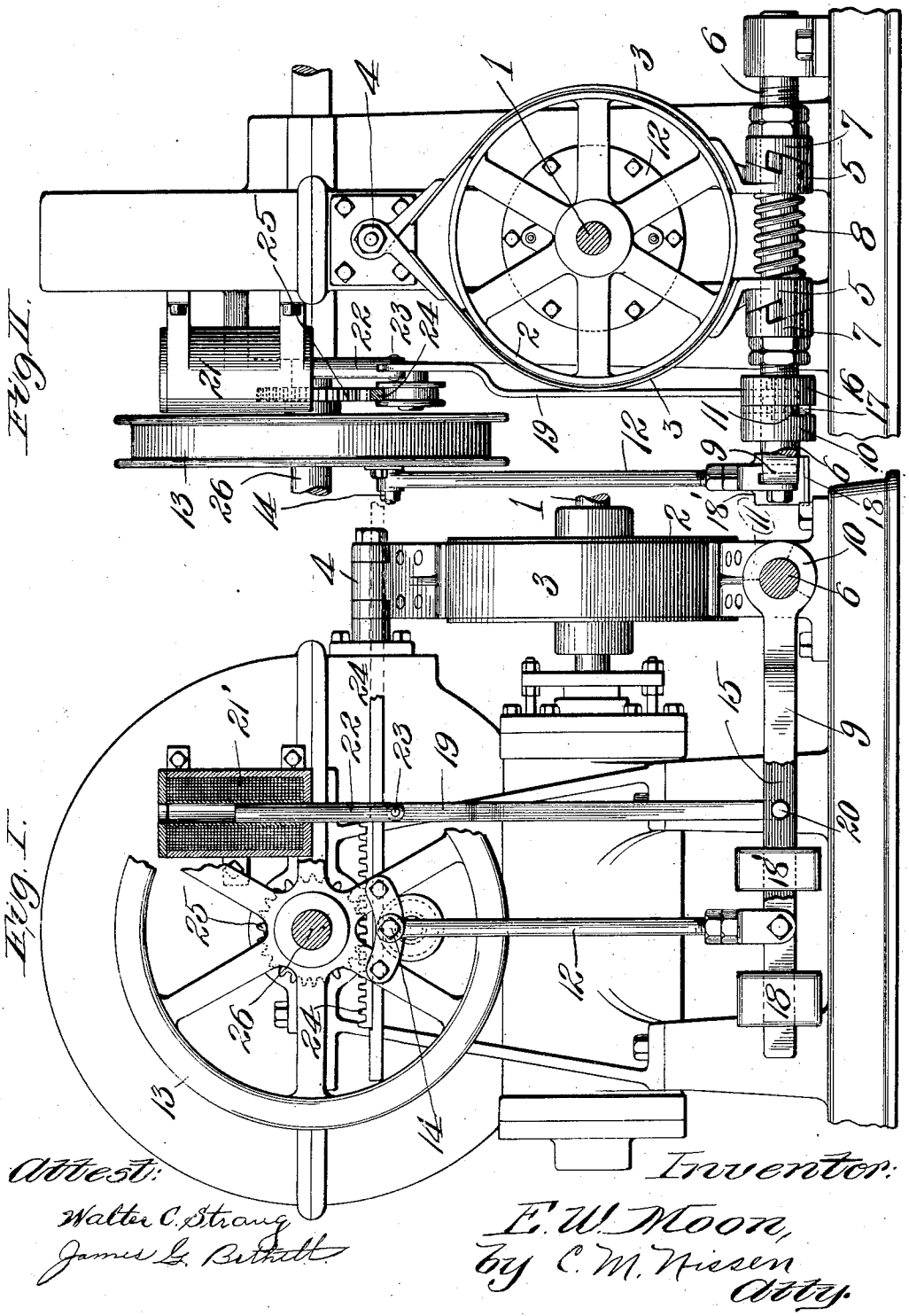

Fig. I.

Fig. II.

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2 SHEETS—SHEET 2.

Fig. III.

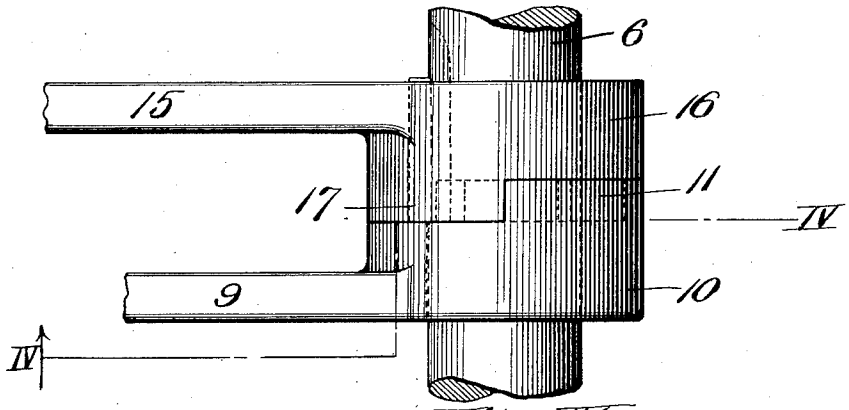


Fig. IV.

