G. M. ALSOP.

AIR SPRING.

No. 36,498. Patented Sept. 23, 1862.

Fig. 1.

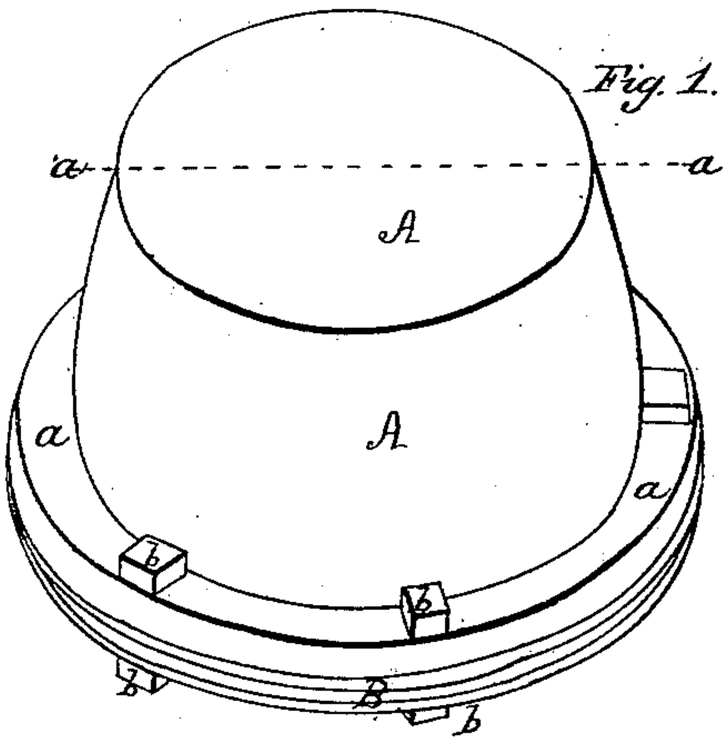


Fig. 2.

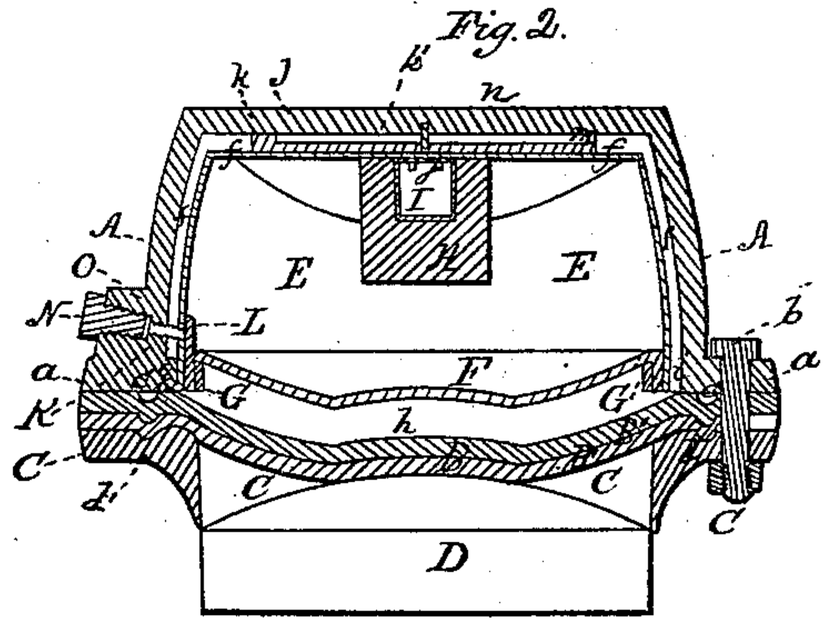


Fig. 3.

