(No Model.) 3 Sheets—Sheet 1.

S. P. HOLLINGSWORTH.

CAR BRAKE.

No. 474,958. Patented May 17, 1892.

Fig. 1.

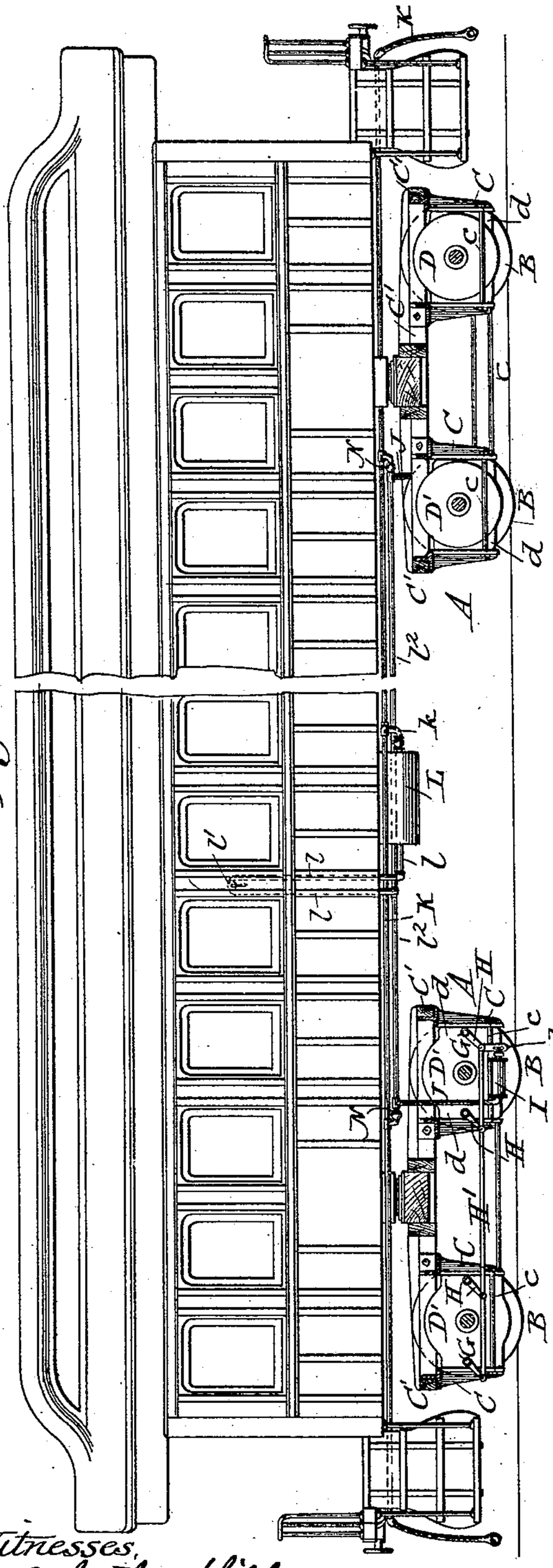
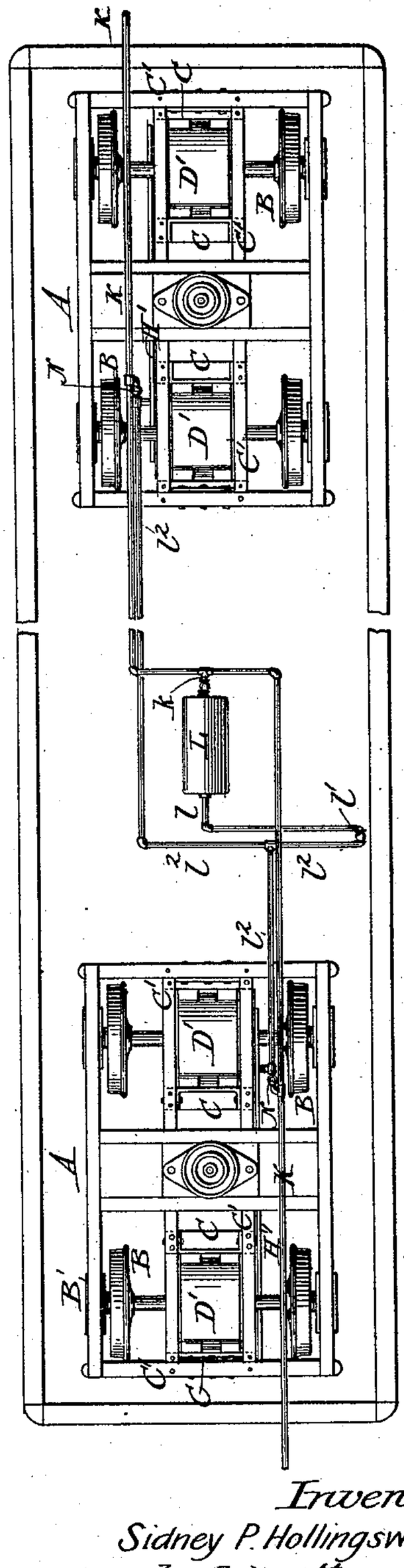


Fig. 2.



