(No Model.)

E. H. JOHNSON.

POWER TRANSMITTING DEVICE.

No. 450,743. Patented Apr. 21, 1891.

Fig. 1.

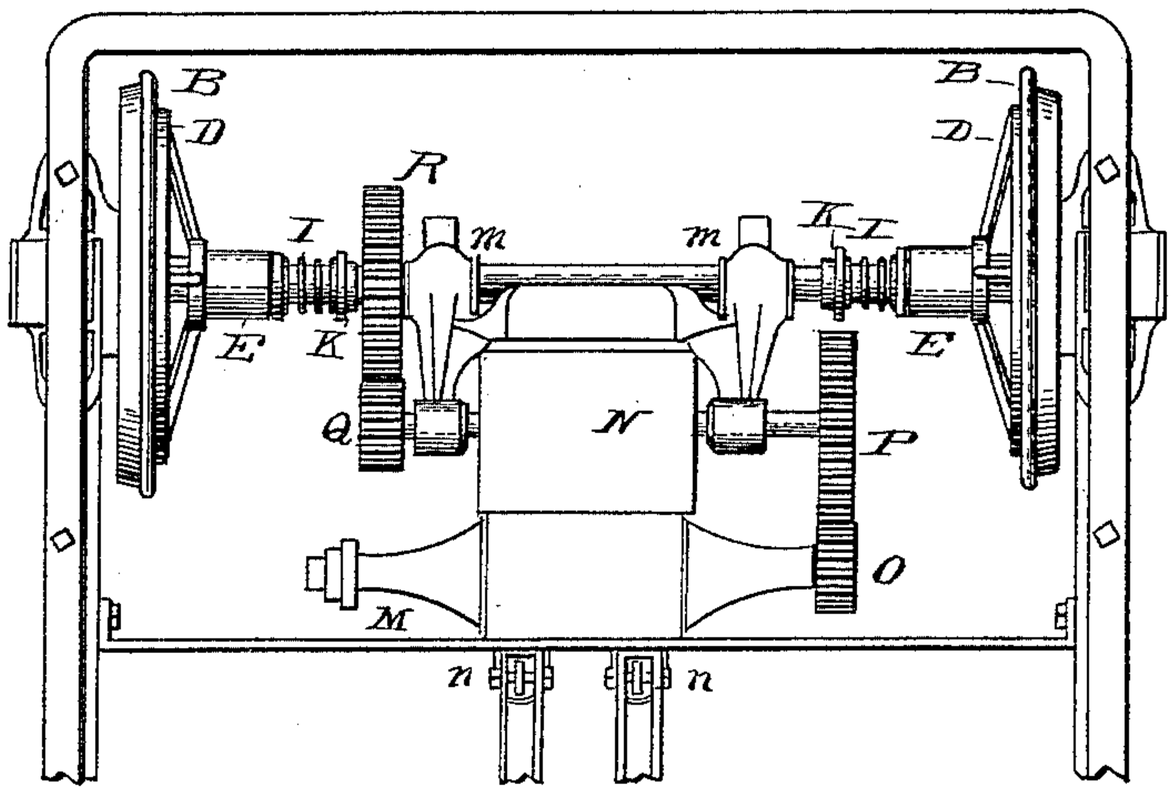


Fig. 3.

