(No Model.) 3 Sheets—Sheet 1.

A. P. MASSEY.

ELECTRO MAGNETIC CAR BRAKE.

No. 382,766. Patented May 15, 1888.

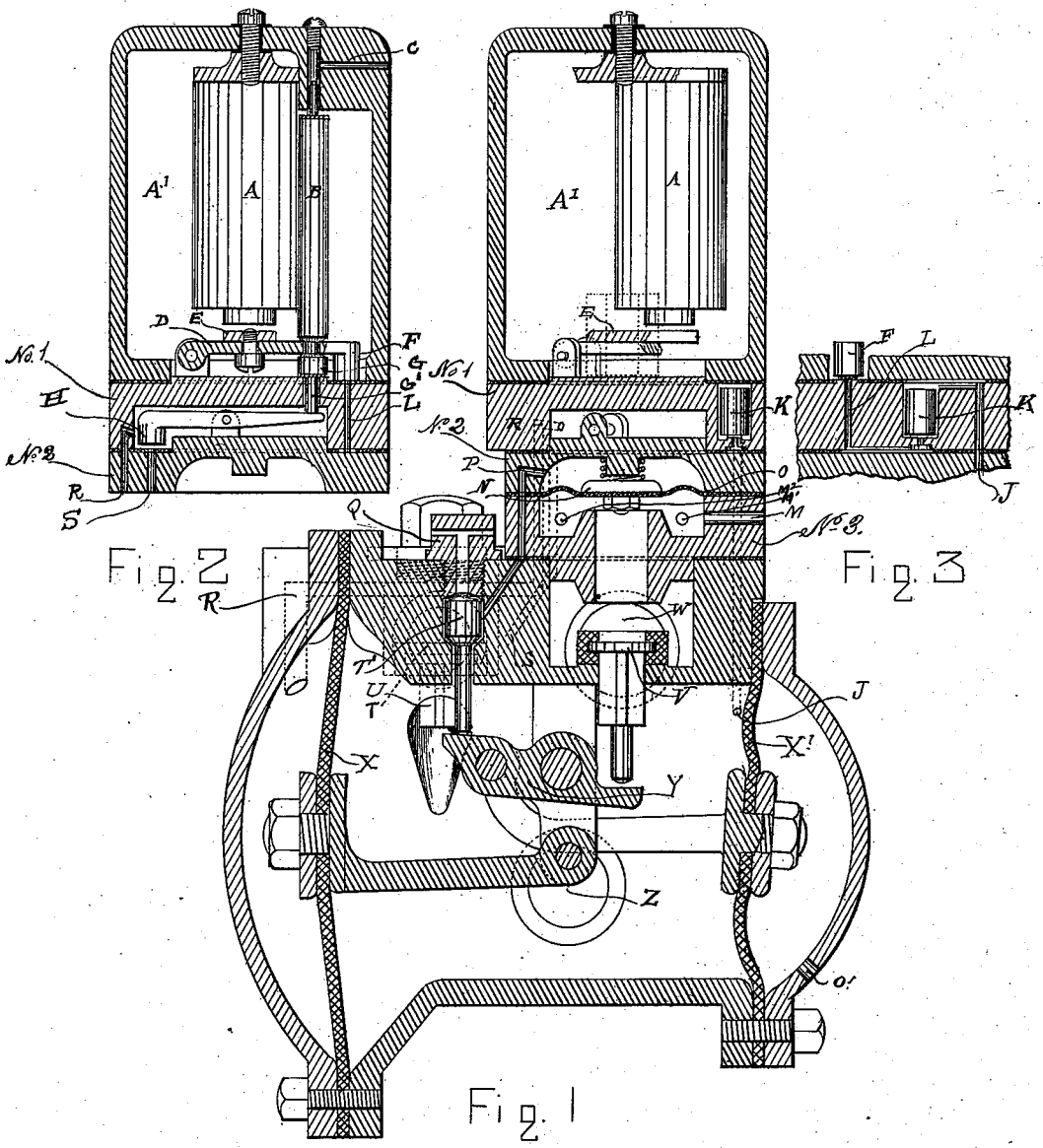

Fig. 2

Fig. 3

Fig. 1

WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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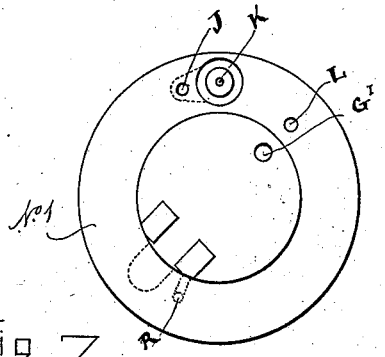

