(No Model.)

M. B. MILLS.

AIR BRAKE.

No. 537,784. Patented Apr. 16, 1895.

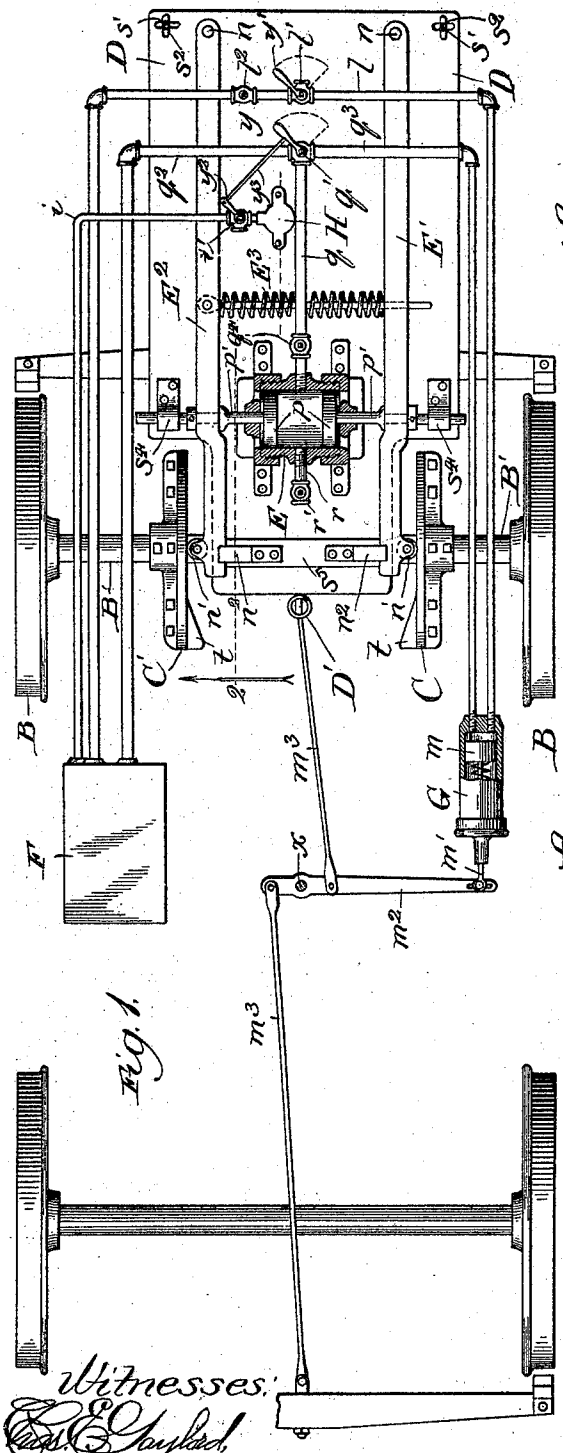

Fig. 1.

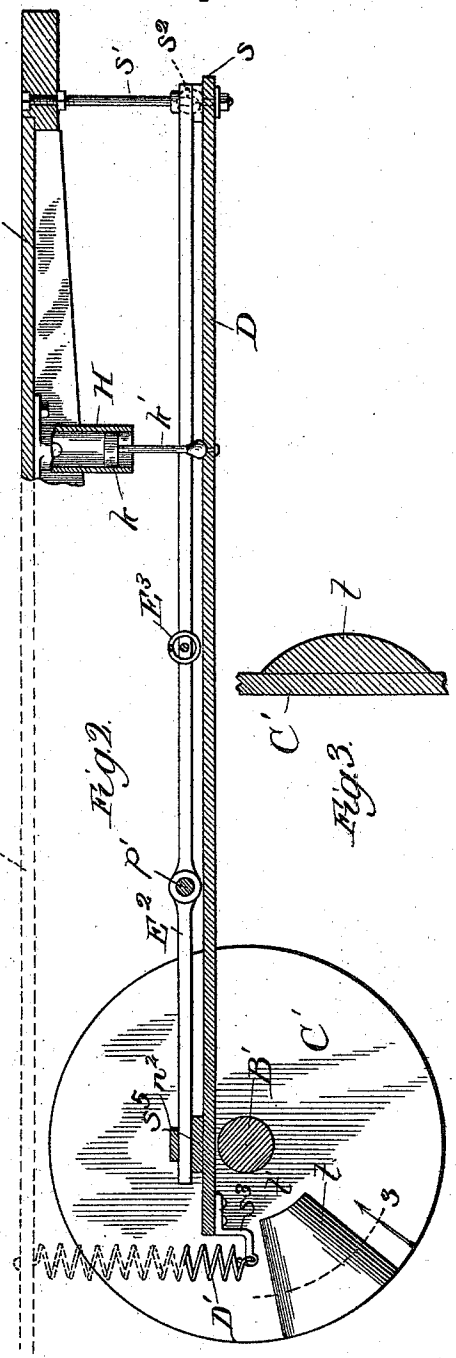

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

MORTIMER B. MILLS, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE MILLS IMPROVED PNEUMATIC BRAKE COMPANY, OF SAME PLACE.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 537,784, dated April 16, 1895.

