

H. OUDINOT & C. PUTOIS.
HYDROPNEUMATIC SPRING.
APPLICATION FILED DEC. 22, 1908.

944,577.

Patented Dec. 28, 1909.

Fig. 1

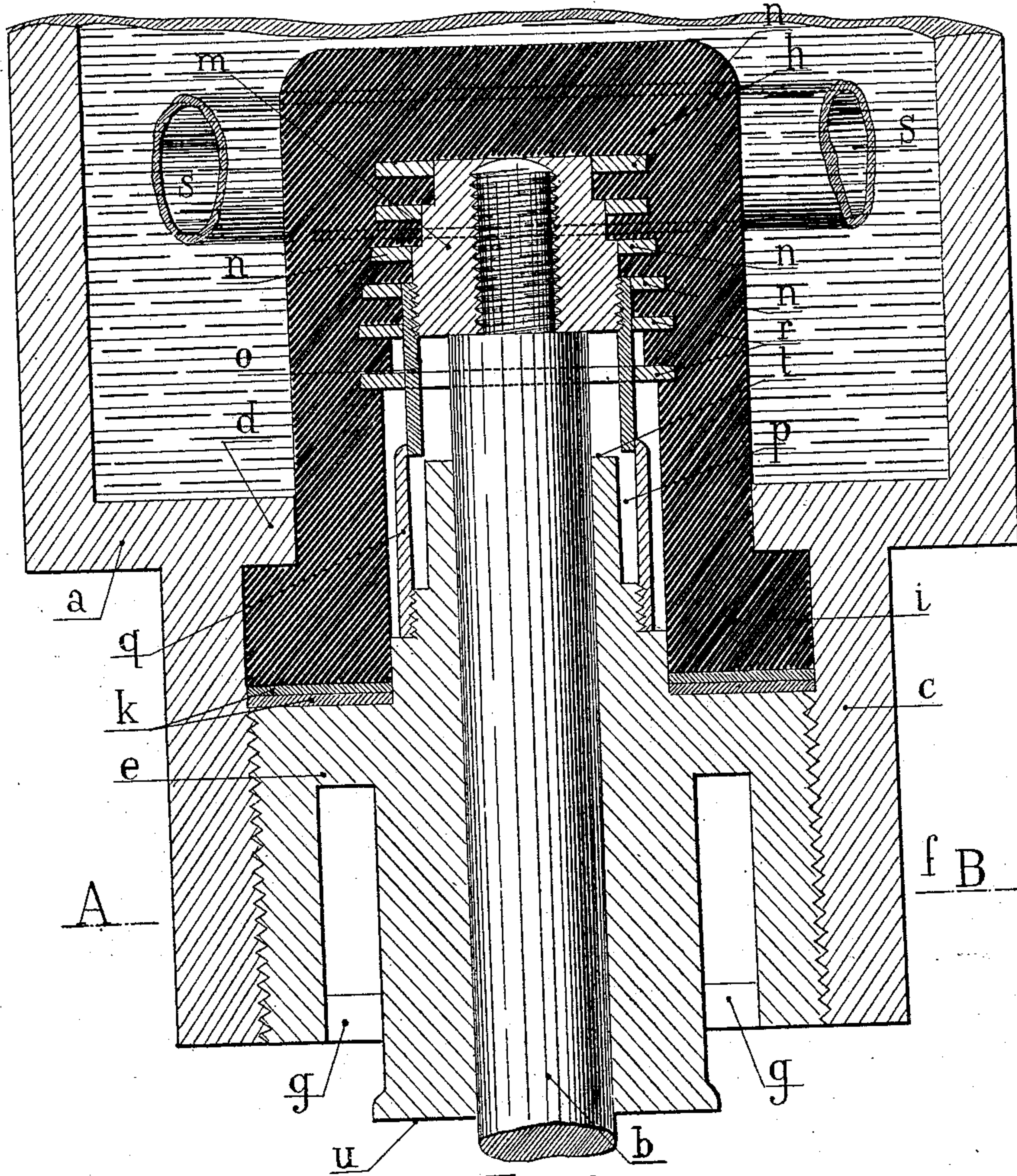
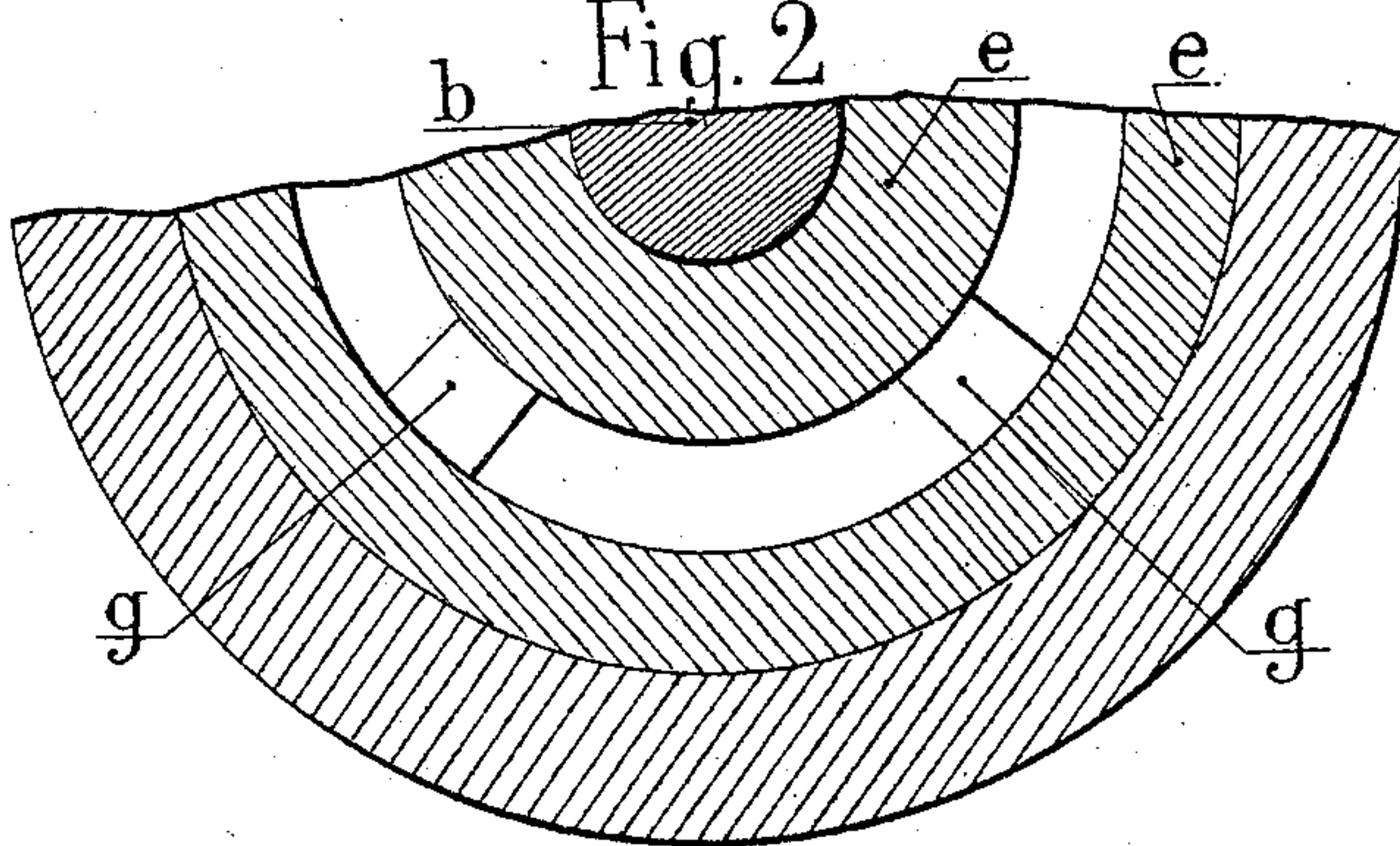


