No. 607,069. Patented July 12, 1898.

E. C. NICHOLS.

CAR BRAKE.

(Application filed Dec. 17, 1897.)

(No Model.) 3 Sheets—Sheet 1.

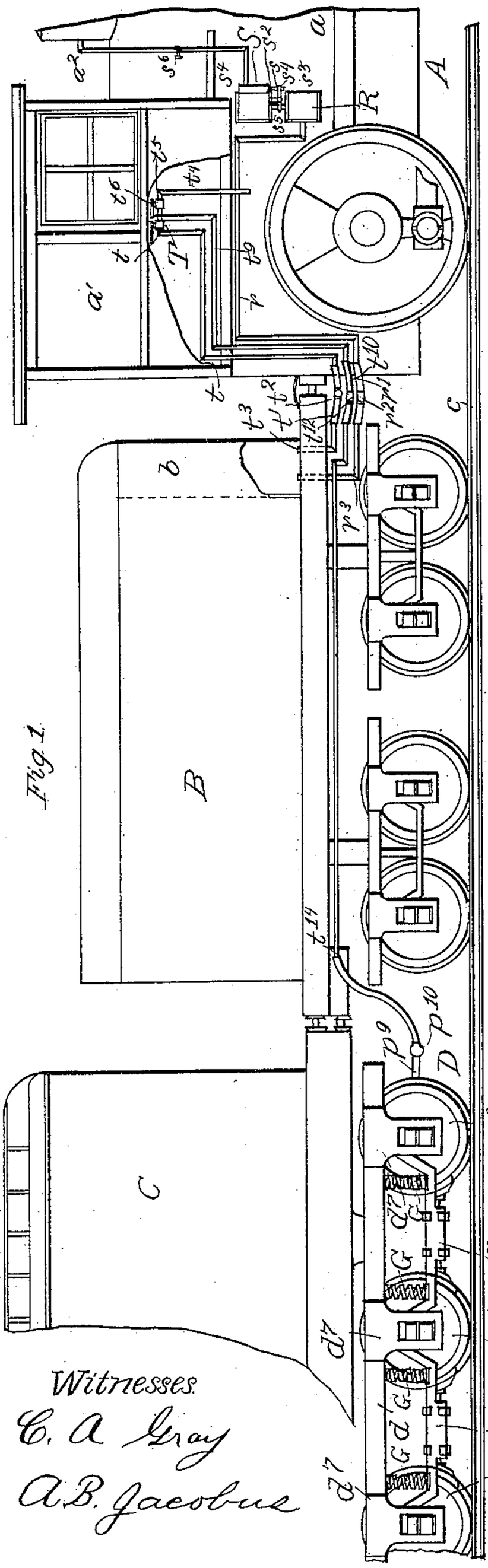

Fig. 1.

Inventor.

Edwin C. Nichols

By

Pitch & Manning

Atty.

No. 607,069. Patented July 12, 1898.

E. C. NICHOLS.

CAR BRAKE.

(Application filed Dec. 17, 1897.)

(No Model.) 3 Sheets—Sheet 2.