Application filed October 29, 1894. Serial No. 527,145. (No model.)

To all whom it may concern:

Be it known that I, MORTIMER B. MILLS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Air-Brakes, of which the following is a specification.

My invention relates to improvements in air-brakes for railway trains, and for use more especially upon the motor cars of electric railway systems.

My object is to provide improved air brake mechanism of a comparatively simple and durable construction, in which an air compressor for generating stored pressure to be used in the application of brakes shall be actuated by the progressive movement of the car upon which it is mounted.

In the drawings—Figure 1 is a plan, partly sectional and diagrammatic, view of my improvements in operative position; Fig. 2, an enlarged section on line 2 of Fig. 1, viewed in the direction of the arrow, and Fig. 3 a broken section on line 3 of Fig. 2.

My improvements are mounted upon the under side of the floor A of the car.

B B are car wheels fixed upon the car axle B′, which latter rotates with the wheels in the usual manner. On the axle B′ to rotate therewith are disks C C′ having smooth flat inner faces and provided at corresponding places with sectoral or segmental cams *t*. The cams *t* extend from the circumferences of the disks nearly but not quite to the axle B′, and each cam is bounded by radial lines which cause it to taper from the circumference toward the center of the disk. Each cam is preferably rounded, as indicated in Fig. 3, and gradually diminishes from the circumference in the direction of the center of the disk, as indicated most plainly in Fig. 1. Thus near the axle the surface of the disk is plain and flat, and constitutes what I term the inner track surface or lever-rest *t′*. The cam *t* at its center rises gradually from the surface *t′* and is of greatest thickness at the circumference of its disk.

D is a platform suspended at its edge *s* from the bottom of the car by hangers *s′*. The hangers are rigid and the platform is pivotally connected to the lower ends of the hangers, as by the eye-bolts s^3 shown in Fig. 2. At its opposite end the platform D is provided with a bracket s^3 and there fastened to the lower end of a spring D′ extending downward from the floor of the car. The tendency of the spring D′ is to raise the platform in the direction of the floor A. Fastened to the platform in the position shown is an air compressor cylinder E having an inlet pipe *r* provided with a check valve *r′*, and an outlet pipe *q* provided with a check valve q^4, both the said pipes extending from the center of the cylinder. In the cylinder are two pistons *p* which work counter to each other from the ends toward the center of the cylinder, and are each provided with a piston-rod *p′*. The piston-rods have their bearings in the ends of the cylinder and also pass at their outer ends through bearings s^4 on the platform.

E′ E^2 are pump levers pivoted to the platform D at *n n* and provided at their opposite ends with anti-friction wheels *n′ n′* which ride upon the faces of the disks C C′. Between their ends the levers are fastened rigidly to the piston stems *p′;* and adjacent to the said anti-friction wheels they move under angle-iron guides n^2 which hold them against a brace bar s^5 forming part of the platform construction. Confined between the levers E′ E^2, and fastened at opposite ends thereto is a spring E^3, which tends normally to press the levers apart, and thus draw the pistons *p* to the ends of the cylinder.

F is a compressed air reservoir which may be located in any suitable place; and G is a brake-cylinder containing a piston *m* upon a piston-rod *m′* fastened to the brake-lever m^2. The brake-lever is pivoted at *x*, and is connected in a common manner by means of rods m^3 m^3 with the brake-beams carrying brake-shoes at the treads of the car-wheels. In the brake-cylinder I prefer to provide a spring about the piston-rod *m′* to press the piston *m* normally forward in the direction of releasing brakes. At the end of the pipe *q* is a valve *q′*, and coupled to the valve is a pipe q^2 extending to the reservoir F, and a pipe q^3 extending to the brake-cylinder G. The valve *q′* may be a three-way cock and provided with

a handle y, whereby air compressed in the pump-cylinder E may be directed through the pipe q^2 to the reservoir F, or through the pipe q^3 to the brake-cylinder. Extending from the reservoir F to the brake-cylinder direct is a pipe l provided with a valve l' having a handle y'. The handle y' may be turned to direct air from the reservoir F to the brake-cylinder, or to the position of cutting off the air from the reservoir and opening the brake-cylinder to the outside air. In the pipe l is a check-valve l^2 which permits ready passage of air from the reservoir in the direction of the brake-cylinder, but prevents retrogression of pressure from the brake-cylinder to the reservoir.