Witnesses,
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Chas. F. Lemmer.

Inventor,
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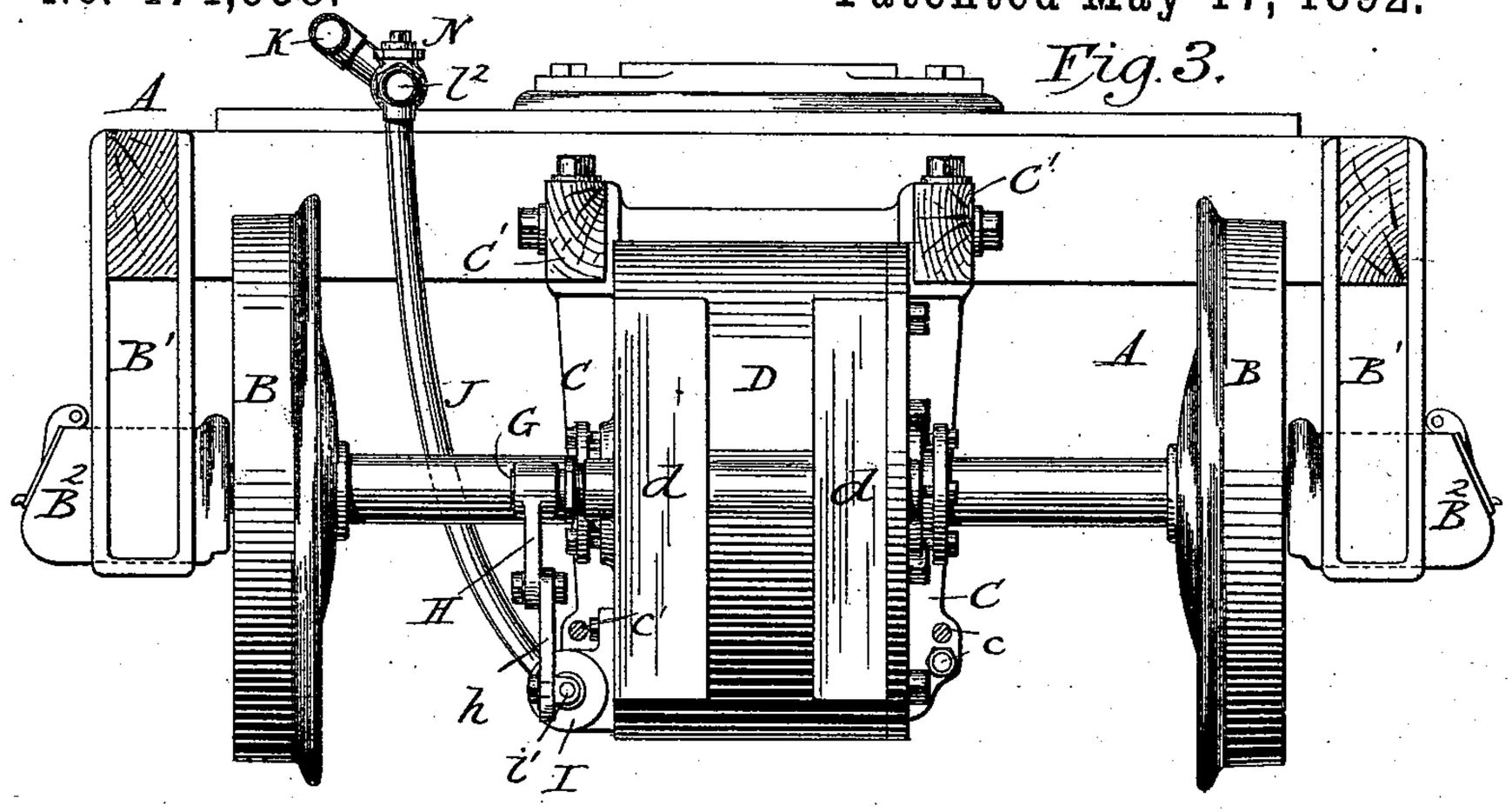
Fig. 3.