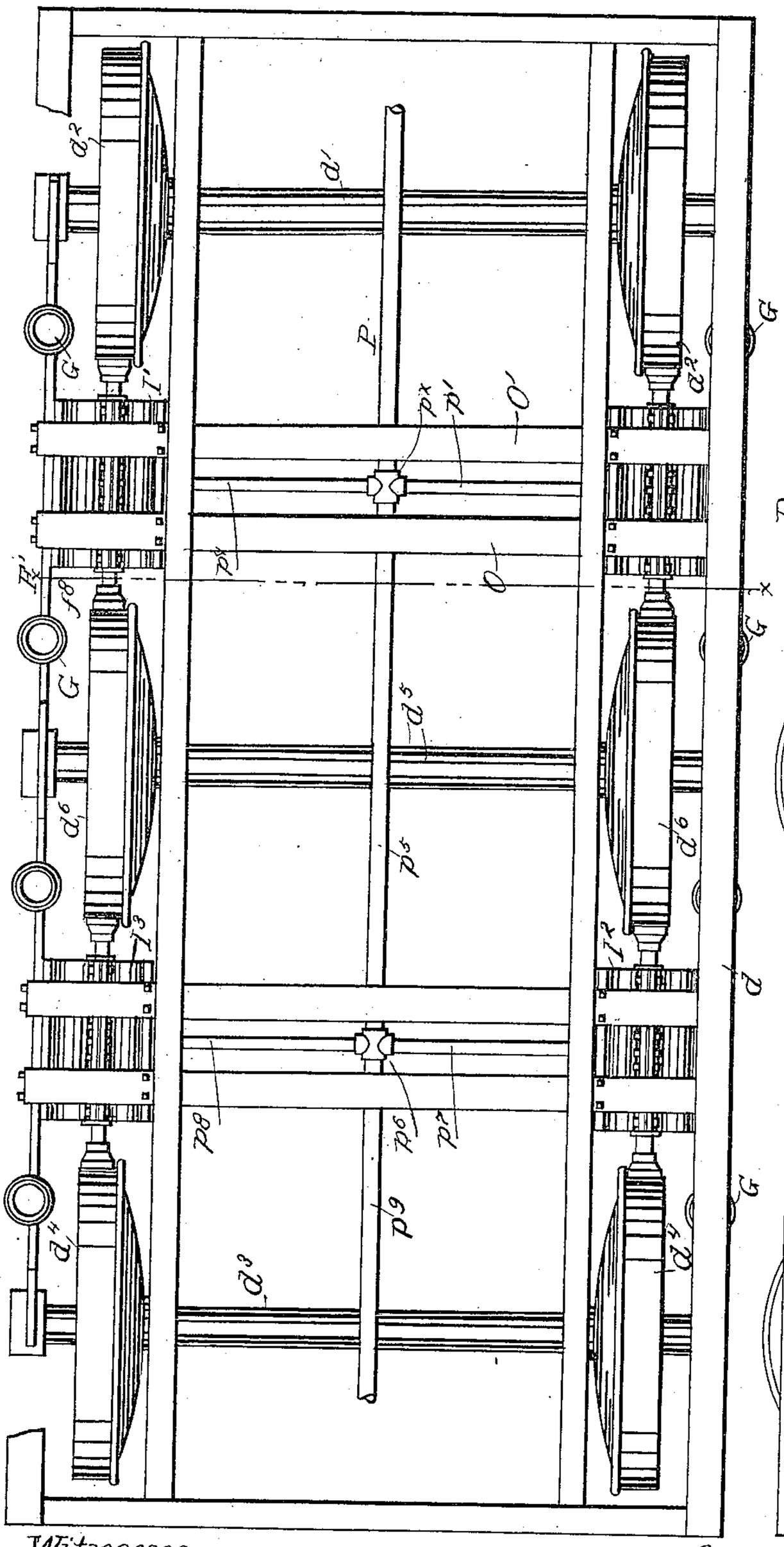

Fig. 2.

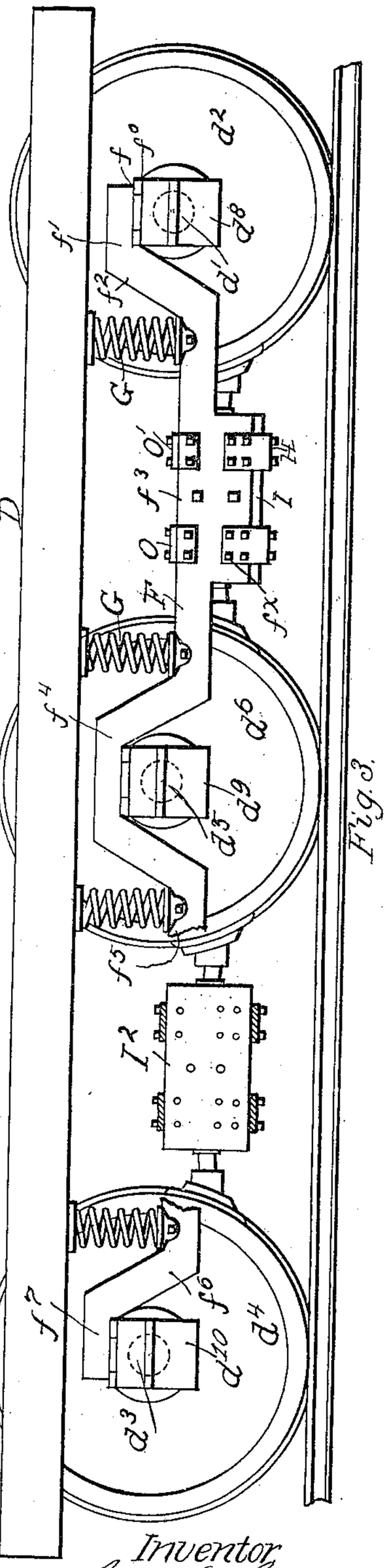

Fig. 3.

Witnesses.

C. A. Gray

A. B. Jacobus

Inventor

Edwin C. Nichols

By Richards & Manning

Attys

No. 607,069. Patented July 12, 1898.

E. C. NICHOLS.

CAR BRAKE.

(Application filed Dec. 17, 1897.)

(No Model.) 3 Sheets—Sheet 3.