Fastened against the under side of the car-floor A is a cylinder H containing a piston k having a stem k' fastened to the platform D. Extending to the cylinder H from the reservoir F is a pipe i having a valve i' provided with a handle y^2. Turning of the handle in one direction causes the air from the reservoir F to pass to the cylinder H and press down the piston k; while turning of the handle y^2 to another position shuts off the flow of air from the reservoir F and vents the air from the cylinder H. When air is directed from the reservoir to the cylinder H it bears against the piston k and tends, if the pressure is high enough, to press the platform D in the downward direction against the resistance of the spring D'.

The operation of my air-brake mechanism is as follows: In the movement of the car and consequent rotation of the wheels B, the axle B' and disks C C' rotate. In ordinary service the cock q' would be so turned as to direct air from the pump or compressor E through the pipe q^2 to the reservoir F, and the valve i' would be turned to the position of opening the cylinder H to the reservoir F. As, in practice, the handle y of the cock q' and handle y^2 of the valve i', should be moved at the same time, as hereinafter explained, they may be tied together as by the rod y^3 indicated. The handle y' of the valve l' should be turned to the position of opening the brake-cylinder to the outside air and shutting off the flow of pressure from the reservoir F. In practice the operating handles $y\,y'$ should be in convenient position to be turned by the motorman. Initially, when there is no pressure in the reservoir F and cylinder H, the spring D' raises the platform D at its swinging end to or nearly to the top of the disks C C'. Thus in the rotation of the said disks the cams t wipe across the anti-friction wheels n' and plunge the pump-levers E' E^2 inward to force the pistons p simultaneously toward each other. As the cams pass the ends of the levers the latter are forced in the outward direction by the spring E^3 to press the pistons p apart and cause the anti-friction wheels n' to bear against the surfaces of the disks. Thus in each revolution of the disks C C' the pump-pistons are forced inward and outward. In their outward movement air is drawn into the cylinder through the valve r', and in their inward movement the air is expelled through the valve q^4, pipes $q\,q^2$ to the reservoir F. As the pressure in the reservoir F rises air flowing therefrom through the pipe i to the cylinder H tends to press the piston k in the downward direction and lower the platform D against the resistance of the spring D'; and the more the pressure rises in the reservoir and cylinder H the further the descent of the platform D until the anti-friction wheels n' ride upon the smooth or flat surfaces t' of the disks. As before stated, the cams t diminish gradually in width and thickness from the circumference of the disks to the surfaces t'. Therefore, as pressure rises in the reservoir and cylinder H and the platform D is pressed down, the action of the pump becomes gradually less until it ceases altogether when the anti-friction wheels ride upon the surfaces t'. Each surface t' thus operates as a lever-rest. If it is desired, as in railway automatic air-brake systems, to carry storage pressure of seventy pounds to the square inch in the reservoir F, the resistance of the spring D' provided may be such as to permit lowering of the levers to the surfaces t' only under seventy pounds' pressure against the piston k.

When it is desired to apply brakes for a service stop the handle y' of the valve l' is turned to direct pressure from the reservoir F through the pipe l to the brake-cylinder. To release brakes the handle y' is turned back again to shut off the flow of pressure from the reservoir F and vent the pressure from the brake-cylinder. As will be readily understood it is preferable to employ a valve l' which when turned to an intermediate position will hold the pressure in the brake-cylinder G, and at the same time prevent any more pressure from flowing thereto from the reservoir. Thus the brakes will be under perfect control of the motorman, who can turn the handle y' to apply brakes with any desired pressure; hold them when thus applied; or release the brakes. If after initially starting the car and before pressure has been raised sufficiently in the reservoir F it is desired to apply brakes, the handle y may be turned simultaneously with the handle y' to cause air to be pumped directly from the pump E into the brake-cylinder. The air thus pumped into the brake-cylinder G will be prevented from escaping through the valve l' by the aforesaid turning of the handle y', and by the check-valve l^2 which prevents the air flowing to the reservoir F.

To make an emergency stop when the reservoir F filled with pressure both the handles y' and y may be turned to cause the reservoir pressure to flow to the brake-cylinder and the compressor E to pump directly into the brake-cylinder. In the turning of the handle y the handle y^2 is also turned, through the connecting rod y^3, to shut off the flow of pressure

from the reservoir to the cylinder H, and vent the pressure from the latter, whereby the platform is raised by the spring D′ and the pump-levers actuated by the cams near the circumferences of the disks.

It is only intended in the present application to show, describe and claim broadly the invention without going particularly into the minor details of the construction. The valves *l′ q′* may in practice be of any construction whereby the operator can bring about quick application for service or emergency stops, hold the pressure in the brake-cylinder or release brakes.