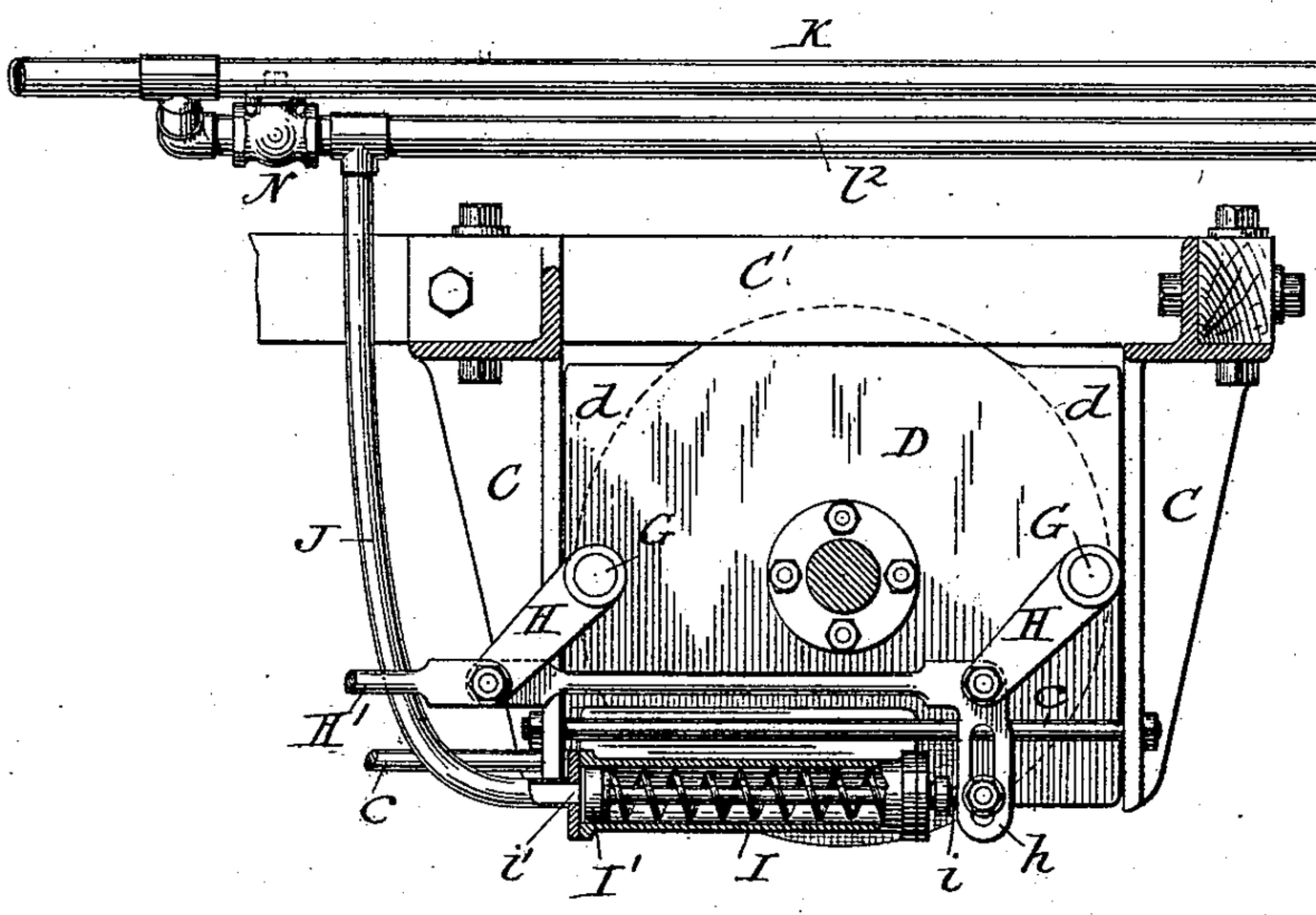


Fig. 4.

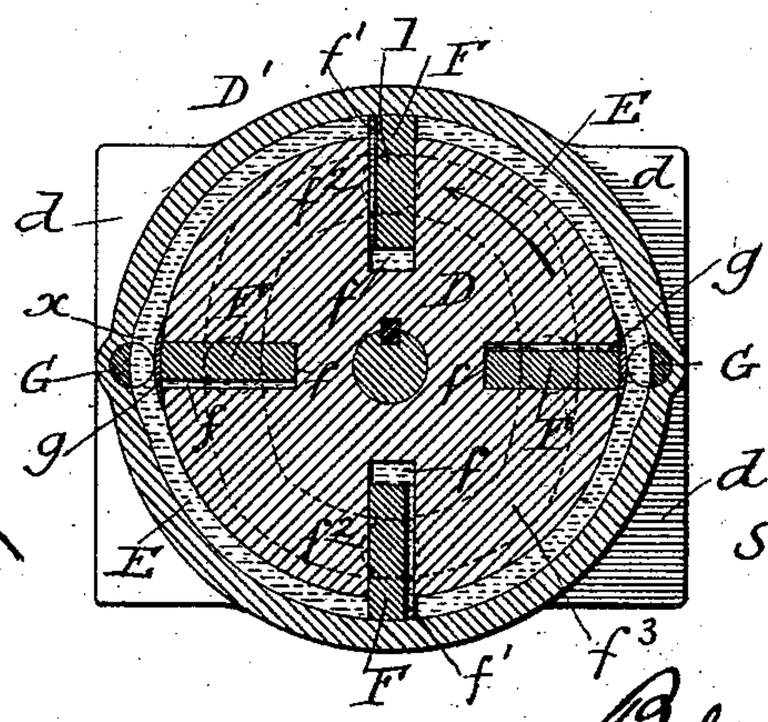


Fig. 5.