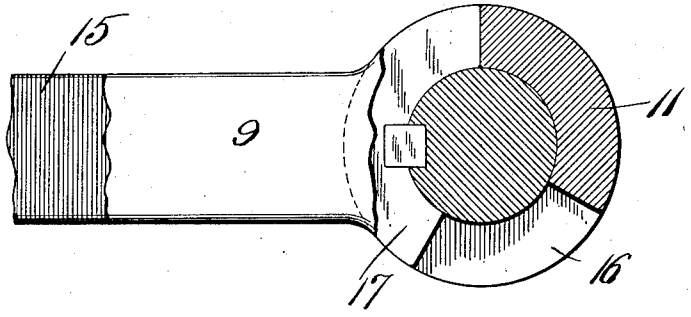
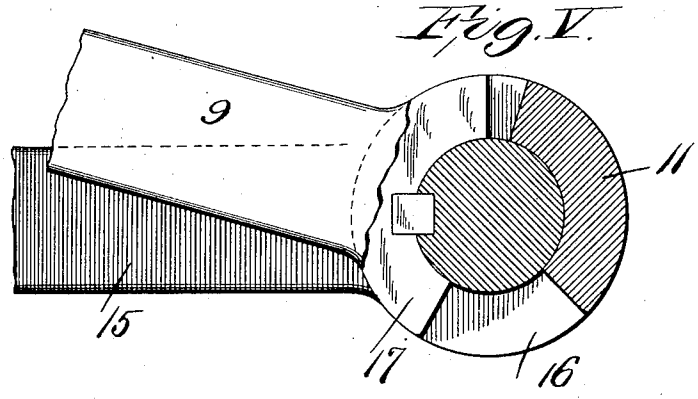


Fig. V.



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UNITED STATES PATENT OFFICE.

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COMBINED ELECTRICAL AND MECHANICAL BRAKE FOR ELEVATORS.

1,047,272. Specification of Letters Patent. Patented Dec. 17, 1912.

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To all whom it may concern:

Be it known that I, EDWARD W. MOON, a citizen of the United States, residing in St. Louis and State of Missouri, have invented a new and useful Improvement in Combined Electrical and Mechanical Brakes for Elevators, of which the following is a specification.

My invention relates to brake apparatus, and is an improvement on the construction set forth in my United States patent issued to me August 19, 1902, #707,442, for an improvement in brakes for motor shafts of elevators.

It is one of the objects of my invention to provide simple and efficient means for insuring the positive application of a brake electrically released.

More particularly it is the object of the present invention to provide mechanical means for releasing a locking device to permit an electro-magnet to release the brake, and to provide a device co-acting with said mechanical unlocking means to insure the application of the brake upon the cutting off of the current from said electro-magnet.

Other objects of the invention will appear hereinafter, the novel combinations of elements being pointed out in the claims.

In the accompanying drawings, Figure I is a side elevation of my improved brake with certain parts shown in section; Fig. II is a side elevation of the brake viewed at right angles to the position in which it is viewed in Fig. I; Fig. III is an enlarged top or plan view of a portion of the rock shaft which carries the brake-strap-operating members and the levers mounted on said shaft; Fig. IV is a section taken on the line IV—IV of Fig. III with the rock shaft levers shown in alinement with each other; and Fig. V is a similar view to Fig. IV, with one of the rock shaft levers in elevated position.

Although my invention is herein illustrated as applied to electric elevators, it may have a general application. The brake is adapted to be controlled electrically from the source of energy by which the motor of the elevator is supplied, or there may be a separate source of energy for the brake-magnet. In any event the brake is to be automatically applied to the motor-shaft when the current to the motor is broken. Motor-controlling apparatus in connection with brake-magnets are well known in the art, and it is not deemed necessary to illustrate any particular system in this case, as such motor-controlling apparatus is *per se* no part of the present invention. In employing a brake-magnet for releasing the brake mechanism, the current should be cut off from such magnet at the same time that the energy is cut off from the motor. It sometimes happens, however, that the electro-magnet will retain sufficient magnetism after the electric current is cut off therefrom to hold the brake released for at least a short time longer than is desirable or safe.

It is, therefore, the principal object of the invention to provide automatic mechanical means to insure the application of the brake to stop the motor when desired.