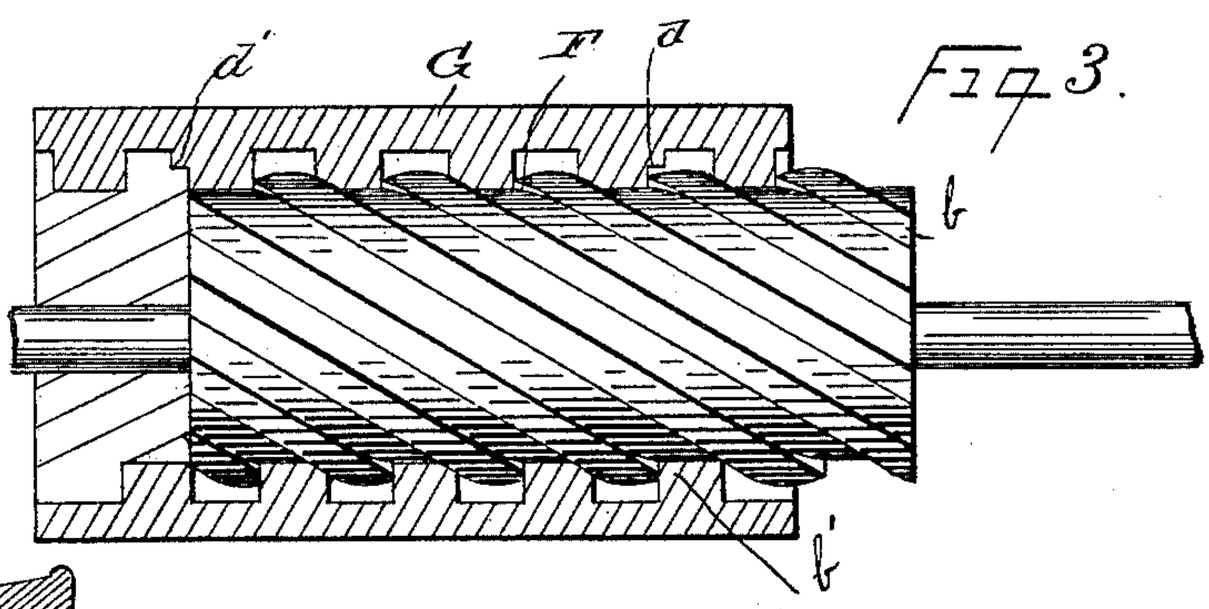
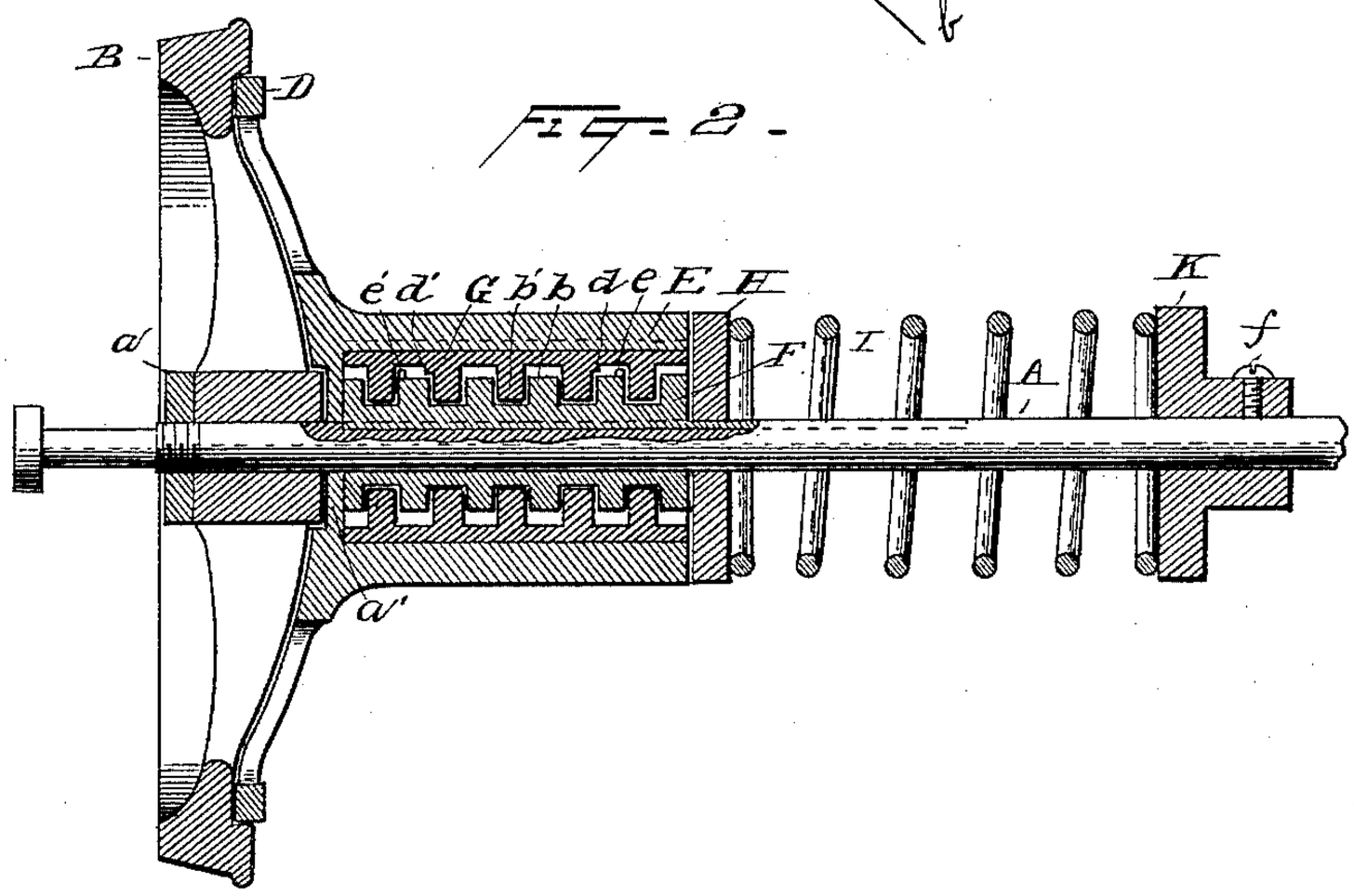