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CAR BRAKE.

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Fig. 6

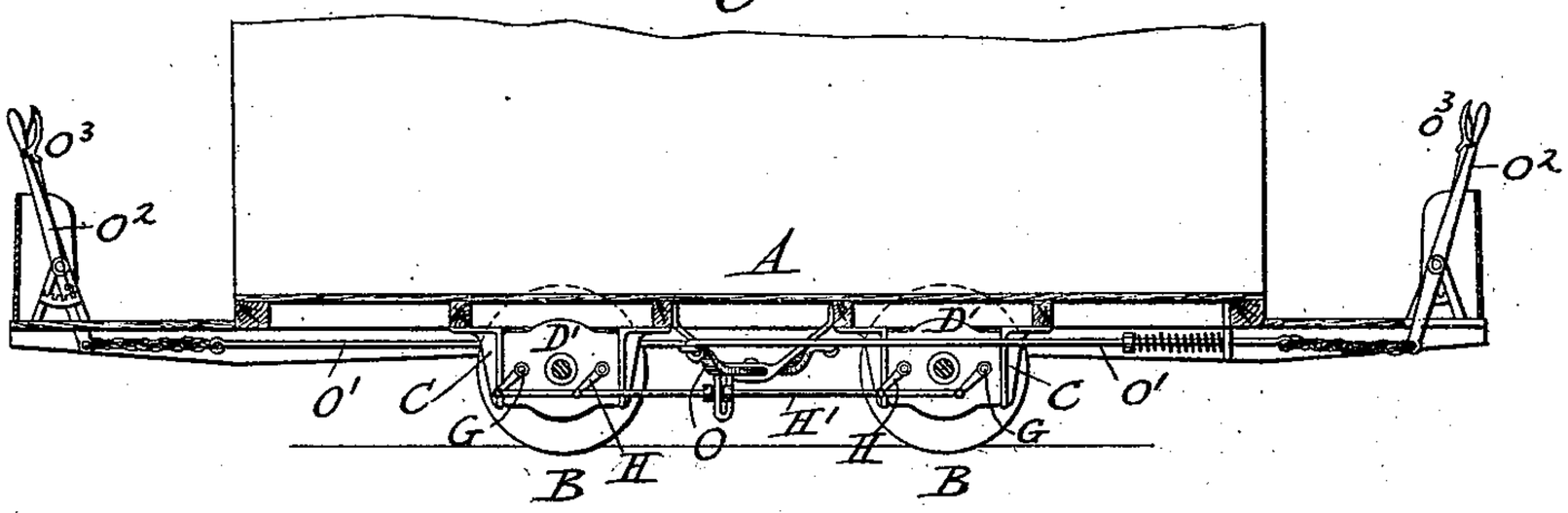


Fig. 7.