Referring now to Figs. I and II, it will be seen that a brake wheel 2 is rigidly mounted on a motor shaft 1, which is connected to the gear mechanism of hoisting apparatus. 3, 3 are friction brake straps in engagement with the rim of the brake wheel, these straps being pivotally supported at a point 4 above the brake wheel. 5, 5, are inner cam members fixed to the lower ends of the brake straps. 6 designates a rock shaft on which the cam members 5, 5 are loosely fitted, and 7, 7 are cam members fixed to said rock shaft and arranged in opposition to said cam members 5, 5. 8 is a spring between the inner cam members, and by which they are held pressed against the outer cam members. The parts just described are similar to corresponding parts in my patent hereinbefore mentioned and no invention *per se* is claimed for them.

9 designates a lever having a collar 10 which is loosely mounted on the rock shaft 6 and is provided at its inner side with an arc-shaped lug 11, (see Figs. II to V, inclusive).

12 is a connecting rod that is pivoted at its lower end to the lever 9, and at its upper end to the shipper-sheave 13. On the shipper-sheave is placed the operating rope for controlling the elevator mechanism.

24 is a rack bar that is arranged for connection to the switch that controls the delivery of current to the elevator operating motor. The rack of this rack bar is in mesh with a pinion 25, fixed to the shaft 26, to which is also fixed the shipper-sheave 13.

15 designates a second lever having a col-

lar 16 that is keyed to the rock shaft 6 and which is provided at its face opposing the collar 10 of the lever 9, with a lug 17. The levers 9 and 15 each carries a weight 18 and 18′, respectively, at their outer ends.

21 designates an electro-magnet which may be arranged in circuit with the source of electrical energy leading to the motor of the elevator operating mechanism, and which is constantly energized when current is supplied to said motor, and it is in operation. This electro-magnet comprises a solenoid 21′ and a core or plunger 22. The latter is connected by a link or connecting rod 19 to the lever 15, being pivoted to the plunger 22 at 23, and to the lever 15 at 20. When the electro-magnet is energized, the lever 15 is lifted against the action of the weight 18′ at its outer end, and when the electric current is cut off from said electro-magnet, the lever 15 and its weight descend by gravity as also the plunger 22 and the link 19.

It should be noted that the lugs 11 and 17 on the collars of the levers 9 and 15 are so arranged relatively to each other, that the lever 9 must be lifted before the lever 15 can be lifted. By an inspection of Figs. I, III and IV it will be seen that the lug 11 is in engagement with the lug 17 and the levers being thus interlocked, the lever 15 can not be lifted without also lifting the lever 9. These lugs therefore form an interlocking clutch device between the levers. By reference to Fig. V it will be evident that when the lever 9 is lifted, the lever 15 is free and may be lifted until its lug 17 again strikes against the lug 11. The parts are preferably so designed that when the lever 9 is released, and residual magnetism in the electro-magnet tends to hold the lever 15 in lifted position, the weight 18 acting on the lever 9 will return the lever 15 to normal position by the lug 11 engaging the lug 17. Therefore, after both levers have been lifted, the descent of the lever 9 will force the lever 15 downwardly by reason of the interlocking lugs 11 and 17.

In the practical use of my brake, the operation is as follows: Assuming the parts to be in the positions illustrated in Figs. I and II, that is, the brake applied, due to the positions occupied by the outer rock shaft cam members 7 against the inner brake strap cam members 5, and the levers 9 and 15 both in lowered positions, let the sheave 13 be rotated in either direction to exert an upward pull on the link or connecting rod 12, and thus elevate the lever 9 so that the lug 11 is moved relatively to the lug 17 to the position indicated in Fig. V. As the shipper-sheave 13 is rotated, it imparts movement to the rack bar through the shaft 26, pinion 25 and rack 24. The switch that controls the delivery of current to the electric motor is thus operated, and simultaneously with the delivery of current to the motor, the electro-magnet 21 is energized. The latter's core 22 will, in this instance, be drawn upwardly to lift the lever 15 through the connecting rod 19. The lever 15 being fixed to the rock shaft 6, imparts a slight rotation to the cams 7, 7, to permit the spring 8 to force the inner cams 5, 5 apart, and thus release the brake. Each time the electric current is discontinued to the motor by the actuation of the shipper-sheave, delivery of current is discontinued to the electro-magnet 21, and as a consequence, the magnet ceases to sustain the plunger 22 and the lever 15 is permitted to descend, with the result of allowing it to impart rocking motion to the rock shaft 6 and cause the rock shaft cams to operate against the brake cams. The brake shoes or straps are therefore again applied to the brake-wheel and remain so applied until the electro-magnet is again energized as before. It should be noted that if after the current is cut off from the electro-magnet, the lever does not descend as desired to apply the brake, the lever 9 will force the descent of said lever 15 through the lug 11 striking against the lug 17 upon the release of the shipper-sheave rope when the weight 18 acts to restore the parts to normal position. When it is again desired to release the brake, the parts may be so designed that the shipper-sheave must be first operated. This can be accomplished by arranging the link 12 so that it will be on a dead center when the parts are in normal position, thus locking the brake in applied position. In such case locking apparatus is provided to prevent the magnet 21 from actuating the lever 15 and causing the release of the brake. Should the electro-magnet 21 be energized before the shipper-sheave is operated, upward movement of the lever 15 will be prevented by the lug 17 striking against the lug 11, the latter being held stationary by the pivotal point 14 of the link 12 being on a dead center with respect to the center of the shaft 26. Upon rotation of the shipper-sheave 13, however, in either direction, the lug 11 would be moved out of the way of the lug 17 to permit the release of the brake. And after the deënergization of the magnet, the brake would be applied by the weight 18′ and the lever 15 alone, or such weight and lever would be assisted in applying the brake by the weight 18 and lever 9 when the shipper-sheave rope is released. The entire operation of the application of the brake is obviously automatic upon the release of the shipper-sheave, or it may be partly manual if the shipper-sheave 13 is rotated to normal position by the operator of the shipper-sheave rope.