Fig. 2.



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UNITED STATES PATENT OFFICE.

EDWARD H. JOHNSON, OF NEW YORK, N. Y.

POWER-TRANSMITTING DEVICE.

SPECIFICATION forming part of Letters Patent No. 450,743, dated April 21, 1891.

Application filed August 18, 1890. Serial No. 362,296. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. JOHNSON, a citizen of the United States, residing in the city of New York, county and State of New York, have invented a certain new and useful Improvement in Power-Transmitting Devices, of which the following is a specification.

My invention relates to frictional connecting devices for transmitting power or motion from a moving part or body to one moved thereby.

More particularly my invention relates to apparatus of the general character set forth in my patent, No. 431,811, dated July 8, 1890, in which a friction-surface connected with the driving shaft or body is moved by the revolution thereof into frictional engagement with a friction-surface connected with the driven shaft or body, and a spring or other elastic device is used to retard or oppose the movement which brings the friction-surfaces into engagement, and so to determine the degree of frictional engagement and the value of the power-transmitting connection in accordance with the power required, and also to apply the power gradually and permit the driving part to develop speed and power in starting, this being especially useful in the employment of electric motors for the propulsion of vehicles, which is the use for which my invention was mainly designed.

With an apparatus such as just generally described difficulty may arise because the load which the driving part has to start when connected with the driven part may sometimes be too great for the capacity of the apparatus or of some portion of it, so that, although the driving part continues to increase its frictional engagement with the driven part, the latter does not start, and the excessive strain thus placed upon the apparatus may result in injury thereto, which injury may be the breaking of some mechanical part, but in the case of an electric motor is apt to be the burning out and destruction of the armature thereof, or the excessive demand for electric current may injure the generator or source of electric supply, especially where this consists of secondary batteries, a serious obstacle to the introduction of which has been the "buckling" and consequent rapid deterioration of the plates due to their being called upon in this way to exceed the current capacity for which they were designed. It is the object of my present invention to overcome these difficulties.

To this end my invention consists, mainly, in providing a power-transmitting apparatus of the character already generally described with a stop or limiting device which positively limits the movement of the engaging frictional surfaces toward each other to such a point as while it permits the driven part to be started with any load not in excess of the safe capacity of the apparatus will not exceed this capacity of the apparatus or of such portion thereof as it is especially desired to protect, and if when this point is reached the driven part does not start the power is then expended in turning the friction-surfaces in contact with each other until relief is obtained from the excessive load.

In addition to this general feature my invention consists in the various novel devices and combinations of devices employed by me in effectively accomplishing the objects above enumerated, as hereinafter set forth and claimed.

My invention is illustrated in the accompanying drawings.

Figure 1 is a top view of a portion of the truck of an ordinary electrically-propelled street-car provided with my invention; Fig. 2, a longitudinal section of the power-transmitting device, and Fig. 3 a view of the screw mechanism with the outer sleeve in section and the inner one in elevation.

In Fig. 2, A is the driving shaft, body, or part, which in this case is a car-axle connected with a suitable motor and having the wheel B, which is the driven part, placed loosely upon it between nut a and internal flange a' of hub E. Secured to the shaft A by a feather thereon is a sleeve F, having an external screw-thread at b. Engaging with this is a sleeve G, internally screw-threaded at b' and feathered to the sleeve E, which sleeve forms the hub of a friction-ring D, which is adapted to engage a friction-surface on the inner side of the wheel B. This friction-ring forms an intermediate frictional connecting device between the axle and the wheel, said ring constituting a movable friction member adapted to be moved by the operation of the screw