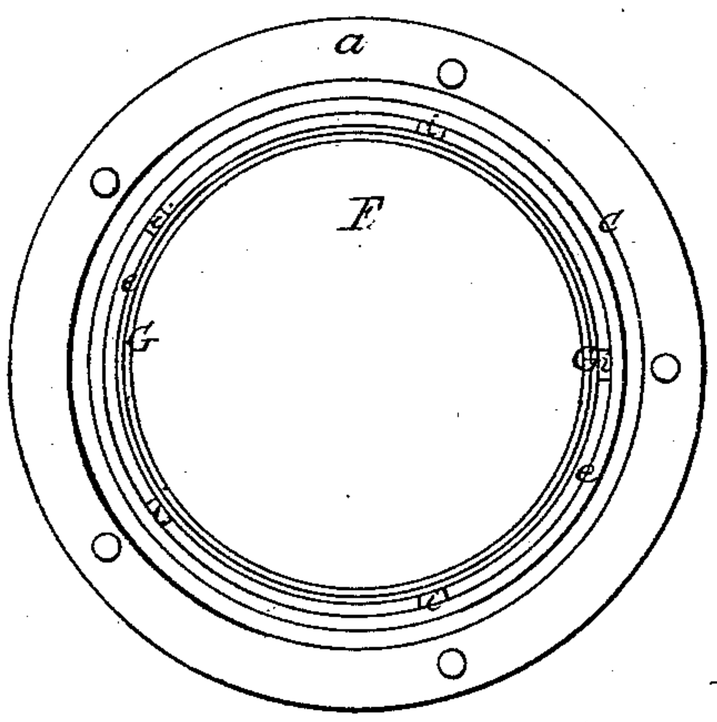


Fig. 5.

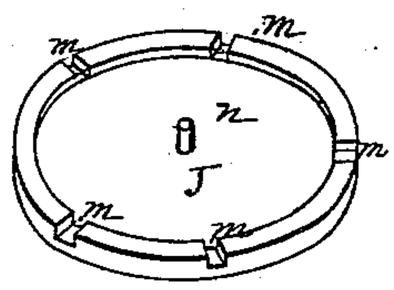


Fig. 4.

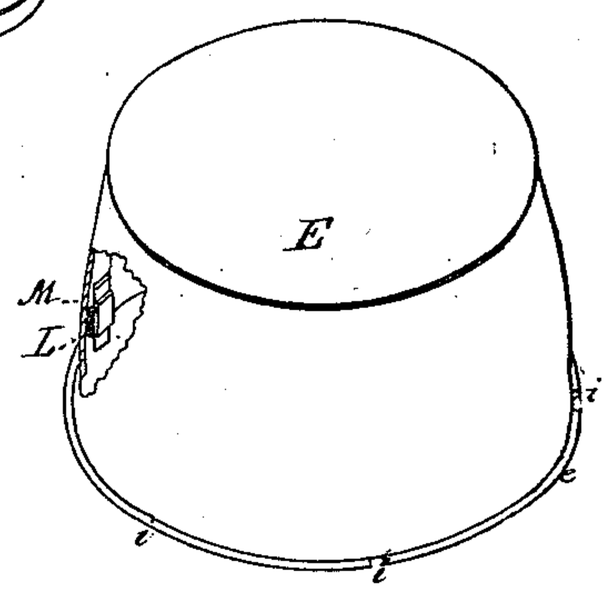


Fig. 7.

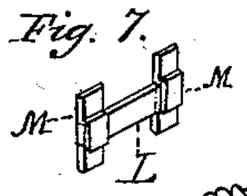


Fig. 6.

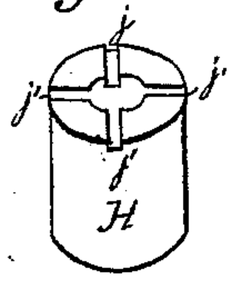
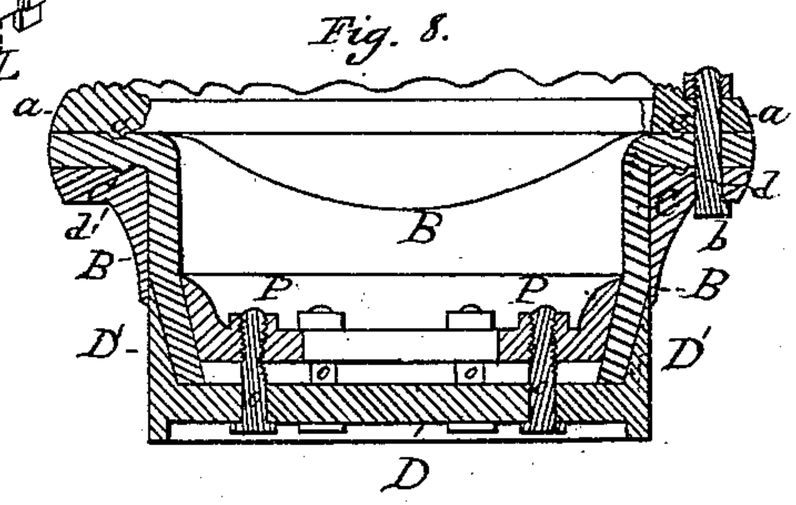


Fig. 8.