While I have shown and referred to the use of two friction brake straps or shoes 3,

3, it is obvious that a single brake strap may be utilized in lieu of the two straps, and with equal advantage. Obviously, those skilled in the art may make various modifications in the details and arrangement of parts without departing from the spirit and scope of my invention, and I desire, therefore, not to be limited to the precise construction herein disclosed.

Having thus described my invention, what I claim and desire to have protected by Letters Patent of the United States is:—

1. In brake apparatus, the combination with a brake, of brake-applying means, means to lock the brake in applied position, electro-mechanical means for releasing said brake, and interlocking clutch mechanism for coupling said brake-applying and brake-releasing means.

2. In brake apparatus, the combination with a brake, of an automatic brake applying device, electro-mechanical means for releasing said brake but held against operation by said brake applying device when the latter is in brake-applying position, and mechanical means for actuating a part of said brake-applying device to permit the operation of said electro-mechanical means.

3. The combination with a brake, of a brake applying device, means for automatically locking the brake in applied position and for unlocking the brake and actuating a part of the brake applying device, and means for actuating said brake applying device to release the brake.

4. The combination with a brake, of a brake-applying device, a positive lock automatically operable into position to hold the brake applied, means for releasing said lock and lifting a part of said brake-applying device, and brake-releasing apparatus.

5. In brake apparatus, the combination with a brake pulley, of a brake associated therewith, a rock shaft, cam mechanism on the rock shaft for operating said brake, a magnet, means actuated by said magnet to impart a rocking motion to said shaft, and means for mechanically controlling the operation of the brake.

6. In brake apparatus, the combination with a moving member, of a brake associated therewith, a rock shaft, a cam member on said rock shaft and connected to said brake, a lever fixed to the rock shaft, an electro-magnet, a connection between said electro-magnet and said lever, and means for operating the brake independently of the magnet.

7. In brake apparatus, the combination with a brake wheel, of a brake associated therewith, a cam member carried by the brake, a rock shaft, an additional cam carried by said rock shaft, and engaging said first-named cam member, a lever connected to move with said rock shaft, a magnet, a connection between said magnet and lever, and means for locking said lever against operation by the magnet.

8. In brake apparatus, the combination with a brake wheel, of brake shoes for engagement therewith, cams, one connected to each shoe, a rock shaft passing through said cams, additional cams fixed to said rock shaft, one in engagement with each of said first-named cams, a lever connected to move with said rock shaft, an electro-magnet connected to said lever, a second lever loosely mounted on said rock shaft and arranged to engage said first-named lever, and means for mechanically operating said second lever.

9. In brake apparatus, the combination with a brake, of cam members connected thereto, a rock shaft, additional cams fixed to said rock shaft and in engagement with said first-named cams, a lever connected to move with said shaft, an electro-magnet for actuating said lever, an additional lever loose on said shaft, mechanical means for actuating said additional lever, and an interlocking connection between said levers.

10. In brake apparatus, the combination with a brake, of a brake-applying device comprising a lug, an electro-magnet operable when energized to actuate said brake-applying device to release the brake, a lever comprising a lug engaging and coöperating with said first-named lug, manual means for actuating said lever in one direction and automatic means for moving said lever in the other direction.

11. In brake apparatus, the combination with a brake, of a brake-applying means comprising a weighted lever, an electro-magnet for actuating said lever to effect the release of the brake, said lever comprising a lug projecting laterally therefrom, an additional weighted lever comprising an additional lug projecting laterally therefrom into the path of movement of said first-named lug, and means for actuating said additional lever.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD W. MOON.

Witnesses:
DOUGLAS D. MCDONALD,
OTTO F. DIERFELD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."