

(No Model.)

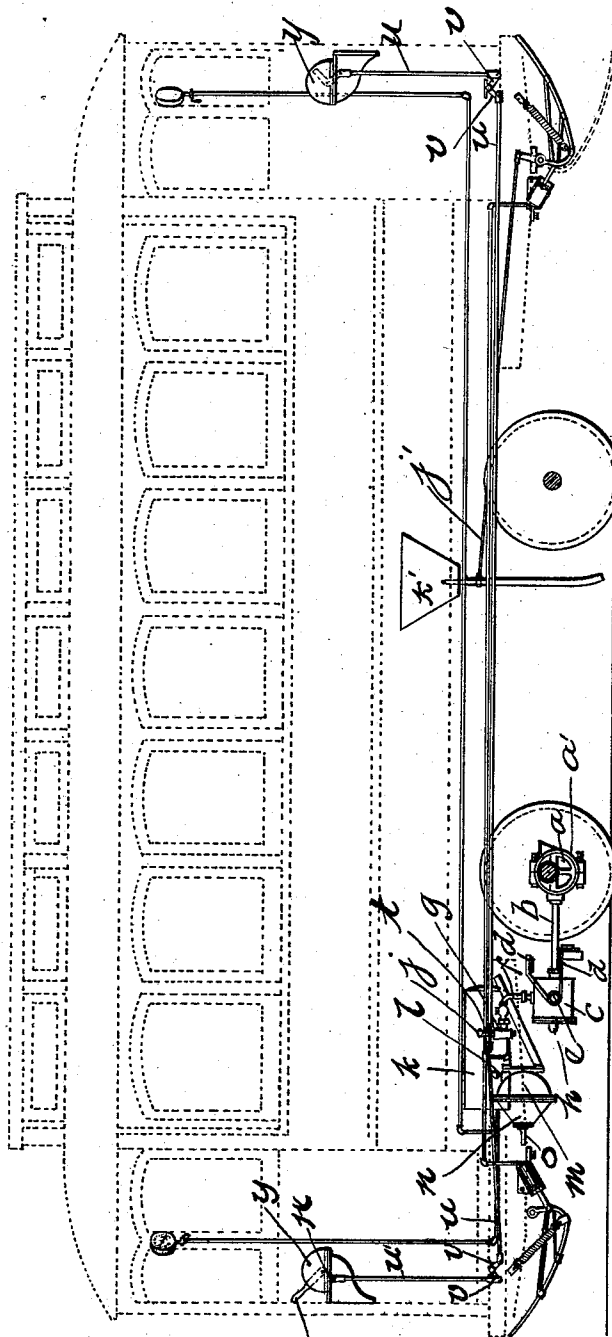
6 Sheets—Sheet 1.

A. M. GOODWIN.
VACUUM BRAKE.

No. 578,602.

Patented Mar. 9, 1897.

Fig. 1.



WITNESSES:

A. R. Appleman
A. Wilson

INVENTOR

Adam M. Goodwin

BY

Henry C. Court

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(No Model.)

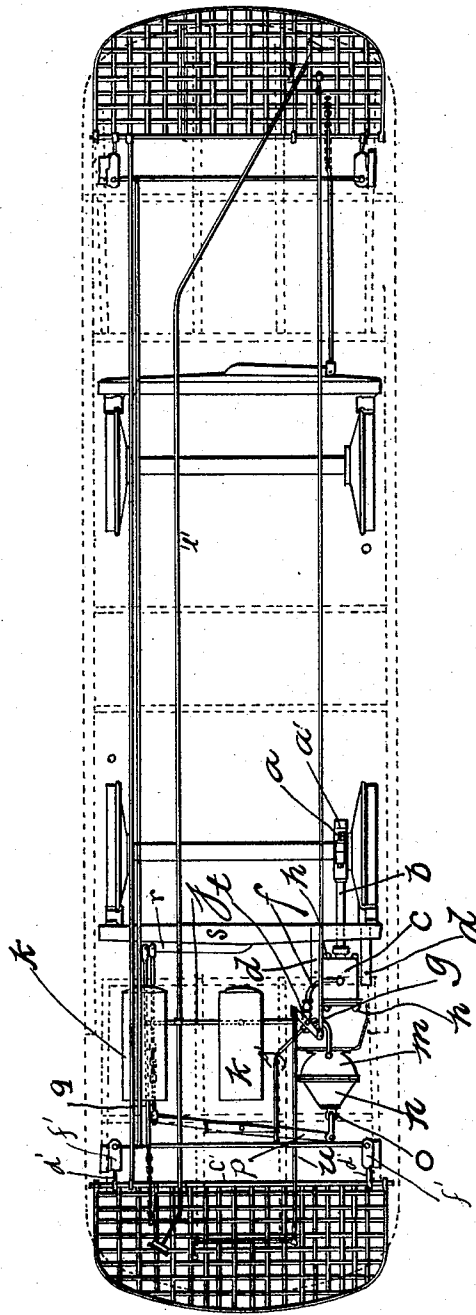
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Fig. 2.