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UNITED STATES PATENT OFFICE.

GEORGE M. ALSOP, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN AIR-SPRINGS.

Specification forming part of Letters Patent No. **36,498**, dated September 23, 1862.

To all whom it may concern:

Be it known that I, GEORGE M. ALSOP, of the city of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Air-Springs for Railroad-Cars and other Vehicles; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of a car-spring, the exterior parts only being visible. Fig. 2 is a perpendicular section of the spring at the line *a b* of Fig. 1. Fig. 3 is a reverse view of the portion of the spring above the diaphragm B. Fig. 4 is a perspective view of the air-vessel E. Fig. 5 is a perspective view of the plate or bridge J. Fig. 6 is a similar view of the buffer H. Fig. 7 is a perspective view of the valve L and clamps M M. Fig. 8 is a perpendicular section of the lower part of the spring, showing a modified form of the diaphragm B and the parts connected therewith.

Like letters in all the figures represent the same parts of the spring.

The nature of my invention mainly consists in combining and arranging an inner cup or air-vessel, which has a diaphragm-bottom, with an outer box, which also has a diaphragm-bottom, which receives the pressure of a weight-sustaining piston, the force of which is exerted upon the air contained in the air-vessel, which reacts upon the piston with an elastic force, the said box and air-vessel being constructed and arranged in relation to each other in such a manner as to have a space between them on all sides to contain a fluid, which also receives the force of the piston, and consequently reacts upon the air and prevents its escape from the air-vessel.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is an outer box or case, which I usually make of cast-iron. It has a diaphragm-bottom, B, secured to the flange *a* by means of the ring C and bolts *b*. The inner side of the ring is of sufficient depth to allow the piston D, which bears against the diaphragm B, to slide in it to the extent required by the yielding of the latter. I usually make the face of the piston D of convex form, either plain, as represented in Fig. 2, or with annular corrugations; but the form may be varied to suit the views of the constructors. The diaphragm B, I have represented in the drawings as composed of two pieces, the lower one being leather and the upper one vulcanized rubber; but, if desired, it may be made of a single piece of leather, vulcanized rubber, or other suitable material. On the face of the flange *a* of the box A there is an annular projection, *c*, and in the face of the ring C there is a corresponding depression, *d*, which would fit on the said projection if the ring should be placed against the flange; but as the diaphragm B is interposed it yields to the said projection and depression when the flange and the ring are drawn toward each other by means of the bolts *b*, and a perfectly tight joint is consequently obtained.

E is an air-vessel, which I make of tin or other suitable material. It has a diaphragm-bottom, F, which yields to the force exerted upon the diaphragm-bottom B, in the manner which I will hereinafter describe. The said diaphragm is secured to the interior of the air-vessel by the ring G, which presses it hard against the latter. The outer diameter of the air-vessel E is less than the inner diameter of the box A, so that when the annular lip *e* of the former is placed against the annular projection *g* of the latter, as represented in Fig. 2, there is a space, *f*, all around between the air-vessel and the box to contain a fluid to react against the air and prevent its escape from the air-vessel. The space *h* between the diaphragms B and F has communication with the space *f* by means of the openings *i* of the annular projection *g* of the box A, there being corresponding openings through the lip *e* of the air-vessel E. The said openings are represented in Figs. 2, 3, and 4.

H is a buffer, which I make of vulcanized rubber or other suitable material, the object of which is to arrest the motion of the diaphragms B and F when any extraordinary pressure or concussion occurs, and by overstraining them would cause a rupture. The use of the buffer is particularly desirable for coal or freight cars, which are often subjected to very rough usage.

I is an air-vessel, which is situated in the interior of the buffer H. It is sufficiently large to press tightly against the inside of the

buffer and hold it in place. The said air-vessel I is soldered or otherwise fastened to the top plate of the air-vessel E, as represented in Fig. 2. It has openings *j*, which communicate with the air-vessel E, there being corresponding openings in the buffer H, as represented in Fig. 6. Instead of constructing the said buffer in the manner described a metallic spring may be substituted in its place. The plate or bridge J, above the buffer H and air-vessel I, rests on the air-vessel E. It has an annular projection, *k*, which forms a space or chamber, *k'*, for the reception of fluid, the said space being connected with the space *f* by means of the openings *m* through the projection *k*. The openings are represented in Fig. 5. The plate J has a center pin, *n*, which fits in a central opening in the lower side of top of the box A.

