C. J. A. DICK.

AIR-SPRING.

No. 193,694. Patented July 31, 1877.

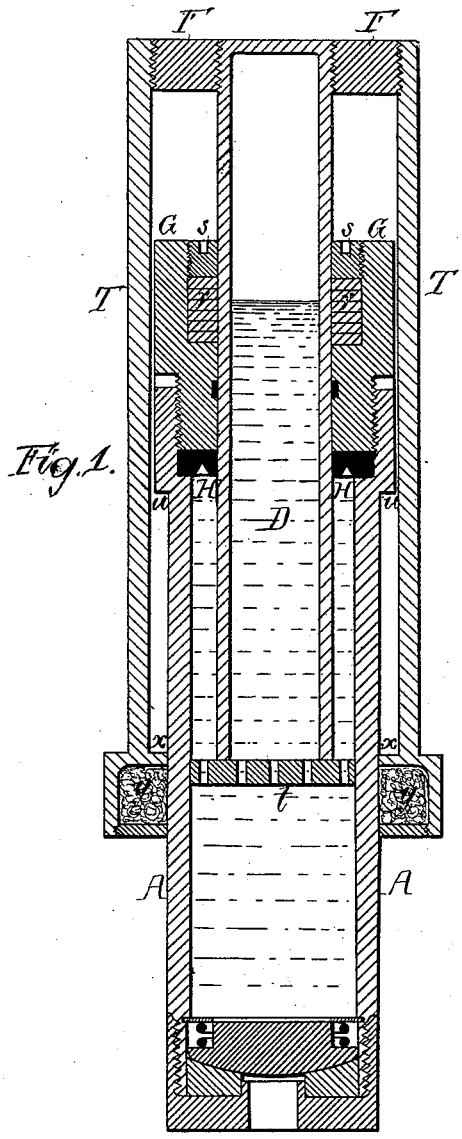


Fig. 1.

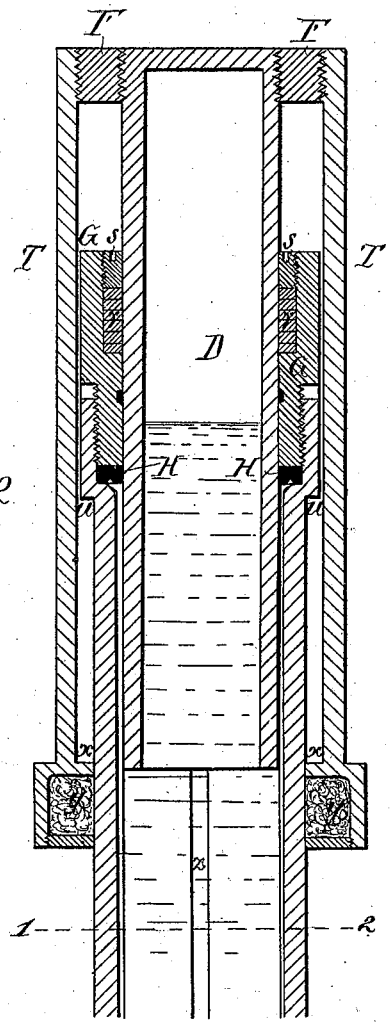
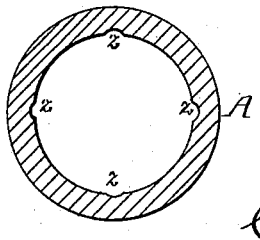


Fig. 2

Fig. 3



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES J. A. DICK, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN AIR-SPRINGS.

Specification forming part of Letters Patent No. **193,694**, dated July 31, 1877; application filed April 21, 1877.

To all whom it may concern:

Be it known that I, CHARLES J. A. DICK, of the city of Philadelphia, Pennsylvania, have invented an Improved Air-Spring, of which the following is a specification:

My invention consists of an improvement, fully described hereinafter, in the air-spring for which Letters Patent of the United States No. 168,980 were granted to Paul Giffard, October 29, 1875.

In the accompanying drawing, Figure 1 is a vertical section of my improved air-spring; Fig. 2, a vertical section, showing a modification of my invention; and Fig. 3, a sectional plan on the line 1 2, Fig. 2.

In Fig. 1, A is the air-vessel of the spring, and is preferably of a cylindrical form, and D is the plunger. Into the top of the air-vessel is screwed or otherwise secured the lower end of the follower G, which maintains in its place the grooved packing-ring H, the latter resting on an internal shoulder on the air-vessel, and being similar to that described in the aforesaid patent.

In the follower G is a chamber for receiving a series of packing-rings, *r*, of leather or other suitable material, which embrace the plunger, and are held in place by an annular screw, *s*, the object of these rings being to insure a proper lubrication of the plunger, and to prevent the injurious effect of dust or dirt on the same. The upper end of the plunger D is attached, by means of a double screw-ring, F, to the upper end of a cylinder, T, which fits over, slides on, and is guided by the air-vessel A, the lower end of the cylinder being provided with a shoulder, *x*, recessed in the present instance for the reception of a packing, *y*, while on the air-vessel A, near the upper end of the same, is formed a shoulder, *u*. The upward movement of the plunger is thus restricted by the contact of the internal shoulder *x* of the cylinder T with the shoulder *u* on the exterior of the air-vessel, the flange on the lower end of the plunger being thereby prevented from coming into contact with and injuring the packing-ring H. The plunger D is hollow, and may be either open at the lower end or there provided with a perforated plate, *t*.

In this spring, as in the patented spring of Giffard, before mentioned, the gradual increase in the resistance of the spring can be regulated by varying the size of the air-space in respect to the diameter of the plunger, and the amount of resistance by varying the pressure of air or gases in the cylinder A.

In the present spring, however, the interior of the vessel A is filled or partially filled with a liquid lubricant, preferably castor-oil or other vegetable oil, the quantity of this liquid determining the size of the remaining air-space, and consequently the gradual increase of resistance which the plunger will meet with under pressure. The smaller the quantity of the lubricant the greater will be that of the air, and the smaller will be the ratio of increase in the resistance which meets the spring during compression.

If a spring comparatively sluggish in its action under pressure is required, there should be a perforated plate, *t*, at the bottom of the plunger, so that a longer time will be required for the admission of the liquid to and its discharge from the interior of the plunger than if the latter were open at the bottom, the size and aggregate area of the perforations in the said plate *t* being varied to accord with the requirements of the spring.

A frame or stirrup connected to the plunger D, and having a shoulder, *x*, may be substituted for the cylinder T, and either the frame or cylinder may be combined with the solid plunger described in the aforesaid patent of Giffard.

When using a plunger which is of the same diameter as the bore of the air-vessel, as in the modification, Fig. 2, I make in the interior of the air-vessel A a series of vertical grooves, *z*, (shown in the sectional plan, Fig. 3,) so that proper and uniform pressure may be exerted on the packing-ring H.

There may be a charging-opening either in the bottom of the air-vessel or top of the hollow plunger, the said opening being provided with a self-closing valve, as described in the aforesaid patent of Giffard.

One of the important advantages of employing a liquid lubricant in the spring is to prevent the heat which the air acquires under sudden and excessive pressure applied to the plunger from injuring the packing-ring H, on the integrity of which the efficient action

of the spring depends, the intervention of the lubricant preventing the access of heated air to the said packing.

I claim as my invention—

The combination, in an air-spring, of an air-vessel, A, having a shoulder, *u*, and suitable packing H, with a plunger, D, and cylinder or frame T, having a shoulder, *x*, all substantially as set forth.

In testimony wherof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES J. A. DICK.

Witnesses:

HERMANN MOESSNER,

HARRY SMITH.