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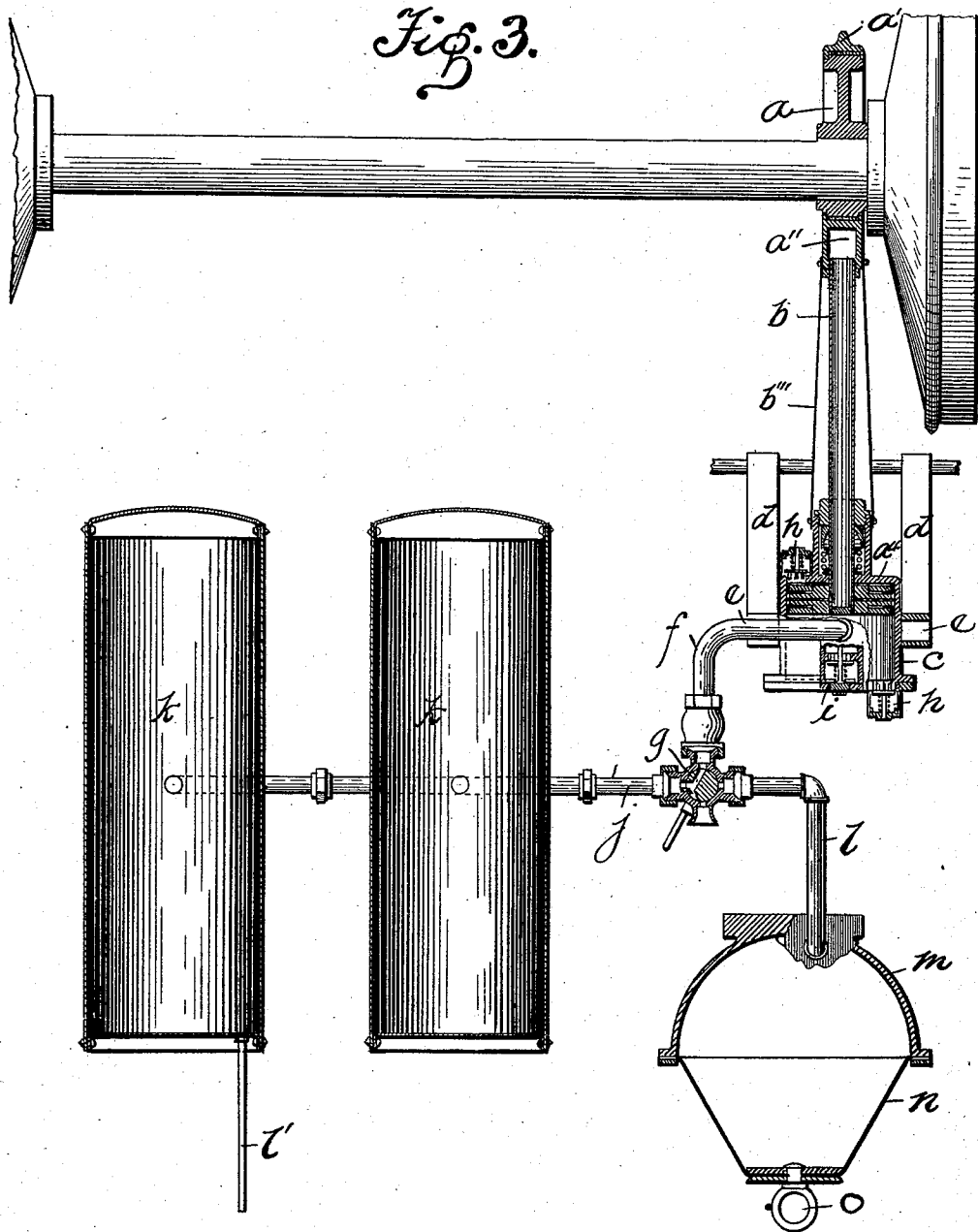
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A. M. GOODWIN.
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Patented Mar. 9, 1897.