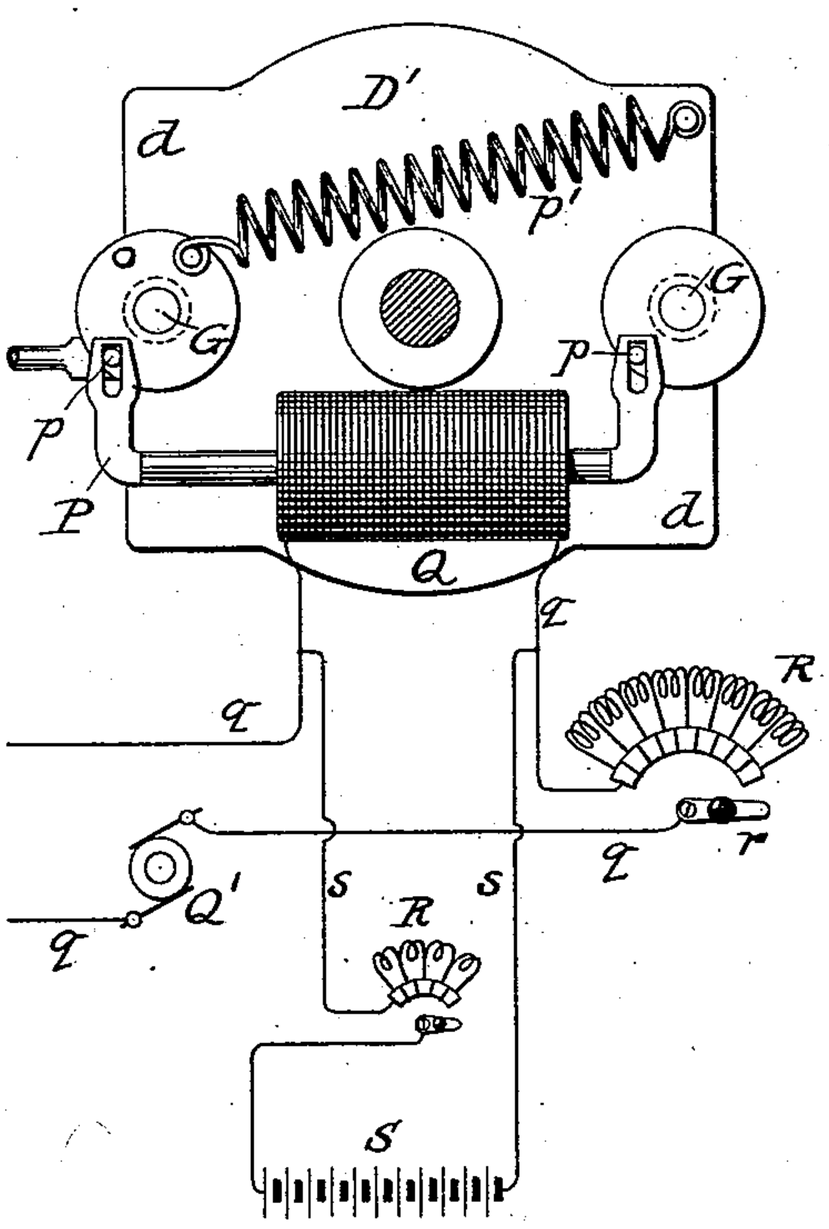


Fig. 8.

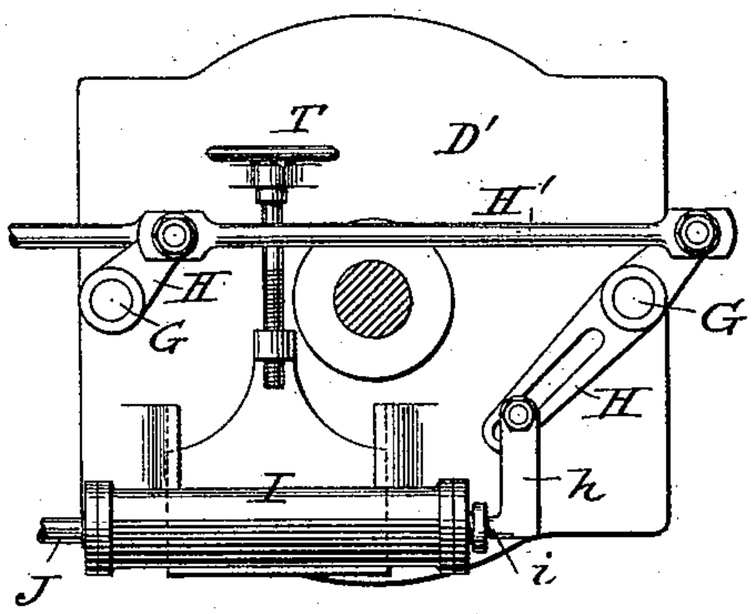
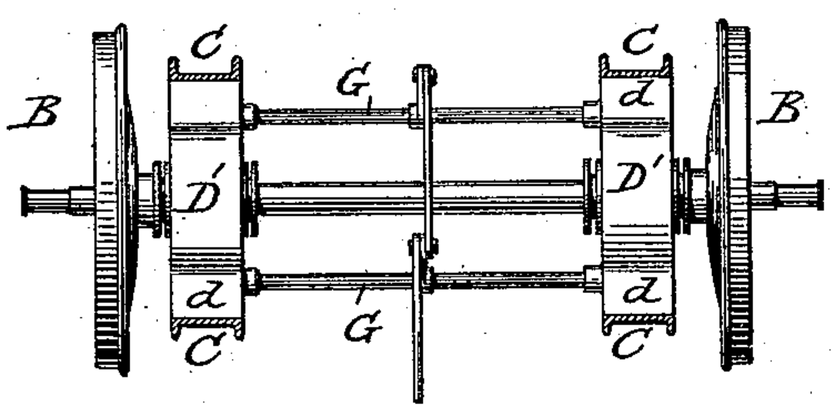


Fig. 9.



Witnesses.
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Chas. F. Sumner.

Inventor
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UNITED STATES PATENT OFFICE.

SIDNEY P. HOLLINGSWORTH, OF WASHINGTON, DISTRICT OF COLUMBIA.

CAR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 474,958, dated May 17, 1892.