Fig 7

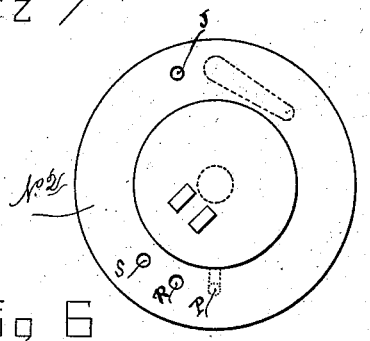

Fig 6

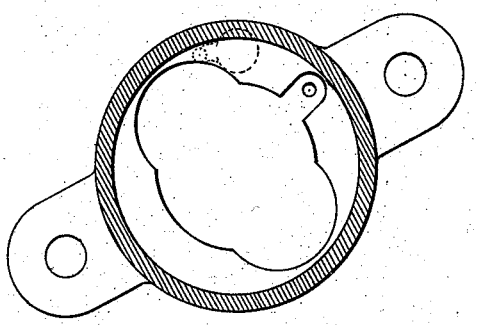

Fig 8

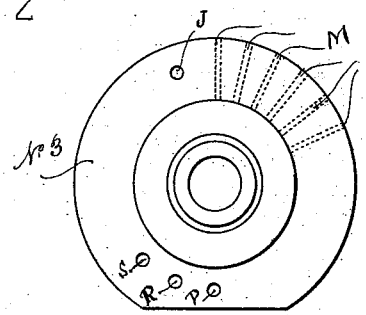

Fig 5

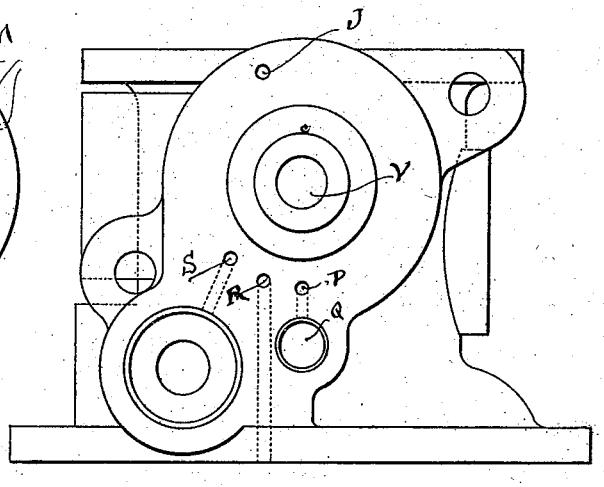

Fig. 4.

WITNESSES.

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ELECTRO MAGNETIC CAR BRAKE.