Fig. 3.



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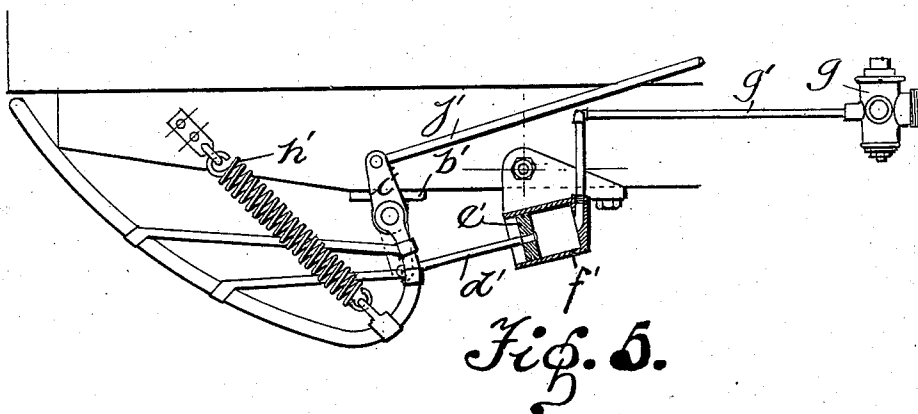
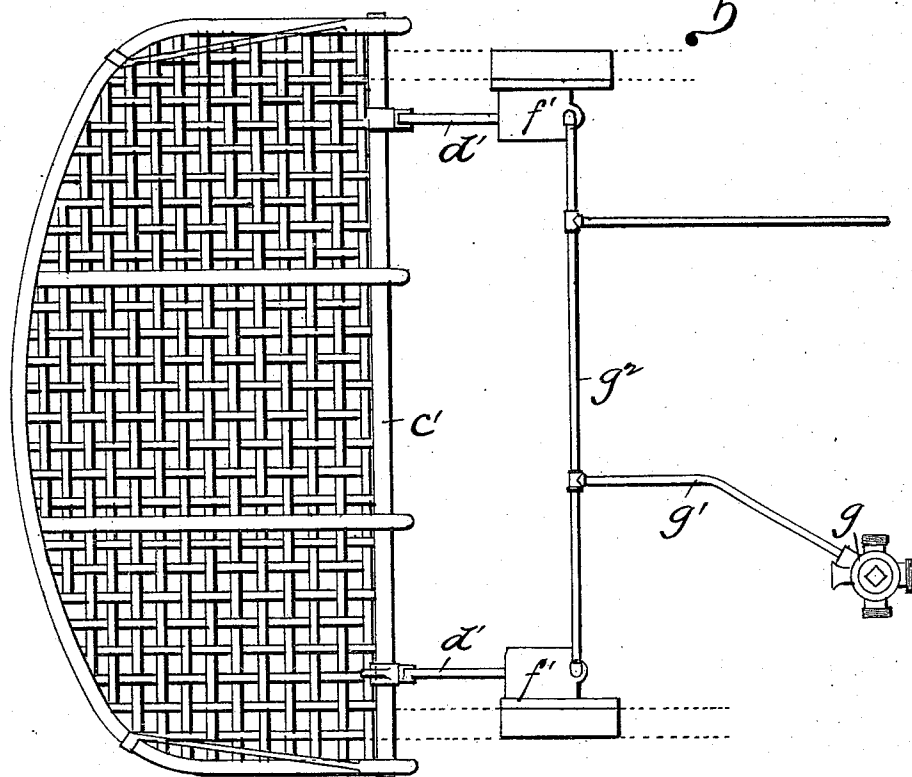
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Fig. 4.