Application filed February 1, 1892. Serial No. 419,935. (No model.)

To all whom it may concern:

Be it known that I, SIDNEY P. HOLLINGSWORTH, a citizen of the United States, residing in the city of Washington, District of Columbia, have invented certain new and useful Improvements in Brakes, of which the following is a specification.

The object of my invention is to provide improved brake mechanism that may be readily operated to stop the rotation of the wheels of street-cars or trains of railway-cars, either gradually or suddenly, as occasion may require.

Previous to my invention brakes have almost universally been applied directly to the wheels, and these brakes have been operated either by lever connections or by steam, gas, or air pressure.

According to my invention I stop the rotation of the wheels by means of an improved brake the operation of which involves the use of a liquid to connect two brake members, the flow or movement of the liquid being controlled by valve mechanism regulated or operated by any suitable means. The operation of the valve mechanism is comparatively easy and may be conveniently effected by the use of compressed air, electro-magnetic devices, lever mechanism, and the like, requiring for their control or actuation but a small expenditure of power.

In the accompanying drawings, illustrating my invention, Figure 1 is a side elevation of a standard railway-car embodying my invention with the trucks in section. Fig. 2 is a plan view of the trucks with the pneumatic valve-operating mechanism in diagram. Fig. 3 is an end view, on an enlarged scale, of a truck with the truck-frame in section. Fig. 4 is a detail view, partly in section, showing particularly the pneumatic valve-operating mechanism and its connections. Fig. 5 is a detail view in section of the brake members with their fluid connection. Fig. 6 is a diagram view of a street-car embodying my invention, showing as a modification lever mechanism for operating the valves. Fig. 7 is a diagram view illustrating electro-magnetic devices for operating the valves. Fig. 8 is a detail view of mechanism for adjusting the connection between the valves and their operating mechanism. Fig. 9 illustrates a modification in which two brakes are applied to a single axle.

In Figs. 1 to 4, inclusive, I have shown my improvements applied to a standard railway-car. The trucks A are in general outline of usual well-known construction, suitably modified to provide means for supporting my improved brake mechanism. The wheels B are arranged within the pedestals B′, as usual, and the axle-boxes B^2 are free to move vertically within the jaws of the pedestals. Brackets C are secured to beams C′, forming part of the frame, and extend downwardly therefrom on opposite sides of each axle at a suitable distance apart to accommodate the brake mechanism. At their lower ends the brackets may be tied together and braced by bolts *c*.

I have shown brake mechanism applied to each of the four axles of the car. The brakes are all alike and a description of one of them will be sufficient. The brake consists of two principal parts—an inner or rotary part D and an outer non-rotary or stationary part D′. The stationary member D′ forms a casing for the rotary member and is provided with projections *d* to afford straight vertical edges adapted to fit loosely between the brackets C. The inner member D is cylindrical in form, its diameter being somewhat smaller than the interior diameter of the outer member, a chamber E being thus formed between the two members, which is filled with a liquid, such as oil. The brake member D is formed with one or more (four being shown) radially-disposed recesses *f*, in which are arranged radially-sliding blocks F. The blocks may be fluted, as shown at *f*′, so that the liquid may pass into the spaces behind the valves, as indicated. The purpose of this arrangement is to balance the pressure on the blocks, as when the liquid is under compression it would be difficult to force the blocks outwardly against the full force of the liquid; but by allowing the liquid to press at the inner ends of the blocks they may readily be operated. The blocks are provided with friction-rollers f^2, which work in cam-grooves f^3 on opposite sides of the casing or outer member D′. The cam-grooves are so shaped as to move the blocks in and out at the proper times. The member D being rigidly secured to the axle, it is obvious that as the axle rotates the mem-

ber D will rotate and the liquid will be carried around by the radial blocks and the rotation will not in any way be impeded; but if means are provided for impeding the rotation of the liquid the rotation of the axle will be correspondingly impeded, and if the flow of the liquid is entirely stopped the two members of the brake will be firmly secured together and the rotation of the axle stopped. I accordingly provide one or more valves G (two being shown) to regulate and control the flow or movement of the liquid. The valves, as shown, are rotary or turning valves, semi-cylindrical in cross-section. It being remembered that the member D′ of the brake is stationary, it is obvious that if the valves be given a quarter-turn from the position shown in Fig. 5 they will be closed and the liquid cannot rotate with the inner brake member—that is to say, suppose the axle is rotated in the direction indicated by the arrow, the block marked "1" would press against the liquid and force it against the valve G at *x*. The liquid, being practically non-compressible and having no escape, would form a firm and rigid connection between the inner and outer members of the brake, and therefore the rotation of the axle would be stopped. The other blocks operate in a similar manner.