K is a supply-tube in the side of the box A and air-vessel E for the purpose of filling the latter with air, there being a valve, L, which opens inward when the filling commences and is closed by the air contained in the air-vessel, as the latter reacts upon it when the filling is completed.

I usually make the valve L of a strip of gum and clamp the ends with strips of tin M M, which are bent in the middle to receive the valve. The ends of the strips M M are soldered or otherwise secured to the side of the air-vessel E. The arrangement of the valve L and clamps M M in relation to each other is represented in Fig. 7. Their connection with the air-vessel E is partially represented in Figs. 2 and 4.

N is a screw-plug, which is used to close the outer end of the supply-tube K, as it forces the washer or cover O against it. The washer I make of leather or other yielding material. I fill the spaces *f*, *h*, and *k'* with water or other suitable fluid, as follows: I reverse the position of the box A and take off the ring C and diaphragm B, the diaphragm F being in its place, but depressed in the reverse position to that shown in Fig. 2, so as to hold the fluid, which I pour in until the spaces *f*, *h*, and *k'* are filled. I then put the diaphragm B and ring C in their places and secure them by means of the bolts *b*. I force air into the air-vessel E through the supply-tube K until it becomes so condensed as to react against the pressure of the piston D on the diaphragms B and F with the proper degree of force. I then screw the plug or stopper N in its place until the washer O is forced against the outer end of the supply-tube K and closes the same, the valve L being previously closed against the inner end of the tube by the reactive force of the air in the air-vessel E. I prefer molasses to water for filling the spaces *f*, *h*, and *k'*, as it has less tendency to enter the pores of the metal than the latter and is less affected by the weather.

The operation of the spring is as follows: The car resting upon the requisite number of boxes A, and the piston D of each box resting upon the journal-box beneath it, the piston is forced into the ring C, and the diaphragm B is brought into the position it assumes in Fig. 2, and the pressure of the said diaphragm upon the fluid contained in the spaces *f*, *h*, and *k'* causes the diaphragm F to assume a corresponding position, as is shown in the said figure, and the air in the air-vessel E yields to the force of the piston D, but reacts with sufficient force as to prevent the overstraining of the diaphragms, except in extraordinary cases of pressure or concussion. In such cases the buffer H arrests the movement of the diaphragms, and by its elasticity and the aid given it by the elastic force of the air in the air-vessel E counteracts the jar of the piston.

It will readily be seen that the air-vessel E being surrounded on all sides by the spaces *f*, *h*, and *k'*, and the fluid in the said spaces receiving the same amount of pressure through the medium of the diaphragm B as is exerted upon the air contained in the air-vessel, the fluid has a reactive force equal to that of the air, and consequently reacts upon the latter and prevents its escape from the air-vessel, and that as the said vessel is held in equilibrium between the fluid and the air it may be made of a thin or weak material and be strong enough for the purpose it subserves, and also that as the pressure against the inside and the outside of the air-vessel I is equal a thin or weak material is sufficient for it.

Various modifications may be given to the diaphragm B and the parts connected with it to suit the views of the constructors in adapting the spring to the different kinds of cars to which it may be attached. One of these modifications is represented in Fig. 8, which is a cross-section of the lower part of the spring. In this view the diaphragm B assumes a cylindrical form at right angles to its flange, and is open at its lower end, which is connected with the piston D. The lower end of the diaphragm is forced slightly inward by the annular wedge D', which forms part of the periphery of the piston. The diaphragm is held against the inner edge of the wedge by the ring P, which is drawn against it by means of the screws *o*, they being placed at suitable distances apart in the piston D.

Having thus fully described the construction and operation of the air-spring as invented or improved by me, what I claim therein as new, and desire to secure by Letters Patent, is—

1. Combining and arranging the air-vessel E and diaphragm F with the box A, diaphragm B, and piston D, the whole being constructed and arranged and operating substantially in the manner and for the purposes set forth.

2. The combination and arrangement of the buffer H with the air-vessel E and plate J or its equivalent, substantially as described, for the purpose specified.

3. The air-vessel I, in combination with the

buffer H and air-vessel E, substantially as described, for the purpose set forth.

4. The annular projection *c* and corresponding depression *d*, in combination with the flange *a* and ring C, substantially as and for the purpose set forth.

In testimony that the above is my invention I have hereunto set my hand and affixed my seal this 13th day of January, 1862.

GEORGE M. ALSOP. [L. S.]

Witnesses:
GEO. M. WILLIAMS,
M. H. BUSH.