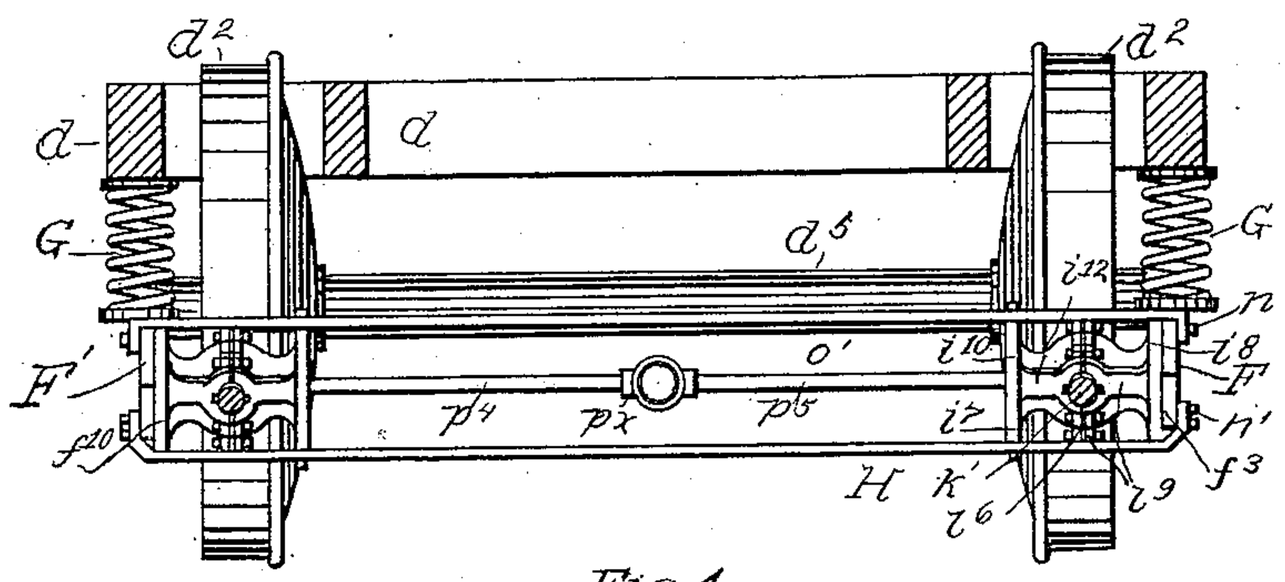

Fig. 4.

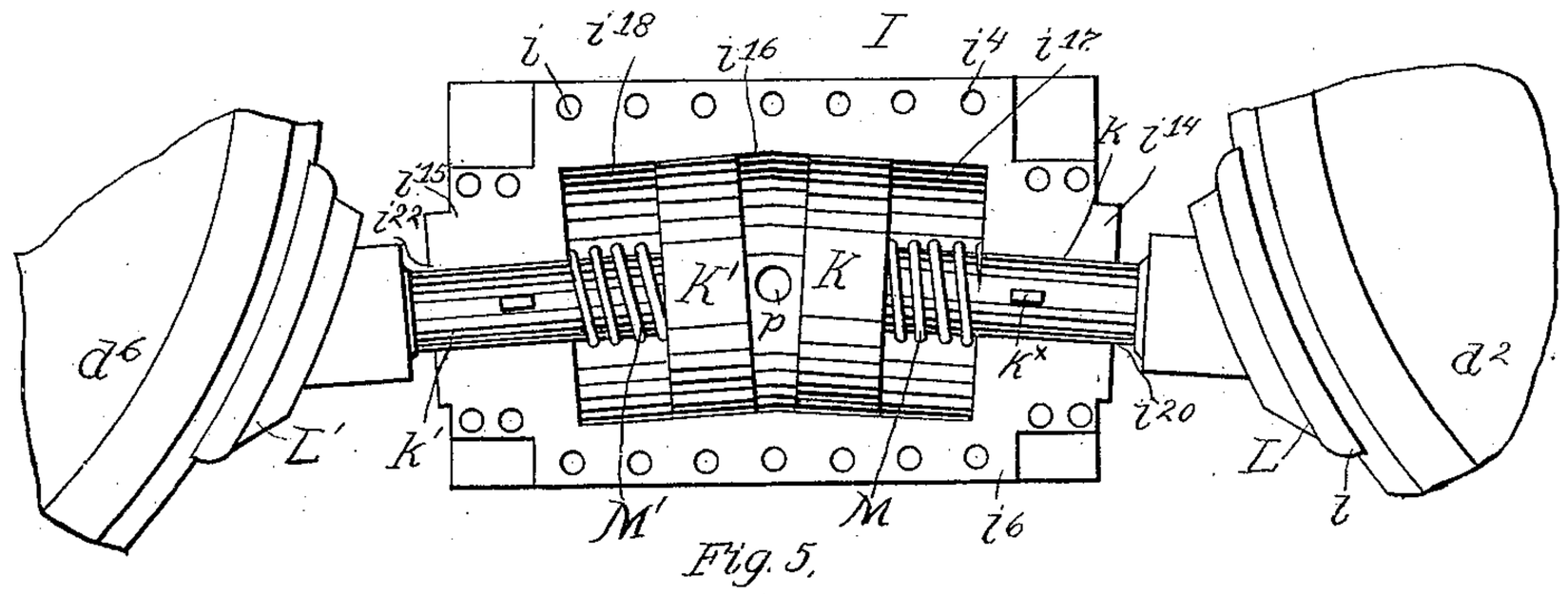

Fig. 5.