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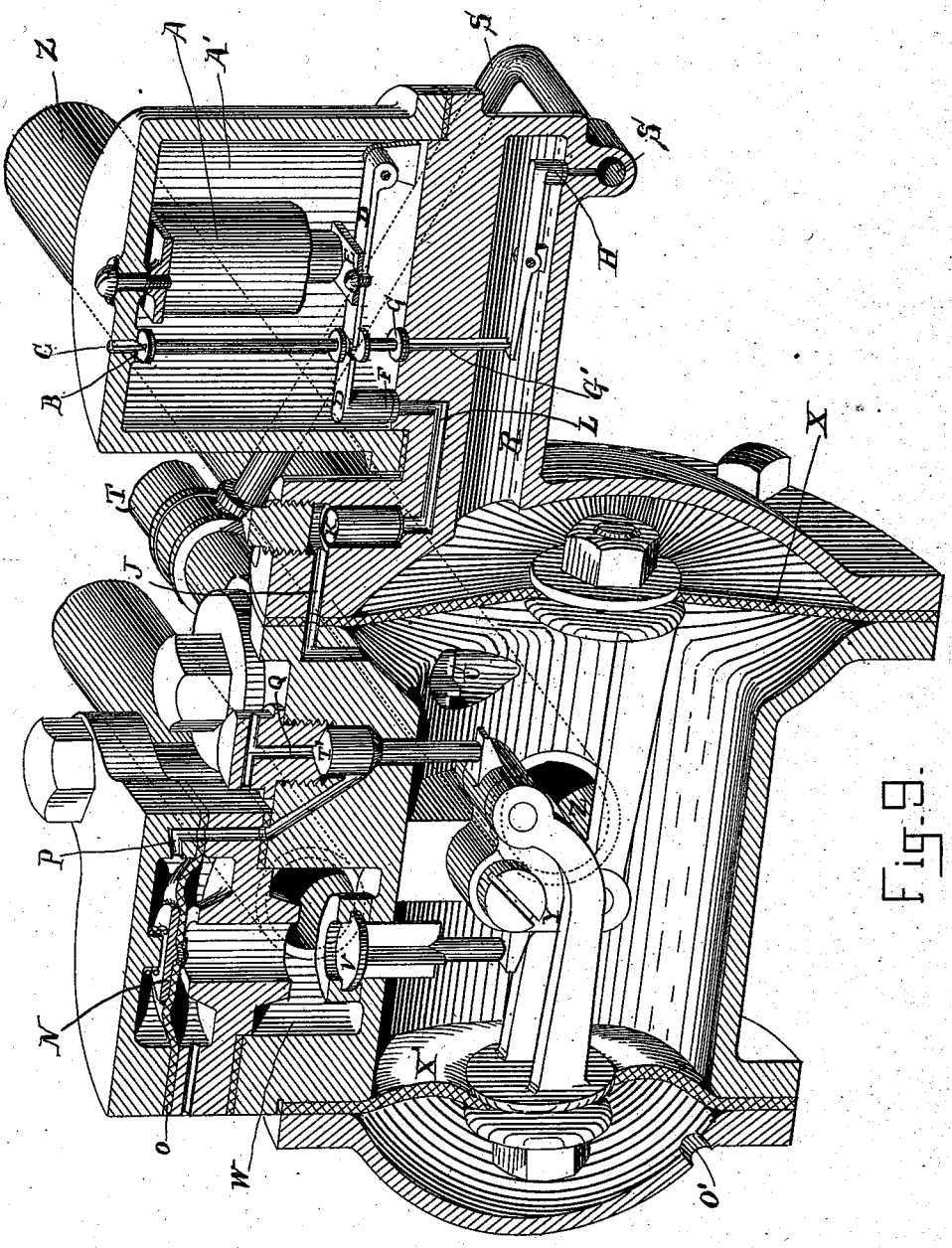

Fig. 5.

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UNITED STATES PATENT OFFICE.

ALBERT P. MASSEY, OF WATERTOWN, NEW YORK, ASSIGNOR TO THE EAMES VACUUM BRAKE COMPANY, OF SAME PLACE.

ELECTRO-MAGNETIC CAR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 382,766, dated May 15, 1888.

Application filed February 16, 1887. Serial No. 227,816. (No model.)

To all whom it may concern:

Be it known that I, ALBERT P. MASSEY, a citizen of the United States, residing in the city of Watertown, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Electro-Magnetic Car-Brakes, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to car-brakes actuated by fluid pressure to which is added an electrical device for causing the valves to act quickly and simultaneously. It is applicable to either vacuum or compressed-air systems, and does not interfere with their operation in the ordinary way except when the electro-magnets are made magnetic by a current of electricity.

Figure 1 is a sectional view of an automatic valve used in a vacuum system with my invention added. Figs. 2 and 3 are cross-sections showing different views of the same device. Figs. 4, 5, 6, 7, and 8 are plans of the various castings containing the apparatus. Fig. 9 is a modification of Fig. 1 for giving a clearer idea of the functions of the electric attachment.