Fig. 2



Witnesses:
Rudolf J. J. J.
A. Schaeffgen.

Inventors:
Henri Oudinot
and Charles
Putois by *Frederick Ward*
Attorney

UNITED STATES PATENT OFFICE.

HENRI OUDINOT AND CHARLES PUTOIS, OF COUDRAY MONTCEAUX, FRANCE.

HYDROPNEUMATIC SPRING.

944,577.

Specification of Letters Patent.

Patented Dec. 28, 1909.

Application filed December 22, 1908. Serial No. 468,879.

To all whom it may concern:

Be it known that we, HENRI OUDINOT, DUC DE REGGIO, and CHARLES PUTOIS, citizens of the French Republic, and residents of Coudray Montceaux, France, have invented certain new and useful Improvements in Hydropneumatic Springs, of which the following is a specification.

The present invention relates to a hydropneumatic spring, that is to say, to a spring which essentially consists of a plunger piston susceptible to penetrate more or less into a liquid mass in which a pneumatic tube is disposed which gives the elasticity.

The characteristic feature of the invention is the special construction of this apparatus with a view to obtaining a perfect joint.

In the accompanying drawings the spring is shown by way of example in Figure 1 in a section through the axis of the plunger piston; Fig. 2 is a section on line A—B of Fig. 1.

The apparatus is constructed as follows:—
A cylinder *a* is filled with a suitable liquid and provided at its lower end with a tubular extension *c* internally threaded for the greatest part of its length. The central boring of the bottom plate of cylinder *a* is of smaller diameter than the tubular extension *c* so that an annular shoulder *d* is formed at the upper end of said tubular extension. A nut *e* which is screwed into the tubular extension *c* serves for guiding rod *b* of a piston. Said nut *e* may have hollows *f* to reduce its weight and its bottom end *u* may be provided with a certain number of openings which form arms *g* (Fig. 2) serving as bearing surfaces for the key.