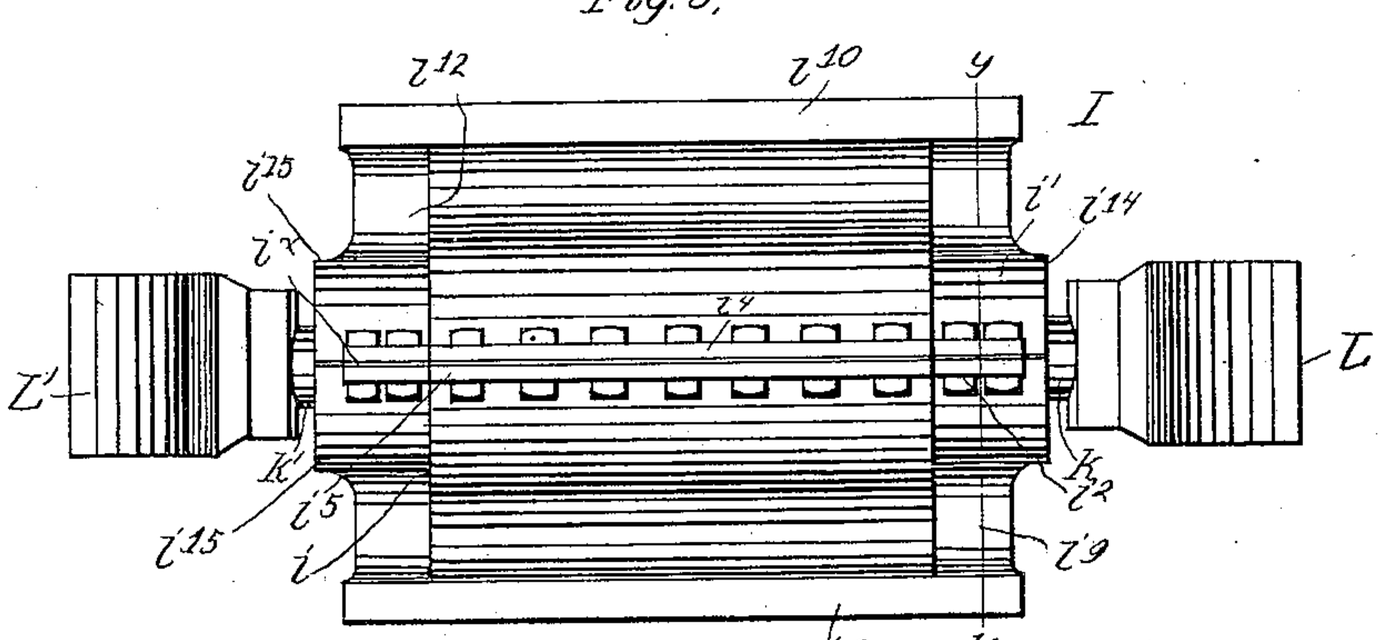

Fig. 6.

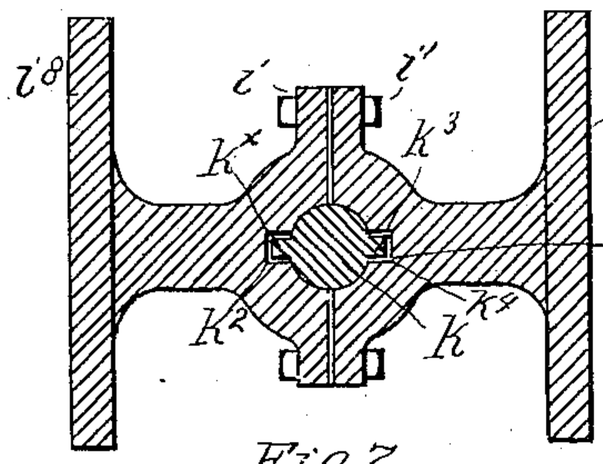

Fig. 7.

Witnesses.
C. A. Gray
A B Jacobus

Inventor
Edwin C. Nichols
By.
Richd & Manning
Att'y

UNITED STATES PATENT OFFICE.

EDWIN C. NICHOLS, OF TOPEKA, KANSAS.

CAR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 607,069, dated July 12, 1898.

Application filed December 17, 1897. Serial No. 662,332. (No model.)

To all whom it may concern:

Be it known that I, EDWIN C. NICHOLS, a citizen of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented certain new and useful Improvements in Car-Brakes; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others to make and use the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates more particularly to that class of brakes which are operated by compressed air and commonly applied to railway-cars.

My invention has for its objects, first, the control of the air-brake when applied to brake the car-wheels, so as to retain the pressure of air in the storage-tank, and, second, to separate the detachable parts of the brake-cylinder upon the bed-plate.

My invention consists in the novel construction and combination of parts, such as will be first fully described, and specifically pointed out in the claims.