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Fig. 7.

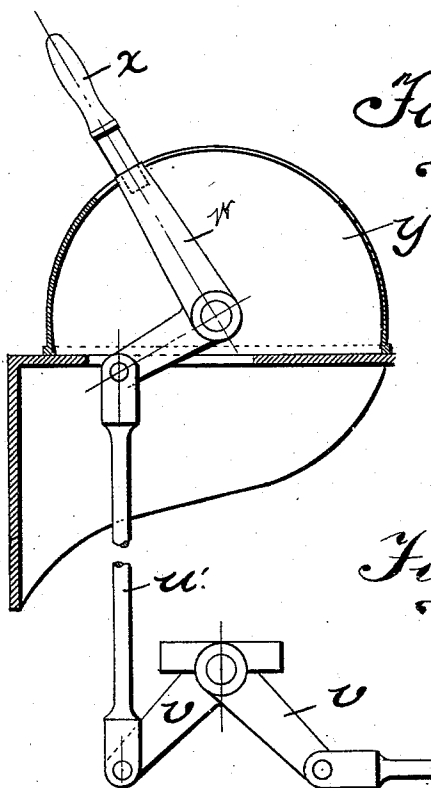
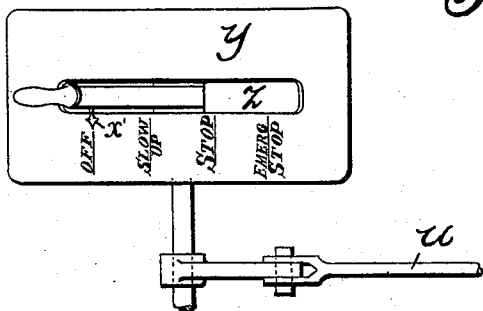


Fig. 6.

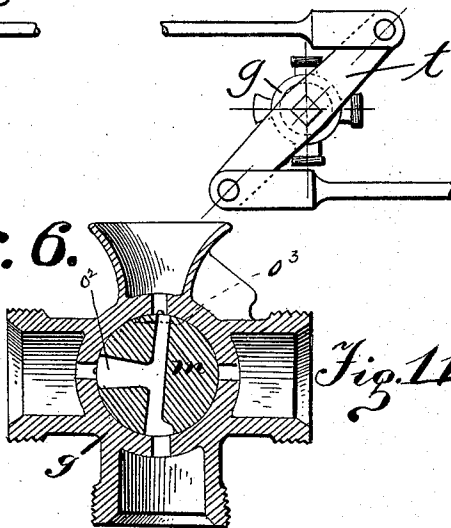
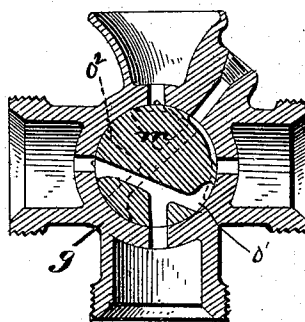


Fig. 11.

Fig. 13.



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Fig. 8.

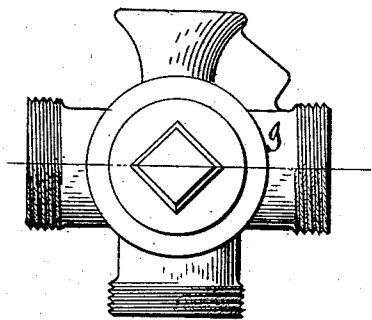


Fig. 10.

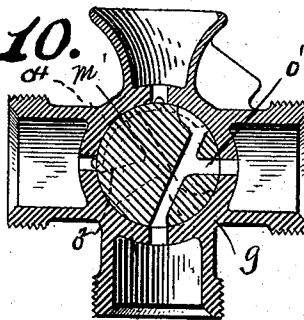


Fig. 12.