My invention is not to be limited to the details illustrated in the drawings, because they may be modified in various ways without departing from the spirit of my invention as defined by the claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an air-brake system for cars, an air-pump and means for operating the same, comprising, in combination, a disk connected with the running gear of the car to rotate, and provided on its face with a segmental cam, a pump-operating lever, lever-shifting means for moving the lever into and out of the path of the cam, and a spring maintaining the lever in contact with the cam when shifted thereto, whereby in the progressive movement of the car the cam is rotated and the lever is oscillated thereby to operate the pump, substantially as and for the purpose set forth.

2. In an air-brake system for cars, a reservoir, a pump for compressing air into said reservoir, and operating means for the pump, comprising, in combination, a rotary disk, actuated by movement of the car, and provided on its face with a segmental cam *t*, a lever-rest at one side of the annular path of the cam, a pivotal pump-lever connected with the pump-piston, shifting means for the lever, actuated and controlled by pressure from said reservoir, for moving the lever between the lever-rest and the cam, and spring mechanism for maintaining the lever in contact with the cam when shifted thereto, substantially as and for the purpose set forth.

3. In an air-brake system for cars, an air-compressor comprising a pump-cylinder and two pistons working therein from opposite ends toward the center, and means for moving the said pistons, comprising pivotal levers connected with the said pistons, cam mechanism operated from the car-axle to throw the said levers in one direction and spring mechanism to oppose the action of the cam mechanism, substantially as described.

4. In an air-brake system for cars, an air-compressor comprising a pump-cylinder and two pistons working therein from opposite ends toward the center, and means for moving the said pistons, comprising pivotal levers connected with the said pistons, segmental cams connected with a car-axle, and spring mechanism for maintaining the levers in contact with the cams, the cams operating in the rotation of the axle to engage the levers and force them simultaneously in contrary directions, substantially as and for the purpose set forth.

5. In an air-brake system for cars, a reservoir, a pump for compressing air into said reservoir, and operating means for the pump, comprising in combination, a rotary disk, actuated by movement of the car, and provided with a cam *t* and plane surface *t′* in concentric paths, a pivotal pump-lever connected with the pump-piston, means for maintaining the lever at one end portion in contact with the disk, and shifting means for the lever, actuated and controlled by pressure from said reservoir, for moving the lever between said concentric paths, all constructed to operate substantially as and for the purpose described.

6. In an air-brake system for cars, an air-compressor comprising a pump-cylinder and two pistons working therein from opposite ends toward the center, and means for moving the said pistons, comprising pivotal levers connected with the said pistons, disks upon and rotating with a car-axle, cams upon the said disks and means for maintaining the levers toward one end in contact with the disks, the cams operating in the rotation of the disks to engage the levers and force them simultaneously in the direction of each other, substantially as and for the purpose set forth.

7. In an air-brake system for cars, disks mounted upon and rotating with a car axle, a movable platform beneath the car floor, an air-compressor comprising a pump-cylinder on said platform, pistons in said cylinder working from opposite ends toward the center thereof, levers pivotally mounted upon said platform, connected with the said pistons and extending at one end in contact with said disks, cams *t* and plane surfaces *t′* in concentric paths on the disks, a storage reservoir to which air is forced by the compressor, and means actuated by pressure in the reservoir for moving the said platform to shift the said levers between the said concentric paths on the disks, and means for maintaining the said levers in contact with the disks, substantially as and for the purpose set forth.

8. In an air-brake system for cars, disks mounted upon and rotating with the car axle, and provided with cams *t* and plane surfaces *t′* in concentric paths, a platform D pivotally supported at one end beneath the car floor to swing at its opposite end in the vertical plane, a spring operating normally to raise the said platform at its swinging end, an air-compressor on the platform comprising a pump-cylinder, pistons in the cylinder movable therein from opposite ends toward the center, levers pivotally connected at one end to the platform, extending at their opposite ends against the said disks and connected between their ends with the said pump-pistons, spring-retaining means for the levers operating to press them in contact with the said disks, a

reservoir into which air is forced by the compressor, and means for forcing the platform downward against the resistance of its spring support when the pressure in the reservoir is raised, comprising a cylinder in open communication with the reservoir, a piston in said cylinder having a piston-rod, the cylinder and the rod of its piston being fastened one to the under side of the car and the other to the said platform, substantially as and for the purpose set forth.

9. In an air-brake system for cars, the combination with the compressor operated by the progressive movement of the car, storage reservoir and brake-cylinder, of pipes extending from the compressor to the reservoir and to the brake-cylinder direct, means for directing the air from the compressor through either of said pipes at will, a pipe *l* extending from the reservoir to the brake-cylinder, an operating valve in said pipe for directing air from the reservoir to the brake-cylinder and for venting said cylinder, and a check-valve interposed between the said reservoir and brake-cylinder, operating to prevent retrogression of air from the brake-cylinder to said reservoir, substantially as and for the purpose set forth.

MORTIMER B. MILLS.

In presence of—
J. H. LEE,
M. J. FROST.