In the drawings, Figure 1 is a side elevation of the tender and broken portions of the engine and railway-car, respectively, of a train, showing the improved brake applied to the wheels of the forward truck of the car, the compressed-air storage-tank on the tender and the series of pipes extending from the said tender to the cab of the engine, the air-conducting pipe connected with the brake-cylinder and with the storage-tank, the air-compressor pump on the engine, and the conductor connected with said pump and the storage-tank. Fig. 2 is plan view of the forward truck of the car, and Fig. 3 is a side elevation of the truck, showing the improved air-brake applied thereto and a portion of the truss-bar opposite one of the brake-cylinders broken away. Fig. 4 is a transverse sectional view of the car-truck, taken upon the line $x\,x$ of Fig. 2, showing an end view of the brake-cylinder and the transverse guide-bars. Fig. 5 is a vertical sectional view of the brake-cylinder, showing the brake-pistons and piston-rods and shoe-releasing springs, also showing the brake-shoes and showing broken portions of the car-wheel. Fig. 6 is a plan view of the brake cylinder and shoes as in Fig. 5, showing the separate flanges on the separate parts of the cylinder or case. Fig. 7 is a transverse view of the brake-cylinder, taken upon the line $y\,y$ of Fig. 6, showing the guides on the piston-rod.

Similar letters of reference indicate corresponding parts in all the figures.

In the drawings, to which reference is made, A represents the locomotive or engine.

a is the steam-boiler, a' the cab, and a^2 the steam-dome; B, the tender, and C the car, which are upon track-rail c, the car being coupled with the tender and the tender with the engine, as in the usual railway-train.

D represents the forward truck of the car C, and d the truck-frame, which supports the weight of the forward end of the car.

In the various illustrations I have shown the triple axle-truck which is commonly employed, in which d' is the front axle and d^2 d^2 the car-wheels on said axle, d^3 the rear axle and d^4 d^4 the car-wheels on said axle, and d^5 the intermediate axle and d^6 d^6 the car-wheels upon said axle. The respective car-axles are journaled in suitable lubricating-boxes in the lower part of the hangers d^7, which are connected at their upper ends with the truck-frame d in the usual manner. On the axle d' and between said box and wheel d^2 is a loosely-connected bearing or plate d^8, and upon the other axles d^5 d^3 and upon side of the truck are the respective plates d^9 d^{10}, which are the same as the plate d^8. Upon the upper side portion of the plate d^8 is hung the upper horizontal end portion f' of the ordinary truss-bar F, which end is secured to the plate by the pins f^0 f^0, which enter the openings f in the bar F. From the point of connection with plate d^8 said bar is bent at an angle and a portion f^2 extended a short distance below the line of the axle d' and then bent at an angle and a portion f^3 extended horizontally in the direction of the plate d^9 on the axle d^5, and at a point near said plate a portion f^4 of said bar is bent upwardly at an angle to the portion f^3 and extended over plate d^9 and thence downwardly upon the other side of the axle d^3 to a point in line with the horizontal portion f^3 of the said truss-bar F, and a portion f^5 extended horizontally in the direction of the plate d^{10} on the axle

d^3 to within a short distance of said plate, and a portion f^6 bent in an upward direction to the line of the top of the plate d^{10}, and a portion f^7 bent in a horizontal direction and extended to the line of the farther edge portion of said plate, the connection with each plate d^9 d^{10} being made with pins in the same manner as with the end f' of beam F, so that a resistance to any strain on the car-axles is afforded in the longitudinal direction of the truck. Upon the other side of the truck D is a truss-bar F', which is secured to plates mounted on the other ends of the respective axles d' d^5 d^3 and having the longitudinal portions f^8 f^9, which are the same as and are directly opposite the respective parts f^3 f^5 of the bar F, the construction of said bar being precisely the same as the bar F.

G G are spiral springs which are connected with the upper edge of the truss-bar F, near the upwardly-inclined portions f^2 f^4, which springs extend upwardly beneath the under edge of the truck-frame A and support the weight of the truck-frame and the forward end of the car C. Said springs G G are placed near the bent portion of each truss-bar which is adjacent to each car-axle and upon both truss-bars. A portion $f^\times$ of the horizontal portion f' of the truss-bars extends downwardly from the lower edge of said bar a distance slightly in excess of the ordinary width of said portion f' of said bar and a short distance each way in the longitudinal direction of the said truss-bar from a point on said portion f' of said bar equidistant from the respective bent portions f^2 f^4. Between the bent portions f^4 f^6 of the bar F is a downward extension f^9 of the horizontal portion f^5, which corresponds in length and width to the portion $f^\times$ of the portion f^3 of the same bar F. Upon the other side of the truck D and extending below the lower edge of said beam, opposite the portion $f^\times$, is a downward extension f^{10}, (see Fig. 4,) which is the same in length and width as said portion $f^\times$, and from the lower edge of the portion f^8 of the said bar is a downward extension which is precisely the same as the extension f^9 of truss-bar F. With the lower edge of the portion $f^\times$ of the horizontal portion f^3 of the bar F is connected one end of bed-plate H, the other end of which plate is extended in a transverse direction to the truck-frame and connected at the other end with the lower edge of the portion f^{10} of the horizontal portion f^8 of the bar F'.