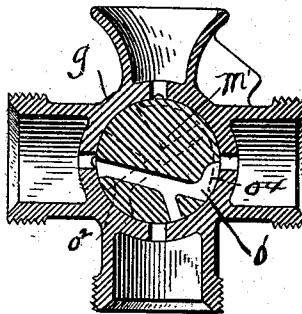
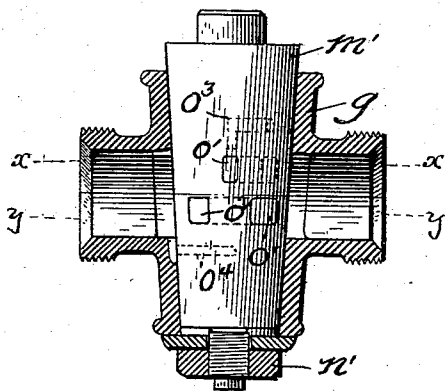


Fig. 9.



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UNITED STATES PATENT OFFICE.

ADAM M. GOODWIN, OF PITTSBURG, PENNSYLVANIA.

VACUUM-BRAKE.

SPECIFICATION forming part of Letters Patent No. 578,602, dated March 9, 1897.

Application filed January 27, 1896. Serial No. 577,001. (No model.)

To all whom it may concern:

Be it known that I, ADAM M. GOODWIN, a citizen of the United States of America, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Vacuum-Brakes, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to certain new and useful improvements in brakes, and relates particularly to that class known as "vacuum-brakes."

15 The invention has for its object the construction of a brake of the above-described class that can be easily controlled, so as to gradually lessen the speed of the car or stop the same within a few feet, if so desired.

20 A further object of the invention is to construct a vacuum-brake having three distinct actions, the first of which will apply the brake-shoes to the wheels at any desired tension that will not immediately stop the car, but will greatly reduce the speed of the same without
25 effecting the vacuum-chambers; secondly, to allow the valve to make the connection between the vacuum-chamber and the diaphragm-chamber and apply the ordinary pressure of the brake-shoes to the wheels, causing
30 the car to be brought to a standstill, and a third action consisting of the first and second actions and the connecting of the pump directly to the diaphragm-chamber and thereby effecting an emergency stop; furthermore, in
35 connection with this latter action a simultaneous operation of the fender is effected, the same being lowered to the track and with this operation applying the sand to the rails, thus aiding to secure a sudden and effective stop
40 of the car.

45 A still further object of my invention is to construct a vacuum-brake having many advantages over the ordinary and well-known air-brakes, as in the case of the latter the resistance is greater on the action of the pump when the air-reservoir is taxed to a high degree. The opposite is the case in my improved vacuum-brake, as when the vacuum is complete there will be but very little resistance
50 and the strain on the pump will be merely nominal, thus operating the brake without

absorbing any portion of the motive power used to operate the car.

A further object of my invention is to construct a vacuum-brake possessing advantages 55 in the simplicity and cheapness of construction, strength, durability, and which can be applied to the car and operated without interfering with the ordinary brake.

60 With the above and other objects in view the invention finally consists in the novel construction, combination, and arrangement of parts to be hereinafter more specifically described, and particularly pointed out in the claims.

65 In describing the invention in detail reference is had to the accompanying drawings, forming a part of this specification, and wherein like letters of reference indicate similar parts throughout the several views, in which—

70 Figure 1 is a side elevation of my improved vacuum-brake, partly in section and showing the car in dotted lines. Fig. 2 is a top plan view of my improved brake as applied in position. Fig. 3 is a horizontal sectional view 75 of my improved vacuum-brake. Fig. 4 is a top plan view of the fender, showing connection with the vacuum-chambers. Fig. 5 is a side elevation of the same. Fig. 6 is a side elevation of the operating-lever and valve-rods, showing casing in section. Fig. 7 is a top plan view of the casing, operating-lever, valve-rod, and valve. Fig. 8 is a top plan view of the valve. Fig. 9 is a vertical sectional view of the valve. Fig. 10 is a sectional 85 view of the valve-casing and plug, taken on a line corresponding with *xx* of Fig. 9. Fig. 11 is a sectional view on a line corresponding with line *yy* of Fig. 9. Fig. 12 is similar to Fig. 10, except the plug is shown in a different position. Fig. 13 is a sectional view of 90 the casing-plug, taken slightly above the section of Fig. 10, except the boss leading to the fender-cylinder, which is shown in section.