The automatic vacuum-valve (shown in Figs. 1 and 9) is for the purpose of applying or releasing the brakes by means of a variation of vacuum in a train-pipe running through the train, and will cause the brakes to go on hard whenever air is admitted to the train-pipe either by rupture or at the will of the engineer. It consists of a shell connected to a reservoir on the car by means of a pipe, Z, and connected to the train-pipe T (shown by dotted lines) through the check-valve U, also to chamber W, connected with the brake-diaphragms through the valve V. The sides of the shell are formed by flexible diaphragms X and X'. The outside of the diaphragm X' is open to the atmosphere through O'. The outside of diaphragm X is inclosed by a cap connected with the train-pipe through passages R and S, the valve H, Figs. 2 and 9, being open in its natural position. The exhaust-valve N is actuated by the small diaphragm O, to which it is attached. The valve T' opens the chamber above the exhaust-valve through passage P to the vacuum in the reservoir to hold it open, and admits air through opening Q and passage P to close it. When the vacuum in the train-pipe and reservoir are equal, the diaphragm X is in equilibrium, while the diaphragm X' would be pressed inward by the atmosphere. This would hold the various parts, as shown. If air is admitted to the outside of diaphragm X, the pressure would overbalance that on the smaller diaphragm, X', and cause the bell-crank Y to revolve and open the valve V, thus applying the brake. This is now done by admitting air to the train-pipe, and requires some seconds to actuate the last valve on a train of fifty cars. Furthermore, the reservoir cannot be recharged or exhausted while the brakes are on, as an increase of vacuum in the train-pipe would release the brakes. My invention is to overcome these difficulties; and it consists in adding to the above-described mechanism a chamber with suitable valves, which will close the connection between the train-pipe and the outside of diaphragm X and admit a measured quantity of air to the outside of X when the electro-magnet is magnetized. This would cause the bell-crank Y to revolve a certain distance and apply the brakes more or less. While the space outside of X is cut off from the train-pipe, the train-pipe may continue its function of exhausting the reservoirs and maintain their maximum power indefinitely. The additional apparatus is best shown in Figs. 2 and 9, which are identical except that the passage R R, which connects the space containing valve H in Fig. 2 with the space outside diaphragm X, is shown more direct in Fig. 9. The passage S from R to the train-pipe is also shown more distinctly.

In the casting, No. 1 is a small chamber connected directly with the outside of diaphragm X through the passage R R, Figs. 1 and 9, and with the train-pipe through S, Figs. 1, 2, and 9, controlled by valve H. There is also a passage, G', to the chamber containing electro-magnet A, controlled by valve G, and a passage from the electro-magnet chamber to the atmosphere at C, controlled by valve B.

A is an electro-magnet.

E is an armature connected to the lever D, which actuates valves B, G, and H, and also the valve F, described farther on.

When used without electricity, its operation

is as follows, and is best shown by referring to Fig. 9: A vacuum is produced in the train-pipe T by means of an ejector or air-pump on the engine. Through this train-pipe the air is exhausted from the inside of the valve-case and the connected reservoir through the check-valve U. The air is also exhausted from the space outside diaphragm X through R and S as the valve H is open in its normal position. Therefore, the diaphragm has the same vacuum on both sides and is in equilibrium. When air enters the train-pipe, either through rupture or by opening the engineer's valve, it closes the check-valve U, but passes through S and R and destroys the vacuum in the space outside the diaphragm X. Diaphragm X has therefore a vacuum on the inside and air-pressure on the outside. This pressure moves it inward and causes the bell-crank Y to revolve against the valve V and push it open, whereupon the air in the brake-diaphragm, which is connected with the space W, rushes through valve V to the reservoir, and the brake is applied by the pressure of the atmosphere on the outside of the brake-diaphragm. When the bell-crank revolves away from the valve T', it (valve T') seats by gravity and admits air through Q P to the space above valve N, allowing valve N to close the space W from the atmosphere.

To release the brakes, the engineer restores the vacuum in the train-pipe, and consequently through S and R in the space outside diaphragm X, thus bringing X in equilibrium again. The atmospheric pressure on the outside of diaphragm X' causes the bell-crank to return to its normal position and lift valve T', connecting the space above valve N again with the vacuum in the reservoir, which opens the valve N and admits air to the space W and releases the brakes. This process is at present in use without electricity. My improvements are to cause the valve to perform the same functions without destroying the vacuum in the train-pipe.

