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G. E. MARCH.

AIR BRAKE.

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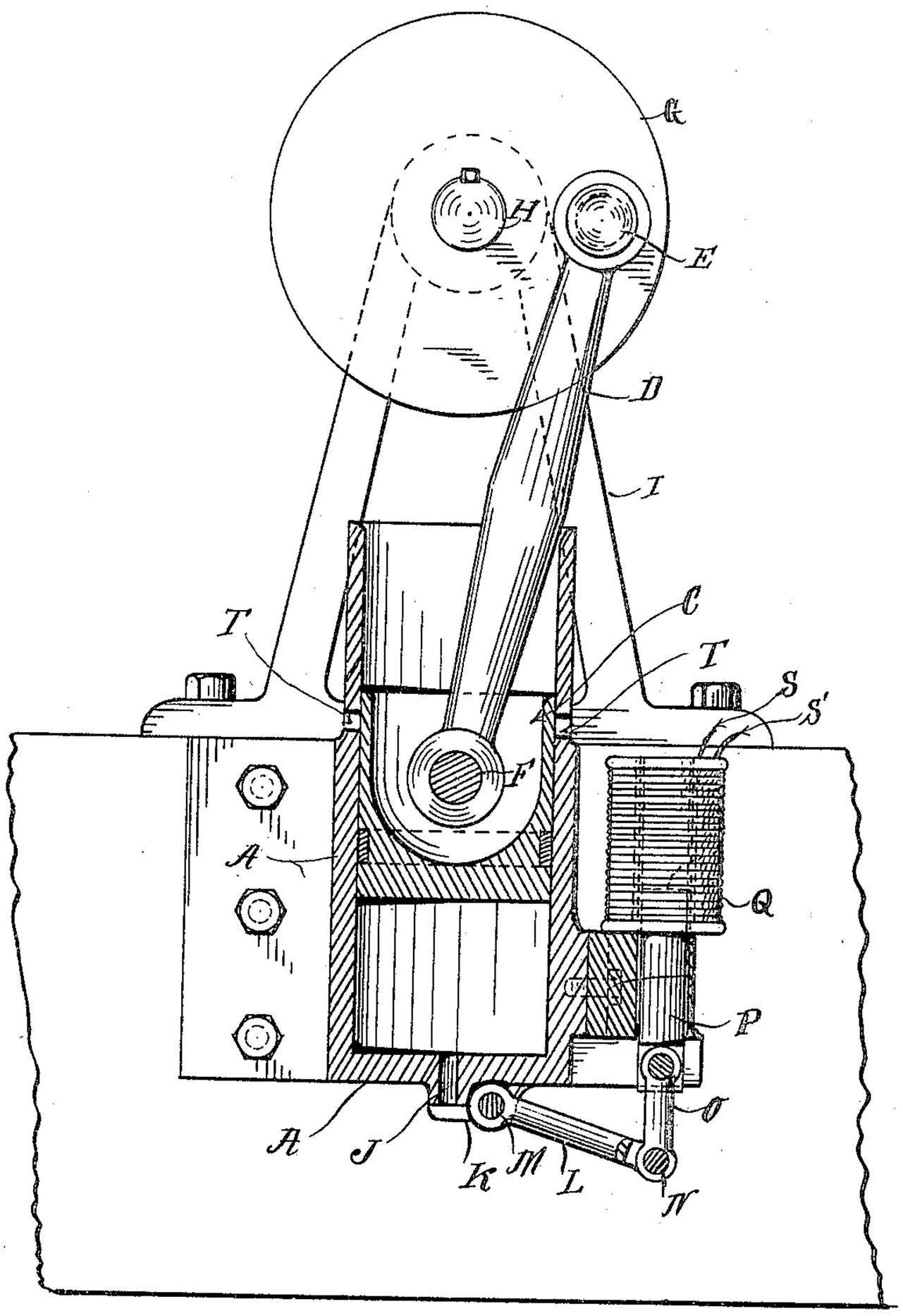

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AIR-BRAKE.

No. 822,747. Specification of Letters Patent. Patented June 5, 1906.

Application filed April 20, 1905. Serial No. 256,573.

To all whom it may concern:

Be it known that I, GEORGE ELMER MARCH, a citizen of the United States, residing at Muskegon Heights, in the county of Muskegon and State of Michigan, have invented new and useful Improvements in Air-Brakes, of which the following is a specification.

My invention relates to certain new and useful improvements in brakes or speed-controllers for rotary shafts and of the class adapted to be made effective by atmospheric pressure and commonly called "air-brakes" or "vacuum-brakes." Its object is to control, check, or stop the motion of a revolving shaft in an especially efficient manner and by application of atmospheric pressure to resist the rotation of the shaft in a more direct manner than through the application of a brake-shoe to a revolving surface. This object I accomplish by the mechanism shown in the accompanying drawing, which shows one embodiment of my invention.

In the drawing, H represents the revolving shaft. The rotary motion of this shaft is converted into reciprocating motion in any customary way, the method which I have shown being by the crank G, the crank-pin E, and the pitman D. This pitman in the form which I have shown operates also as a piston-rod, reciprocating the piston C in the cylinder A. This cylinder at its upper end is entirely open to the atmosphere and at the other end is provided with an outlet-port J of sufficient size so that when the port is open the piston will run freely back and forth in the cylinder with practically no resistance, and its operation will consume practically no power, nor will it while this port is open have any effect whatever upon the operation of the main shaft. The cylinder is also provided with suitable inlet-ports T T, and it is apparent that when the piston rises above these ports they will permit the air to enter the cylinder below the piston.