Upon the bed-plate H, on the inner side of the portion f^3 of bar F and between the respective car-wheels d^2 d^6, is arranged the car-brake cylinder or case I. Said cylinder or case I is comparatively short in length and is in two separate longitudinal parts i i'. Upon the upper portion of the part i of said cylinder is a flange i^2, which extends the length of said cylinder, and upon the upper portion of part i' is a flange i^4, both of which flanges are secured firmly together by the bolts i^5, which pass through both flanges. Upon the under side portion of each separate part of the case or cylinder I is a flange i^6, which are secured together by the bolts i^7 (see Fig. 4) in precisely the same manner as the flanges i^2 i^4, said separate flanges having the usual rubber gaskets $i^\times$ between each flange, so as to insure an air-tight joint. Upon one side of the cylinder or case I is a plate or casting i^8, which extends the length of said cylinder and from the bed-plate H the same distance in a vertical direction as the flanges i^2 i^4 and is secured to the outer side portion of said cylinder by the web i^9. (See Figs. 4 and 6.) Upon the other side of the cylinder I is a plate i^{10}, which is precisely the same in length and extends the same height above the bed-plate H as the plate i^7 and is connected with the adjacent side of the cylinder by means of a web i^{12}. The ends of the cylinder or case I are each in two parts i^{14} i^{14} and i^{15} i^{15} and cast integral with the respective sides of the said brake-cylinder.

From the point i^{16} within the cylinder or case I, which is equidistant from the respective ends i^{14} i^{15} of said cylinder, the sides of the cylindrical opening i^{17}, extending from said point i^{16} to the inner side of the end i^{14} of said cylinder, incline downwardly at an angle to the horizontal line of the outer side of said cylinder. The inner side of the end i^{14} describes a line at right angles to the lines of the sides of said cylindrical opening i^{17}. From the point i^{16} in the direction of the end i^{15} the sides of the cylindrical opening i^{18} are inclined downwardly and extend to the inner side of the head i^{15} in the opposite direction to and at the same degree of inclination from the horizontal line of the outer side of the cylinder as described of the cylindrical portion i^{17} of said cylinder. The inner side of the head i^{15} also describes a right angle to the lines of the sides i^{18}. Within the portion of the cylinder having the inclined sides i^{17} is a piston K, and within the portion of the cylinder having the inclined sides i^{18} is a piston K'. With the piston K is connected one end of a piston-rod k, the other end of which piston extends through an opening i^{20} in the end i^{14} of the cylinder I, which opening is slightly larger than said piston-rod for the purpose hereinafter described. On the side of the piston-rod k opposite to the head i^{14} of the cylinder is a longitudinally-extended guide-lug $k^\times$, and in the inner portion of the said end l^{17} is a groove k^2, which receives the lug $k^\times$. Upon the other side of the piston-rod k is a lug k^3, and on the inner side of the end of said cylinder a groove k^4, which are in line horizontally with the lug $k^\times$ and groove k^2. The piston-rod k' is provided with a lug and the side i^{15} of said cylinder with grooves in the same manner as described of the end i^{17} of the cylinder and its piston-rod k. With the other end of the piston-rod k is connected rigidly the shoe L, which consists of a curved plate or casting l, the bearing-surface of which

shoe is curved in the arc of the circle described of the periphery of the wheel d^2, said shoe being of sufficient length to obtain a firm bearing upon the wheel.

Within the portion of the cylinder having the inclined inner side portion i^{18} is a piston K′, which is the same as the piston K and with which is connected one end of a piston-rod k', which is the same in length as the piston-rod k, and which rod extends through an opening i^{22} in the end i^{15} of said cylinder and is provided with a brake-shoe L′ at the other end of said rod, which bears against the periphery of the wheel d^6 in precisely the same manner as described of the piston-rod k and the shoe L.

Between the piston K and the inner side of the end i^{14} of the cylinder I is a spiral spring M, which extends around the piston-rod K and bears against the said piston with sufficient force to throw said piston in the direction of the intermediate point i^{16} within the cylinder away from the end i^{14} to a described normal position when at rest. Between the piston K′ and the inner side of the end i^{15} is a spiral spring M′, which is the same in tension as spring M and is also upon the rod k' and performs the same office as the said spring M.

The cylinder I is secured to the truss-bar F by the nut-bolts n, which extend through the truss-bar and the upper portion of the vertical plate i^8 in the said cylinder, and also by the nut-bolts n', which extend through the said plate i^8 near its lower edge and also through the truss-bar F. With the upper edge of the truss-bar F is connected one end of a strip or plate O, the other end of which plate extends in a transverse direction to the said cylinder I and over the plates i^8 i^{10} and is connected at the other end with the upper edge of the truss-bar F′ on the other side of the truck D. A separate plate O′ also extends from the truss-bar F to the truss-bar F′ over the cylinder I and at a short distance from the plate O. In the side of the separate portion i' of the cylinder I is a screw-threaded opening p, in which is fitted the screw-threaded end portion p' of a pipe P, the other end of which pipe extends to a position which is equidistant from the opposite sides of the truck and is provided with a four-way joint $p^\times$. (See Fig. 2.) Upon the other side of the truck D and secured to the inner side of the truss-bar F′ is a brake-cylinder I′, which is precisely the same in construction as the brake-cylinder I and the brake-shoes of which bear upon the periphery of the respective wheels d^2 d^6 of truck D. Upon the same side of the truss-bar as the brake-cylinder I and between the respective wheels d^6 d^4 is a brake-cylinder I^2, which is precisely the same in construction as the brake-cylinder I and secured to the truss-bar F in like manner. Upon the inner side of the truss-bar F′ and secured thereto between the respective car-wheels d^4 d^6 is a brake-cylinder I^3, which is precisely the same in construction as the brake-cylinder I′ and secured to the truss-bar F′ in like manner. With the four-way joint $p^\times$ of pipe P is connected one end of a pipe p^4, the other end of which pipe is connected with the cylinder I′ in the same manner as described of the pipe P with the cylinder I. With the four-way joint $p^\times$ is connected one end of a pipe p^5, the other end of which pipe extends to a position in line transversely with the respective cylinders I^2 I^3 and is connected with a four-way joint p^6. With the four-way joint p^6 is connected a pipe p^7, which is connected with the cylinder I^3 in the same manner as the pipe p' with the cylinder I, and with the four-way joint p^6 is also connected a pipe p^8, which is connected with the cylinder I^3 as described of pipe p^4 with the cylinder I. With the four-way joint p^6 is connected one end of an air-supply pipe p^9, the other end of which pipe is extended to a position near the forward end of the car C and provided with a compressed-air coupling p^{10} of the well-known construction.