Opposite each valve G, I provide a shield or guide *g*, against which the valves may work and with the inner sides of which the blocks F engage when they pass the valves. If instead of completely closing the valves they be partially closed, the two members of the brake will not be locked together, but the flow of the liquid will be impeded, so that the speed of rotation will be reduced. If, for instance, the valves are one-half open, the blocks F will push the liquid forward; but as the liquid meets a resistance in the valves G and as the opening is comparatively small the flow of the liquid is impeded, and consequently the speed of rotation reduced. It will thus be seen that the brake may be applied gradually by gradually closing the valves, which is an important feature in brake mechanism. The liquid is confined between the two brake members. There is no outlet for it, and the joints of the casing, axle, &c., should be carefully packed.

It will be observed that the axle has a free vertical movement, as is usual, and the brake mechanism may move vertically with it, as the brake member D′ is not bolted to the brackets C, but is simply confined between them, being thereby held against a rotary movement, which is all that is necessary.

In Figs. 1 to 4 of the drawings I have shown pneumatic valve-operating mechanism. I will describe the apparatus specifically as illustrated, it being understood, however, that the details of construction may be varied and a greater or less number of valves employed than that shown. Each brake is shown as provided with two valves, and each valve has a crank-arm H. The two sets of valves on each side of each truck are connected by a rod H′, so that the valves may all be moved simultaneously. Each rod H′ is provided with a slotted arm *h*, which has a sliding connection with the end of a piston *i* of an air-cylinder I. The cylinder contains a spring-actuated piston I′ and has at its rear end a port *i′*, connecting with an air-pipe J. The construction is such that normally the spring holds the valves fully open, so that the axle and the inner member of the brake may freely revolve; but should air or other suitable fluid be admitted through the pipe J the piston will be forced inwardly against the force of the spring, and thus move the valves to a degree corresponding with the pressure of air admitted to the cylinder.

As I before stated, it is always desirable to apply the brakes gradually, and so air should at first be admitted gradually, but after a sufficient time has elapsed the full pressure of air may be allowed to enter the cylinder and the valves completely or nearly closed, so as to prevent the rotation of the inner brake member. All the brakes on a train of cars may be readily operated from the engine by means of compressed air passing through suitable pipes or conduits.

In the system I have shown K indicates the main pipe, which connects the engine with all the brakes. Each set of brakes is connected with the main pipe by the branch pipe J, and there may be located in the system of pipes suitable check-valves and relief-valves, as may be found necessary. I provide means whereby the brakes on each car may be operated independently of the general brake-operating mechanism.

It sometimes occurs that a car becomes detached from the train, and so I provide on each car an air-reservoir L, which is connected with the main pipe K by a branch pipe *k*, which should contain a check-valve. The reservoir has a pipe *l* leading up into the car, as indicated in Fig. 1, and provided with a valve *l′*. The pipe *l* continues from the valve and joins with pipes l^2, which lead to the branch pipes J, connecting with the air-cylinders. Check-valves N are interposed between the pipes l^2 and the pipes K.

The reservoir is charged by means of the pipe K, back-pressure being prevented by the check-valve in the branch pipe *k*, and the outlet on the opposite side of the cylinder being closed by the valve *l′*, so that the brakes on the whole train may be operated from the engine without bringing the reservoirs into operation; but should a car be detached from the train by operating the valve *l′* compressed air may be passed from the reservoir through the pipes to the cylinders I to operate the valves. Flexible connections for the pipes K, of well-known construction, may be provided between the several cars.

In Fig. 6 I have shown mechanical devices for operating the valves. The several valves are connected together in the manner before

described, and the rod H′ is suitably connected with a lever O, operated by rods O′, connected with levers O^2, having detent mechanism O^3. Cranks or other well-known operating mechanism may be readily substituted for the levers. It is obvious that only a slight expenditure of manual power need be exerted to operate the valves and that the brake mechanism is sufficiently powerful to stop the vehicle either gradually or suddenly, as occasion may require.

In Fig. 7 I have shown, diagrammatically, electro-magnetic devices for operating the valves. The valves are provided with pins *p*, extending into the slotted ends of a connecting-rod P. One of the valves is provided with a spring *p′*, which operates to normally hold both valves fully open. The rod P extends through a solenoid Q and forms the armature or core thereof. The solenoid is electrically connected by wires *q* with a generator Q′, and in the circuit is included an adjustable resistance R. By means of the hand-lever *r* the strength of the current traversing the solenoid Q may be regulated to move the core P to the desired extent, and thus open the valves more or less, as may be needed.

The resistance R, with its hand-lever *r*, may be located at any part of the train, as on the engine, so as to control the circuit for the entire train for all the valves. In order that the brake mechanism on each car may be operated independently, I provide a branch circuit the wires *s* of which are connected with a battery S, and the circuit includes an adjustable resistance R. By this arrangement it will be seen that practically no manual power need be expended in controlling the brakes.