The outlet-port J may be closed by any suitable valve mechanism. I have shown the valve K operated by the bent lever-arm L, pivoted at M to the casing of the cylinder and pivotally connected at the other end at N through connecting-rod O to a weight P.

It is evident that this weight will normally keep the valve K closed, but that in so far as the weight is raised the outlet-valve will be opened.

As a suitable means of controlling the weight in the electrically-driven apparatus which I have intended especially to illustrate I provide the solenoid-magnet Q, which when the electric current passes therethrough will operate to raise the weight P, acting in this form as an armature, a greater or less distance, according to the adjustment of the parts and the strength of the current.

Assuming the device shown in the drawing to be connected to an armature-shaft or some other rotary shaft of electrically-driven apparatus, I have not shown the conducting-wires completely or any other portion of the complete structure, because the operation of the other parts is obvious and they are well known. I have by S S′ indicated the current-wires of the magnet.

It is apparent that so long as the outlet-port J is freely open the device will offer no resistance to the operation of the shaft, and it is also apparent that when the outlet-port J is closed the downward stroke of the piston operates against the cylinder-contained air below the piston as against an air-cushion, compressing the same and eventually if the force be sufficient driving the same out against the resistance of the port-closing force, and that then upon its next or upward stroke the piston will operate against the outside atmospheric pressure, or, in other words, operate against the vacuum caused below the piston upon its upward stroke and that this resistance will continue until the piston passes the inlet-ports T T, when the cylinder will again fill with air and the complete operation will be repeated. It is thus apparent that the rotary motion of the shaft will be checked by an elastic but continuance resistance greater or less as the parts may be adjusted and operating either to lessen the speed or absolutely to stop the rotation almost or quite instantly, just as may be desired.

If the adjustment of the port-closing force represented by the weight P is such that the valve K is only partly closed, there will be a diminished air resistance upon the downward stroke of the piston and a partial vacuum resistance upon its upward stroke, and it is apparent that the effect of the device can be varied upon the downward stroke all the way from nothing up to the result of a very high air compression and upon the upward stroke all the way from nothing to the opposing air

resistance caused by a complete vacuum. It is apparent also that the arrangement of ports and valves can be greatly varied without departing from the principle of the invention—as, for example, the valve might be located in the piston itself, which valve, suitably opened and closed, would then cause the piston to operate like the well-known plunger of a pump.

When the device is applied to electrically-driven apparatus, it will probably be best applied to the armature-shaft, although it might be applied to some other rotary shaft, and when used with such apparatus and with the weight-controlling apparatus of some such form as shown in the drawing it is apparent that when the electric current is on and the weight is raised and the piston running free the same throw of the switch or lever which shuts off the electricity from the dynamo or other driving mechanism may and normally will also shut off the electricity from the weight-controlling means, and thereby the weight will drop, the valve will close, and the brake will operate, so that the same motion of the operator's hand will shut off the driving power and apply the brake.

I have found this device to be especially useful with electrically-driven hoisting apparatus where a brake of great power is required, and I have found that not only can I thus cause the apparatus to hold stationary a much greater weight than it can lift, but I can also so check, regulate, and control the motion as to produce the most desirable results.

The use of this device also avoids the heating resulting from friction between the brake-shoe and the surface with which it is in contact and the wearing of such surface and by its gradual action when properly adjusted will avoid the wear on a wheel, such as a car-wheel, which results from the sudden and absolute setting of the brake-shoe, causing a flat wheel.

The device can be applied as well to other apparatus as to electrically-driven mechanism and by means of the crank which I have shown or the familiar eccentric or other common mechanism may be applied to any rotary shaft at any point.

I have shown an ordinary piston and an ordinary cylinder; but it is evident that this cylinder is essentially a valve-chamber and that neither its form nor that of the piston or valve therein moving is important.

In the form that I have shown in the drawing, the cylinder being entirely open at one end, the moving piston may well be called a "cylinder-head."

It is apparent also that while the difference in size of the opening between a free opening at one end of the cylinder and such an outlet-port as I have shown at the other end may cause theoretically some resistance, yet that this outlet-port can be made large enough so that the driving of the air out therethrough will not cause any serious resistance to the piston.

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

1. In combination with a rotary shaft, a piston, a cylinder, and means for causing the piston to reciprocate within the cylinder, a port in the cylinder near its end and normally open, a valve and operating means for the valve, whereby the port can be opened to permit escape of the compressing-air and closed to prevent the ingress of the external air, and a port located at some distance from the end of the cylinder, whereby the external air can be admitted after the piston has passed the same on its reverse stroke.

2. In a device for braking electrically-driven apparatus, the combination of the driven shaft, a cylinder and a piston, means carried by the shaft for reciprocating the piston within the cylinder, means for creating atmospheric resistance to the motion of the piston, means whereby the driving-current of electricity will lessen or prevent such atmospheric resistance, and means whereby the lessening or stoppage of the electric current will cause an increase in such atmospheric resistance.

3. In a device for braking power-driven apparatus, the combination of the driven shaft, a cylinder and a piston, means carried by the shaft for reciprocating the piston within the cylinder, means for creating atmospheric resistance to the motion of the piston, means whereby the normal operation of the driving power will prevent or lessen such atmospheric resistance, and means whereby the entire or partial discontinuance of the driving power will increase such atmospheric resistance.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GEORGE ELMER MARCH.

Witnesses:
CLAUDE A. VAN ZANTEN,
E. CLIFFORD BRAMBLE.