The perfect joint between cylinder *a* and piston *b* is realized by means of an india-rubber bag *h* having a flange *i* at its lower end destined to be clamped in between shoulder *d* of the cylinder and nut *e*. One or more metal washers *k* are inserted between flange *i* and nut *e*. The india-rubber of bag *h* is of considerable thickness in proportion to the stress to which it is to be exposed. The head *m* of piston *b* serves for pushing the upper part of india-rubber bag *h* into the liquid which fills cylinder *a* when piston *b* be moved upward. Said head *m* which is removable, is screwed upon the upper end of piston *b* and presents several steps decreasing in diameter toward the front end of the head *m*. The inner profile of the front part of india-rubber bag *h* exactly corresponds

with the outer profile of said head *m* and in said part of the india-rubber bag a certain number of metal rings *n* are inclosed which are arranged and which have such diameter that the upper end of each of the steps of head *m* is embraced by one ring *n*. Thus any lateral deviation of cushion *h* is avoided. The rear end of movable head *m* is externally threaded for receiving a metal sleeve *o* which is guided in an annular space *p* formed between the small front end *t* of nut *e* and a metal sleeve *q* screwed upon nut *e*. The front edge of metal sleeve *q* is externally beveled.

The device which has just been described is destined to prevent that under the effect of any lateral pressure the india-rubber be gripped between the movable head *m* and the front part *t* of nut *e* when the piston withdraws. Owing to the two sleeves *o* and *q* the india-rubber cannot get between the movable head and nut *e*. The india-rubber could perhaps flap against the outer surfaces of said sleeves *o*, *q*, but is prevented from doing this by a certain number of metal rings *r*. An air chamber *s* which is inflated with air under pressure, is located in the liquid which fills cylinder *a* for imparting elasticity to the apparatus.

Fig. 1 of the drawings represents the several parts of the device in the position which corresponds to the normal state. India-rubber bag *h* is shown neither stretched nor compressed and head *m* is at its medium position, that is to say it can either advance or withdraw for a certain distance. The back movement of head *m* is limited by the front end of nut *e* against which head *m* abuts and the forward movement can be limited by an abutment ring of rod *b*, arranged outside the apparatus, adapted to abut against the bottom part *u* of nut *e*. If any pressure is exerted upon rod *b* it penetrates into cylinder *a* stretching the india-rubber bag *h* so that the shock is completely used by the elastic displacement of rod *b*. When the pressure ceases rod *b* returns to its original position under the influence of india-rubber bag *h* as well as owing to the pressure which is exerted upon the outer surface of said bag. The length of the stroke of piston *b* depends on the length of india-rubber bag *h*. If cylinder *a* be fixed and a reciprocating motion be communicated to piston *b* this apparatus will act like a hydraulic piston. Its characteristic feature is its absolutely perfect

joint. The degree of elasticity of the spring is regulated by the pressure which exists in cylinder *a*. This pressure can be modified at will by means of a second piston with head *m* and bag *h* identical to the one described, the rod *b* of which bears upon a regulating nut which permits it to penetrate more or less into cylinder *a*. A pressure gage could be provided for indicating the pressure in the apparatus.

This apparatus can be applied to any hydraulic installation to replace the usual plunger-pistons of leather; but it can further serve wherever force is to be utilized or shocks to be softened, particularly as spokes for elastic wheels, for the suspension of vehicles and the like, for brakes or buffers for railway wagons.

We claim:—

1. A hydropneumatic spring comprising in combination a cylinder filled with suitable liquid, an air chamber filled with air under pressure inclosed in said cylinder, a piston adapted to penetrate into said cylinder, suitable means for guiding said piston in the bottom of the cylinder, an india-rubber bag coöperating with the head part of said piston, means for guiding said india-rubber bag upon said piston, and means for obtaining a perfect joint between the india-rubber bag, the piston and the cylinder substantially as described and for the purpose set forth.

2. The piston comprising a rod, a threaded part at the upper end and a movable head

screwed upon said threaded part, said head presenting steps which decrease in diameter toward the upper end, and an externally threaded part of the head at the bottom end of the same, substantially as described and shown.

3. The india-rubber bag comprising a thick head part profiled according to the profile of the piston-head provided with steps, three metal rings in said head part, one for each step of the piston head for guiding the bag upon the piston, a certain number of metal guide rings below said first mentioned guide rings, and a flange at the lower end by means of which the india-rubber bag is fixed between the cylinder and the device for guiding the piston.

4. The device for guiding the piston consisting of a nut screwed into the lower end of the cylinder, a tubular extension of said nut projecting into the cylinder, an externally threaded flange at the bottom end of said tubular extension, a guide sleeve screwed upon said flange and a guide sleeve screwed upon the lower end of the piston head and guided in said first mentioned sleeve, substantially as described and for the purpose set forth.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

HENRI OUDINOT.
CHARLES PUTOIS.

Witnesses:

ALFRED FREY,
DEAN B. MASON.