Upon the engine A and secured to the side of boiler a is an air pump or compressor R. Above said compressor and secured to the said boiler is a steam-cylinder of the motor S, the piston-rod s of which motor is connected with the piston-rod of the air-compressor R. On the side of steam-cylinder S is a steam cut-off valve s^6, having the usual slide-valve, the valve-rod s^2 of which is operated by the lever s^3, pivoted at one end to the said valve-rod and at a point between both ends to a support s^4, extending from the cylinder S. The other end of valve-rod s^2 extends to the piston-rod s and is operated by lugs s^5 on the piston-rod s in the well-known manner. With the steam-valve check s' is connected one end of pipe s^6, the other end of which pipe is connected with the steam-dome a^2 on the engine. With the eduction-opening to the compressed-air cylinder R is connected one end of a pipe r, the other end of which pipe is connected with one end of the flexible pipe r' near the forward part of the tender B, which is in two parts and provided with a compressed-air coupling r^2. With the other end of the flexible pipe r' is connected one end of a pipe r^3, the other end of which pipe extends within the bottom of the compressed-air storage-tank b on tender B.

Within the cab a' on the engine A is a two-way valve or cock T. With one end of said cock is connected one end of a pipe t, the other end of which pipe extends to and is connected with one end of a flexible pipe t', which is in two parts and connected by the compressed-air coupling t^2. With the other end of the flexible pipe t' is connected a pipe t^3, which extends within the compressed-air storage-tank b at the bottom of said tank. With the other portion of valve T is connected one end of an exhaust-pipe t^4, which extends a short distance from said valve and is bent at right angles, as at t^5, and a portion of said pipe extended in a downward direction toward

the floor of the cab a' and is open at its lower end. In the exhaust-pipe t^4, a short distance from the valve T, is a cut-off or exhaust valve t^6. With the portion of pipe t^4 between the valve T and t^6 is connected one end of a pipe t^9, the other end of which pipe extends to a position near the flexible pipe t' and is connected with one end of a flexible pipe t^{10}, which is in two parts and provided with a compressed-air coupling t^{12}. With the other end of pipe t^{10} is connected one end of a pipe t^{14}, which pipe extends beneath the tender B and extends to and is connected with the other end of the flexible pipe p^9, having the coupling p^{10} near the forward end of car C, and which pipe p^9 is connected with the respective brake-cylinders I I' I' I^3 heretofore described.

In like manner as described upon car C other cars may be coupled to said car provided with my improved car-brake and a pipe connected with the pipe P and said pipe extended to another car and connected with the air-conducting pipe to the brake-cylinders through flexible pipes, as described of the flexible pipes r' t' t^{10}, and in this manner an entire train composed of a number of cars is under the control of the brakes.