With the electricity, its operation is as follows: When the train is running, the valves H and B are open, while the valve G is closed. The chamber containing valve H is therefore open to train-pipe and to outside of diaphragm X, and they all have the same vacuum. When the electro-magnet is magnetized, it lifts the armature, thus opening valve G and closes valves H and B. This allows the air in the upper chamber to flow through G to the lower chamber, and thence through R to the space outside diaphragm X, thus destroying the equilibrium of pressure on X and causing bell-crank Y to revolve and open valve V and apply the brakes. As the bell-crank Y revolves away from the valve T', the valve drops and opens the space above the exhaust-valve N to the atmosphere through the passage P and Q, whereupon the exhaust-valve is closed by the spring above it. While the outside of diaphragm X is cut off from the train-pipe by valve H, the vacuum in the reservoir may be re-enforced through check-valve U without affecting the position of X, and therefore while the brakes are on. If the electro-magnet simply actuated the valves H and G, and the valve G opened direct to the atmosphere, when the valve G was opened the entire vacuum outside of diaphragm X would be destroyed and the atmospheric pressure on the diaphragm X would move the bell-crank to its extreme limit and hold valve V wide open, thus applying the brakes with the full force of the vacuum in the reservoir. Now, the arrangement of the diaphragms X and X' with the bell-crank Y is such that the amount of motion given to bell-crank Y, and consequently to valve V, may be regulated by a greater or less difference in the vacuum on opposite sides of diaphragm X. In order, therefore, to regulate the amount of reduction in vacuum outside of diaphragm X when valve G is opened, the chamber A' is added with a valve, B, which is open to the atmosphere through C when G is closed, but is closed when valve G is open. This chamber is made of such capacity that the air which it contains when valve B is closed and valve G is opened will reduce the vacuum in space outside of diaphragm X just sufficient to move diaphragm X and bell-crank Y enough to open valve V a little and begin to apply the brakes. As the air from the brake-diaphragms reduces the vacuum in the reservoirs, the vacuum on the inside of diaphragm X soon approaches that on the outside of X, which causes the bell-crank to retreat away from valve V and suspends the amount of application of the brakes at an intermediate pressure. As the position of the bell-crank between the valves V and T, without touching either, is maintained only when the vacuum on outside of X is slightly less than that on the inside, it becomes necessary to provide some way whereby that relation may be sustained while the vacuum in the reservoir is being re-enforced through the train-pipe and check-valve U. This is accomplished by a passage, J, leading from the reservoir through valve K, passage L, Fig. 3, and valve F, Fig. 2, to the chamber A', in communication with the outside of diaphragm X.

The relation of the passages are better shown in Fig. 9. The valve K is held on its seat by gravity only, and is of such weight that a variation of one-half pound pressure on a square inch will lift it and allow air to flow from space R through passages G', L, and J to the interior of the case; hence when the vacuum is re-enforced in the reservoir through the check-valve U the vacuum outside the diaphragm X will also be re-enforced with a constant difference equal to the pressure required to lift the gravity-valve K.

The valve F is for closing the passages L and J from the atmosphere when the valve B is open. It is attached to the armature and

closes when the armature is released and the valve B allowed to open.

I am aware that others have used electricity for actuating valves for fluid-pressure brakes in which the action of the magnet opens the air-valves which apply or release various systems of brakes; but these valves require such an expenditure of force that it is customary to use a relay-battery on each car for actuating the valves. In my invention the main valves are actuated by the fluid pressure in the usual manner, while the magnet has only to actuate very small valves, as minute quantities of air will cause sufficient variation of pressure in the small spaces outside the actuating diaphragms or pistons.

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

1. In a fluid-pressure brake in which the valves are actuated by a variation of pressure in a given space, a chamber of such capacity that the air contained will, when opened to the space for actuating the main valves, vary the pressure in said space sufficiently to cause the fluid pressure to actuate the main valves controlling the application of the brakes, a valve between said chamber and said space, a valve between said chamber and the atmosphere, and an electro-magnet for actuating the valves, substantially as set forth.

2. In a fluid-pressure brake, the auxiliary chamber A′, in combination with valves B, G, and H, and suitable passages connecting same with the chamber outside of diaphragm X.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 14th day of February, A. D. 1887.

ALBERT P. MASSEY.

Witnesses:
G. B. MASSEY,
H. W. BOYER.