mechanism formed by the sleeves F G into frictional engagement with the friction-surface on the inner side of the wheel B. Upon the shaft at the end of the hub is a sliding disk H, behind which is a spring I, coiled on the shaft between the disk H and collar K, whose position on the shaft is adjustable by loosening the set-screw *f*, whereby the tension of the spring may be altered and adjusted. Each screw-thread is made up, as shown in Fig. 3, of several distinct threads, each extending from one end to the other of the threaded sleeve, whereby a thread of long pitch is obtained. The screw-thread *b'* is deeper than the screw-thread *b*, and near each end of the former is formed or placed on the thread a projection or pin *d* or *d'*. At corresponding but opposite portions of the screw-thread *b'* are like projections *e* and *e'*. These are the limiting-stops to avoid the exertion of the motor above the desired capacity.

In the screw mechanism formed by sleeves F G, both members of the screw mechanism being in mechanical contact or connection with the friction-ring D, movement in either direction causes an increased pressure upon such friction member, and the movement in either direction is opposed by the spring, which is arranged to have normally a certain degree of tension, this initial tension being increased by the screw movement which it opposes.

In operation, the shaft A being turned and the friction-surfaces of wheel B and ring D being always in contact, the effect of the rotation of the shaft is to screw either the sleeve F or the sleeve G out along the shaft against the disk H. If the shaft turns in one direction, sleeve F will be moved longitudinally, and if in the other direction sleeve G, and in each case the other sleeve will have a tendency to move toward the wheel. In either case the effect is to compress the spring and to increase the frictional engagement of friction-ring D with wheel B until the same is sufficient to turn the wheel, provided the load is not greater than the safe capacity of the apparatus, the arrival at this point being retarded by the spring I, so that the power is applied gradually and the driving-motor is allowed to develop speed. If, however, the load is too great for the capacity of the apparatus, the limiting-stops provided for the purpose will prevent such movement as will cause such capacity to be exceeded. If, for instance, the sleeve G moves toward the spring at the beginning of the movement, the projections *e d* and *e' d'* move past each other, they being on opposite sides of the channel of screw-thread *b'*; but near the end of the movement the projection *d'* will engage projection *e'* and the travel of the sleeve will be stopped. A similar operation occurs when the shaft runs in the opposite direction and sleeve F moves toward the spring. The stops are preferably so arranged that this point will be reached somewhat before the apparatus reaches the limit of its safe capacity, and at this time, there being no further increase in frictional contact between B and D, their surfaces will slip on each other and the shaft will thereupon continue to turn, continuing to exert the same power as before, and therefore not losing the speed and inertia which it has already acquired, although there is no increase in the load upon it, and this will continue until relief is afforded in any suitable way.

Fig. 1 illustrates the equipment of an ordinary electric street-car, it being understood that each axle of the car is provided with the devices shown.

M is the armature, and N the field-magnet, of a suitable electric motor. The armature, shaft has a pinion O engaging a toothed wheel P on a counter-shaft, which has a pinion Q engaging toothed wheel R on axle A. The motor is supported partly upon the axle by the centering-supports *m m*, sleeved on the axle, the other end of the motor being supported at *n n* by spring-supports in any usual or convenient manner.

Each wheel B is loose on the axle and provided with the power-transmitting devices already described, and their operation is as explained. By the use of such devices the motor is allowed to apply its power gradually and to develop its speed and counter electromotive force before the load is placed upon it and is prevented from exceeding its safe capacity.

In electric railways one of the most serious difficulties has been the excessive draft on the motors in starting, the load being placed upon the motor before it reaches such a condition that it can safely exert its full effective power, and the consequent abnormal flow of current in its armature often resulting in the destruction thereof. In the application of my invention to such uses I so proportion the spring and the limiting-stops of the screw mechanism that the increase of frictional engagement will be stopped at a point which is the limit, or preferably somewhat less than the limit, of the safe capacity of the motor, so that it can never get beyond such capacity. In other cases I may so proportion or adjust the apparatus as to provide for the safety of storage-batteries or other sources of electrical supply, or I may employ my invention in the same manner to prevent injury by excessive strain to the mechanical portions of a driving or propelling apparatus of any kind.

The purpose of the adjustable collar K is to enable the tension of the spring to be adjusted at any time to compensate for wear on the friction-surfaces, loss of tension, &c.

What I claim is—

1. The combination of a driving part, a driven part formed or provided with a friction-surface, a movable friction member, connections between said movable friction member and the driving part, whereby said friction member is moved by the motion of

the driving part into frictional engagement with the driven part, an elastic cushion opposing such movement, and a stop positively limiting the frictional engagement with relation to the safe capacity of the apparatus, substantially as set forth.