95 In the drawings, *a* represents the eccentric, and *a'* the strap secured to the eccentric. The strap *a'* is provided with an oil-pocket *a²*, which is connected with the hollow piston-rod *b*, adapted to carry the oil to lubricate the exhaust-pump *c* through the piston *a⁴*. 100 This exhaust-pump *c* has an oscillating motion and is secured to the trucks of the car

by straps *d d* and trunnions *e e*. A flexible hose *f* is connected to the exhaust-pump *c* and to the four-way valve *g*. Outlet-valves *h h* are provided in the cylinder, and inlet-valves *i i* are also provided, as shown in Fig. 3 of the drawings.

A pipe *j* is connected to the valve *g* and to the vacuum-chambers *k k*, and also connects the two chambers together. This valve is further connected by a pipe *l* to the diaphragm-chamber *m*, which is secured to the car-body. To this diaphragm-chamber *m* is secured a rubber diaphragm *n*, which has rigidly secured in its end an eyebolt *o* for attaching to the counter-lever *p*, as is shown in Fig. 2 of the drawings. At the end of this counter-lever is attached the brake-rod *q*, which connects with the brake-lever *r*, operating the brake-beam *s*, carrying the shoes.

An operating-lever *t* is connected to the valve, one end of which is pivotally connected to the valve-rod *u*, this valve-rod being likewise connected through levers or arms *v v* to the upright valve-rod *u'*, which is also pivotally connected to the brake-lever *w*. The handle *x* of this brake-lever is detachable, so as to be moved from one end of the car to the other, as desired, or can be removed by the motorman when he leaves the car, which will prevent any one from tampering with or operating the brake.

The brake-lever *w* and upright valve-rod *u'* are provided with a casing *y*, which is curved at the top and provided with a slot *z*, through which the brake-handle *x* extends when it is placed in its position in the brake-lever. On this casing I have provided the graduation-stops designating the required throw of the brake-handle, which will be hereinafter more fully described, and a pointer *x'* on a handle is provided for the convenience of the operator.

Bracket-bearings *b' b'* are secured to the car-body and support the shaft *c'*, forming the rear portion of the fender-frame. This fender is formed in a curved shape, as shown in Figs. 1 and 5, so as to allow the same to be suspended and clear any obstructions on the track when in the suspended position and when lowered to lie close to the track. The network portion of the fender may be composed of wire-netting, iron strips, or any other material that may be found suitable or desirable. To this shaft *c'* are secured piston-rods *d' d'*, carrying on their other ends a piston-head *e'*, which operates in a cylinder *f'*, secured to the car-body. These cylinders are connected to the main-valve casing *g* by a connecting-pipe *g'*, the two cylinders being connected together by means of a horizontal pipe *g''*.

Springs *h' h'* are connected near the base of the fender and to the car-body, which serve to retain the fender in its normal position, and at the ends of the shaft *c'* are secured levers *i' i'*, which are pivotally connected to

a rod *j'*, leading to the sand-box *k'* and operating the valve of the same when the fender is dropped. The vacuum-gage *k''* is connected to the vacuum-chambers by means of a small gage-pipe *l'*, as is fully shown in Fig. 1 of the drawings.

The plug-valve is a special four-way valve constructed with a tapered part *m'*, which is secured in the valve-body by a nut *n'*. The tapered part *m'* is provided with ports *o' o''*, which connect with the ports in the body or shell of the valve according to the way the same may be operated, as will be hereinafter more fully described.