In the operation of the improved brake the steam from the steam-dome a^2 on the engine, which is superheated steam, passes to the steam-cylinder of motor S on the side of boiler a. The motor S actuates the air-compressor R, and the compressed air passes through pipe t^4 direct to the compressed-air tank b on the tender B, and a degree of pressure maintained in said tank from energizing volumes of compressed air received from compressor R sufficient to be utilized upon the instant and with power adequate to be exerted in each brake-cylinder between the wheels of the trucks of one or more cars with corresponding impulse and the degrees of force of the compressed air on the tank b. The pressure, therefore, of the compressed air in tank b is also extended through pipe t to the valve T in the cab a' of the engine and within control of the engineer when required for the instant action of applying the brake to check or completely stop the movement of the car-wheels, and thus the movement of the train. In order to apply the brake mentioned, the valve t^6 is closed. The valve T is then opened the proper extent, and the compressed air passes through the pipe t^9, thence through the pipe t^{14} to the pipe p^9 beneath the car C, and thence to the respective brake-cylinders I between the car-wheels d^2 d^6 through the pipes p^5 and P, and the compressed air admitted to cylinder I exerts a pressure corresponding to that in tank b upon the opposing sides of the pistons K K', and forcing said pistons in an opposite direction, and through the brake-shoes L L' upon the periphery of the wheels d^2 d^6, compressing the springs M M' in the movement. At the same time the compressed air enters the brake-cylinders I' I^2 I^3 and exerts the same degree of air-pressure upon the opposing pistons in each one of the respective brake-cylinders as described within the brake-cylinder I, thus throwing the power upon all the wheels of the truck D. In this action of the pistons M M' it will be observed that the positions of the piston-rods k k' of brake-cylinder I and also in each brake-cylinder are below a line horizontally extended through the axis of the car-wheel and the brake-shoes comparatively a short distance above the track-rail c, and that when the force of the brake-shoes L L' is brought by the action of the compressed air upon the respective car-wheels the lines of force are downward in the direction of the track-rail and at an angle to the lines of force applied to the car-axles to move the train. Upon the instant that the movement of the train or car ceases the valve T is closed and valve t^6 on the cab a' opened, and the compressed air in the brake-cylinder I and also each brake-cylinder on the track returns through the same supply-pipe t^9 and exhaust through the pipe t^4. When, however, the brakes are required to be kept upon the car-wheels for any considerable length of time and with all the pressure of the air obtained from the compressed-air storage-tank b, with the air-compressor at work and with the valve T open, and it is desired to reduce the pressure in the brake-cylinders, the valve T is closed and the exhaust-valve t^6 is opened in a slight degree, which action of the valve t^6 releases the brakes upon the car-wheels and permits the moving car to receive an increased degree of speed, but which speed may be instantly checked by closing the valve t^6 and opening valve T, and the pressure of air within the compressed-air storage-tank is at once communicated to the air within the brake-cylinder and the brakes applied to the wheels.

The action of the springs M M' in the brake-cylinder I and also within the other brake-cylinders exerts a power upon the respective pistons K K' and throws said pistons toward each other to a normal position in the brake-cylinder and the brake-shoes away from the car-wheels in readiness to be again operated by the compressed air. It will be observed that the position of the brake-shoe when thrown from the car-wheel is within a short distance of the wheel, so that its action when required is immediate. In these movements of the brake-shoes an accidental change of position of the brake-shoes L L' is prevented by the guide-lugs k' k^2 in the piston-rod k and upon the other pistons of each brake-cylinder.

In order to separate the parts of brake-cylinder, the nut-bolts are removed from the upper and lower flanges of the brake-cylinder I and the separate part i' moved in the bed H a suitable distance from the other part i, thus affording a convenient access to the pistons

of the brake-cylinder for the purposes of repairs.

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

1. In a car-truck the combination with the car wheels and axles of truss-bars on opposite sides of said truck connected with the car-axles, transverse bed-plates connected with said truss-bars, brake-cylinders on said bed-plates, between the opposing car-wheels each brake-cylinder having separate pistons and piston-rods and a spring between each piston and the head of said brake-cylinder, brake-shoes on the outer ends of said piston-rods adapted to contact with the respective car-wheels, a compressed-air storage-tank and an air-compressor, and a motor connected with and actuating said air-compressor separate air-conducting pipes connected with said storage-tank one of which pipes leads to and is connected with said air-compressor and the other with one end of a brake-controlling two-way valve or cock an air-exhaust pipe connected with the other end of said two-way cock an air-exhaust valve in said exhaust-pipe and a separate pipe connected with said exhaust-pipe between the brake-controlling and exhaust valves at one end and with the brake-cylinder at the other end at a point between the opposing pistons as and for the purpose described.

2. In a car-truck, the combination with the truss-bars, upon both sides of said truck, having a downwardly-extended portion, of a bed-plate extending between the opposing car-wheels of said truck, and connected with the lower edges of the respective downwardly-extended portions of said truss-bars, and a brake-cylinder mounted upon said bed-plate, having separate detachably-connected parts, one of said parts being detachably secured to one of said truss-bars, and the other part adapted to be moved upon said bed-plate, for the purpose described.

3. The combination with an engine and its tender and a car connected with the tender, of a car-truck having car-wheels, truss-bars upon each side of the truck, a brake-cylinder interposed between the car-wheels in line with each other and connected with one of the truss-bars, said brake-cylinder having separate pistons and piston-rods, and the inner side portion of said cylinder extending in the direction of the cylinder-heads in separate downwardly-inclined planes and at opposite angles to each other, and brake-shoes upon the outer ends of said piston-rods, a compressed-air storage-tank upon said tender and separate conductors of compressed air, one of which conductors is connected at one end with said storage-tank and the other end extended within said engine and provided with a brake-operating valve, an exhaust-pipe connected with and extending from said brake-valve at one end, an exhaust-valve in said exhaust-pipe an air-compressor upon the engine and a motor, and a conductor of compressed air connected with said compressor and also with said compressed-air storage-tank and a conductor of compressed air connected at one end with said brake-cylinder at a point between the opposing pistons, and the other end with the said exhaust-pipe at a point between the brake-operating and exhaust valves for the purpose described.

EDWIN C. NICHOLS.

Witnesses:
E. E. CARPENTER,
J. K. HUDSON.