2. The combination of a driving part, a driven part formed or provided with a friction-surface, a movable friction member, a screw mechanism connected with the driving part, so as to be turned thereby, and connected with the said movable friction member, so as to move the same into frictional engagement with the driven part, an elastic cushion opposing such movement, and a stop positively limiting the frictional engagement with relation to the safe capacity of the apparatus, substantially as set forth.

3. The combination of an electric motor, a driven apparatus formed or provided with a friction-surface, a movable friction member, connections from said motor to said friction member, whereby the same is moved by the operation of the motor into frictional engagement with the driven apparatus, an elastic cushion opposing such movement, and a stop positively limiting the frictional engagement with relation to the safe capacity of the motor, substantially as set forth.

4. The combination, with two parts having frictional surfaces, of screw mechanism for moving them into frictional engagement, an elastic cushion opposing such movement, and a stop on the screw mechanism for positively limiting such movement to a predetermined extent, substantially as set forth.

5. The combination of a wheeled vehicle, an electric motor mounted upon said vehicle for propelling it, a movable friction member intermediate said motor and the running-gear of said vehicle, connections between said motor and said friction member, whereby said friction member is moved into frictional engagement with the running-gear by the operation of said motor, an elastic cushion opposing such movement, and a stop positively limiting the frictional engagement with relation to the safe capacity of the motor, substantially as set forth.

6. The combination of the axle, means for giving motion thereto, the wheel loose on the axle, the friction-ring connected with the axle, so as to be moved thereby into frictional engagement with said wheel, an elastic cushion opposing such movement, and a stop positively limiting the frictional engagement with relation to the safe capacity of the apparatus, substantially as set forth.

7. The combination of a driving part, a driven part, a movable friction member, connections between said friction member and the driving part, whereby said friction member is moved into frictional engagement with the driven part by the movement of the driving part, a spring opposing such movement, means for adjusting the tension of said spring, and a stop positively limiting the frictional engagement with relation to the safe capacity of the apparatus, substantially as set forth.

8. The combination of a driving part, a driven part, a movable friction member, connections between said friction member and the driving part, whereby said friction member is moved into frictional engagement with the driven part by the motion of the driving part in either direction, an elastic cushion opposing such movement, and a stop positively limiting the frictional engagement with relation to the safe capacity of the apparatus, substantially as set forth.

9. The combination of a driving part, a driven part, a movable friction member adapted to frictionally engage the driven part, a screw mechanism composed of two members, both in mechanical contact with said friction member, connections between said screw mechanism and the driving part, whereby upon motion of the driving part one member of the screw mechanism or the other, according to the direction of movement, is moved against the friction member to bring the same into engagement with the driven part, and an elastic cushion opposing such movement, substantially as set forth.

10. The combination of a shaft, a loose wheel, a movable friction member adapted to frictionally engage the wheel to drive it, two concentric sleeves, the inner one being feathered on the shaft and the outer one screw-threaded on the inner one, connections with the source of power, and mechanical connections between said sleeves and said friction member, whereby movement of said sleeves in either direction moves the friction member into frictional engagement with the wheel, substantially as set forth.

11. The combination of a driving part, a driven part, a movable friction member adapted to frictionally engage the driven part, a screw mechanism composed of two members, both in mechanical contact with said friction member, connections between said screw mechanism and the driving part, whereby upon motion of the driving part one member of the screw mechanism or the other, according to the direction of movement, is moved against the friction member to bring the same into engagement with the driven part, a stop at each end of the screw mechanism for positively limiting the frictional engagement, and a spring opposing the movement of the screw mechanism in either direction, substantially as set forth.

12. The combination of the wheel loose on the axle, the friction-ring adapted to engage said wheel and having a hub surrounding the axle, the internally-screw-threaded sleeve feathered within said hub, the externally-screw-threaded sleeve feathered on the axle, means for giving motion to the axle, and a spring opposing the longitudinal movement of said sleeves, substantially as set forth.

13. The combination, with the two screw-threaded sleeves and friction member operated thereby, of the two pairs of stops at opposite ends of the screw-threads, those of each pair being on opposite sides of the channel of the thread, and a spring opposing the longitudinal movement of the sleeves, substantially as set forth.

This specification signed and witnessed this 12th day of August, 1890.

EDWARD H. JOHNSON.

Witnesses:
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D. H. DRISCOLL.