The operation of my improved vacuum-brake is as follows: The revolving of the car-axle rotates the eccentric *a* and the strap *a'*, imparting a reciprocating motion to the piston-rod *b*, driving the piston *a''*, and pumping the air through the flexible connection *f*, the valve *g*, and the pipe *j* from the vacuum-chambers *k*. From this it passes to the inlet-valves *i*, and from thence into the exhaust-pump *c*, and is expelled through the outlet-valves *h h* into the open air. To apply the brake, the handle *x* is moved to any desired point, as shown on the casing *y*, lifting the vertical rod *u'*, which will rotate the cranks *v v* and operate the valve-rod in the horizontal direction, which in turn operates the valve-lever *t*, secured to the tapered plug *m'* in the valve *g*, and bringing the port-holes in the tapered plug *m'* in communication with the ports in the valve-body *g*, thus exhausting the air in the diaphragm-chamber into the chambers. This operation will cause the eyebolt *o* to recede into the diaphragm-casing *m* and pull on the brake counter-lever *p*, which in turn pulls on the brake-rod *q*, operating the brake-lever *r*, attached to the brake-beam *s*, thus forcing the brake-shoes against the wheels.

The foregoing description has been for the general application of the brake, and when the brake is off the brake-handle will be in the position shown in Fig. 7 and marked "Off" and the tapered part *m'* in the valve *g* will be in the position shown in Fig. 10, the passage *o'* connecting the parts leading to the vacuum tank and pump and allowing the air to be pumped from the vacuum-chambers into the open air, as described.

Presuming that it is desired to apply the brake sufficiently to slacken the speed of the car or to retard the same on a downgrade, the handle is moved to the position marked "Slow up" on the casing, (shown in Fig. 7,) thus operating the valve-rods and bringing the tapered plug of the valve into the position shown in Fig. 11, making communications through the passage *o''* with the pump and open air and diaphragm chamber. By gradually closing the open-air port a vacuum is created in the diaphragm-chamber and the vacuum-chambers will be simultaneously closed.

In applying the brake for the regular stop the handle is moved to the position marked "Stop" in Fig. 7, which operates the valve-rods, as heretofore described, and brings the tapered part m' of the valve in the position shown in Fig. 12, closing the open-air and pump ports and making communication with the vacuum-chamber and diaphragm-ports, thus allowing the air to rush into the vacuum-chambers and thereby collapsing the diaphragm-chamber, which will operate the brake-levers and apply the brake-shoes, as heretofore described.

When the emergency stop is required, which need only be used in cases where an accident is liable to happen, the handle is moved to the position marked "Emergency stop," Fig. 7, operating the valve-rods in the same manner as described and bringing the tapered plug m' into the position shown in Fig. 13, thus closing the open-air and vacuum-chamber ports and making the connection through the passage o' between the pump and the diaphragm-chamber, which has already been exhausted of air by the port of the tapered plug passing the ports, as mentioned in the "regular stop." With this operation the fender-port in the valve g is connected with the vacuum-chamber by the cut-away portion o^2 in the tapered plug, as is shown in Fig. 13, allowing the air in the cylinders f' to be exhausted through the pipes g^4 and g' and the valve-casing g and through the vacuum-chamber port into the vacuum-chambers, thereby allowing the piston e to recede into the cylinders and drawing the fender down to the track. Simultaneously with this operation the levers i' are moved forward by the action of the shaft c' in the lowering of the fender, and these levers in turn operate the rod j' , which opens the sand-valve and allows the sand to escape on the rails.

When it is desired to release the brake, the handle is returned to the position marked "Off" on the casing, which will return the tapered plug m' of the valve g to the position shown in Fig. 10, making connection from the diaphragm-chamber to the open air, thereby releasing the brakes, and from the fender-port to the open-air port, as shown by dotted lines o^4 in this view, thus filling the cylinders with air and allowing the springs $h' h'$ to return the fender to its normal position, which will operate the rod connected to the valve of the sand-box and close the same.

My improved vacuum-brake does not in any way interfere with the ordinary hand-brake of the well-known construction. In fact, they may be operated simultaneously or independently, if desired. The fender when suspended in its normal position is elevated above the rails at a height sufficient to conveniently clear any obstruction that may be found on the path of travel and is only operated as heretofore described—that is, when the emergency stop is applied the fender will be auto-

matically lowered and will then be again returned to its normal position by the releasing of the brake.