It is well known that difficulty has been experienced in properly applying brakes simultaneously to a train of cars. Some cars are loaded more heavily than others and the momentum of the heavily-loaded cars is correspondingly greater than the others. The lighter cars could be stopped much sooner than the heavier ones, and consequently it is desirable that the brakes on the lighter cars shall not be applied so suddenly as those on the heavy cars. I have provided means in my system of brakes for accomplishing this result. One way in which it may be done is illustrated in Fig. 8. As there shown the air-cylinder I is adjustable by means of an adjusting-screw T, and as the connection between the valves and the piston of the air-cylinder is adjustable it is obvious that if the air-cylinder is raised or lowered the leverage is correspondingly varied, so that the brake-valves on the several cars may be made to operate at different times and to different extents, as may be desired. Of course the mechanism should be adjusted on each car to correspond with the load, and after once adjusted all the brakes will operate in the desired manner to stop the train without tending to stop one car sooner than another. Each axle may be provided with a single brake located midway between the wheels; or it may be provided with two brakes located close to the wheels, as shown in Fig. 9.

I claim as my invention—

1. A brake comprising a member connected to rotate with an axle, a stationary or non-rotary member, a liquid interposed between the two members of the brake, and means for controlling the flow or movement of the liquid.

2. A brake comprising a member adapted to rotate with the wheels and axle, a stationary or non-rotary member, a liquid confined between the two brake members, means carried by the rotary brake member to move the liquid, and valve mechanism for impeding the flow or movement of the liquid.

3. A brake comprising a member adapted to rotate with the wheels and axle, a stationary or non-rotary member, a liquid interposed between the two brake members, radially-moving blocks carried by the inner brake member and adapted to move the liquid relatively to the stationary brake member, and valves for impeding the movement of the liquid.

4. A brake comprising a member adapted to rotate with the wheels and axle and a stationary or non-rotary member, brackets for preventing the rotation of the stationary brake member, but in which the brake members are free to move vertically, means carried by the rotary brake member for moving a liquid interposed between the two brake members, and valves for impeding or controlling the movement of the liquid.

5. A brake comprising a member adapted to move with the wheels and axle, a stationary or non-rotary member inclosing the rotary member, a liquid confined between the two brake members, radially-sliding blocks, means for operating them, valves for controlling the movement of the liquid, and means for operating the valves.

6. A brake comprising a member adapted to move with the wheels and axle, a stationary or non-rotary member, a liquid confined between the two members of the brake, means for moving the liquid relatively to the stationary brake member, a normally-open valve for impeding the movement of the liquid, an air-cylinder having its piston connected with the valve, and a compressed-air pipe connected with the cylinder.

7. A brake comprising a member adapted to move with the wheels and axle, a stationary or non-rotary member, a liquid confined between the two members of the brake, means for moving the liquid relatively to the stationary brake member, a normally-open valve for impeding the movement of the liquid, an air-cylinder having its piston operatively connected with the valve, a compressed-air pipe connecting the cylinder with the engine of a train, and a pipe connecting the cylinder with a reservoir on the car to which the brake is applied.

8. The combination of a series of brakes, each comprising two members connected and disconnected by a liquid and a series of air-cylinders, an air-pipe leading to the engine, to which all the cylinders are connected, a reservoir on each car of a train of cars, and connections between the reservoir and the air-cylinders of each set of brakes on said car.

9. The combination, in a train of cars, of a series of brakes, each comprising a member connected to rotate with an axle and a stationary or non-rotary member, a liquid interposed between the two members of the brake and means for controlling the flow or movement of the liquid, simultaneously-operated fluid-pressure devices for applying the brakes to the several cars of the train, independent fluid-pressure devices for each car, and devices on each car for controlling said independent fluid-pressure devices, whereby when a car is separated from a train the brakes may be applied to the detached car.

10. A brake comprising a member connected to rotate with an axle, a stationary or non-rotary member, a liquid interposed between the two members of the brake, devices for controlling the flow or movement of the liquid, and adjusting devices whereby the brake mechanism may be applied more or less gradually.

11. A brake comprising a rotary and a stationary or non-rotary member connected and disconnected by means of an interposed liquid, valves for controlling the flow or movement of the liquid, means for operating the valves, and adjusting devices to vary the movement of the valves, so that they may be operated more or less gradually.

12. A brake comprising a member adapted to rotate with the wheels and axle, a stationary or non-rotary member, a liquid confined between the two brake members, means for moving the liquid relatively to the stationary member, valves for impeding or controlling the movement of the liquid, an air-cylinder having its piston operatively connected with the valves, and devices for adjusting the connection between the piston and the valves, for the purpose specified.

In testimony whereof I have hereunto subscribed my name.

SIDNEY P. HOLLINGSWORTH.

Witnesses:

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R. S. DONALDSON.