It will be noted that by the use of a single operating-handle the car may be easily controlled, the brake performing three different and distinct actions; furthermore, automatically dropping the fender to the track and applying the sand to the rails.

I wish to call particular attention to the advantage of my improved vacuum-brake over the ordinary and well-known air-brake, as in my brake, when the vacuum is complete, the resistance and strain on the pump will be merely nominal, while in the air-brake, when the air-reservoirs are taxed to a high degree, the resistance on the action of the pump is very great, as is a well-known fact to those skilled in the art.

The advantage of the brake in holding a car on a downgrade will be readily apparent, as it will permit of the car being kept under control at all times, and thus prevent many serious accidents arising from this source, as in case the motorman has lost control of the car the brake-shoes need not be applied to the wheels suddenly, as in the ordinary way, but can be applied with a gradual tension, thus reducing the speed of the car before applying the brake in full and preventing any danger of damaging the brake or car, as is the case where a sudden application of the brakes is made.

I also wish to call attention to the simplicity of construction in my improved vacuum-brake, thus insuring strength and durability of the same and making the brake comparatively inexpensive to manufacture.

The graduation-stops provided on the casing over the brake-lever will make the operation of the brake very simple, so that an inexperienced motorman may readily understand how to operate the same, which is not the case where the air-brake is used.

It will be noted that various changes may be made in the details of construction of my improved vacuum-brake and fender combined without departing from the general spirit of my invention.

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

1. In a vacuum-brake, an exhaust-pump, a four-way valve-casing having a flexible connection with the exhaust-pump, pipe connections to the diaphragm and vacuum chambers, and a fender and open-air ports, cylinder and pipe connections for operating the fender, said valve-casing having a tapered plug secured therein by a nut, and provided with ports adapted to connect with the ports of the valve-casing when the same is operated, substantially as shown and described.

2. In a vacuum-brake, a valve having a tapered plug connected to the brake-lever through the valve-rod, a cylinder and con-

nections for operating the fender, whereby the cylinder connected to the car may be filled with or emptied of air, such as described.

3. A vacuum-brake having a fender operating in conjunction therewith, said fender being of a curved shape and having piston-rods connected to the rear shaft, the other ends of said piston-rods carrying piston-heads operating in cylinders secured to the car, said cylinders being connected to the operating-valve by pipes, substantially as shown and described.

4. A vacuum-brake having a fender operating therewith when the brake is applied to its full power, said fender being operated through cylinders connected to the main valve, and carrying levers connected to a rod operating the sand-box valve, whereby the sand is applied to the rails when the fender is operated, substantially as shown and described.

5. In a vacuum-brake and fender combined, a fender secured to the car-body by a shaft suspended in brackets, said shaft carrying levers connected to a rod operating the sand-box valve, piston-rods connected to said shaft operating in cylinders, said cylinders being connected to the main valve by pipes, and springs arranged at the sides of the fender for supporting the same when not in use, substantially as shown and described.

6. In a vacuum-brake, the eccentric and strap secured to the car-axle, said strap having an oil-pocket and being connected to the hollow piston-rod, a piston-head carried by

the rod, a cylinder secured to the truck, a flexible connection between the cylinder and the valve-casing, a vacuum-chamber, a diaphragm-chamber, fender connections between the vacuum-chamber, diaphragm-chamber and fender substantially as described.

7. In a vacuum-brake and fender combined, an exhaust-pump secured to the trucks and connected to the main valve, said valve being also connected to the diaphragm and vacuum chambers, the diaphragm-chamber being connected to the counter-lever operating the brake-beam, and means whereby the brake and fender are operated, substantially as shown and described.

8. In a vacuum-brake and fender combined, a main valve connected to the brake-lever by valve-rods and cranks, and adapted to operate the fender through connecting-pipes and cylinders, substantially as shown and described.

9. The combination of a fluid-pressure brake, a controlling-valve and a car-fender controlled by said valve, as set forth.

10. The combination of a fluid-pressure brake, a controlling-valve, a car-fender, a fluid-cylinder, a piston working in the cylinder and connected with the fender and suitable communication between the cylinder and controlling-valve, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ADAM M. GOODWIN.

Witnesses:

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H. E. SEIBERT.