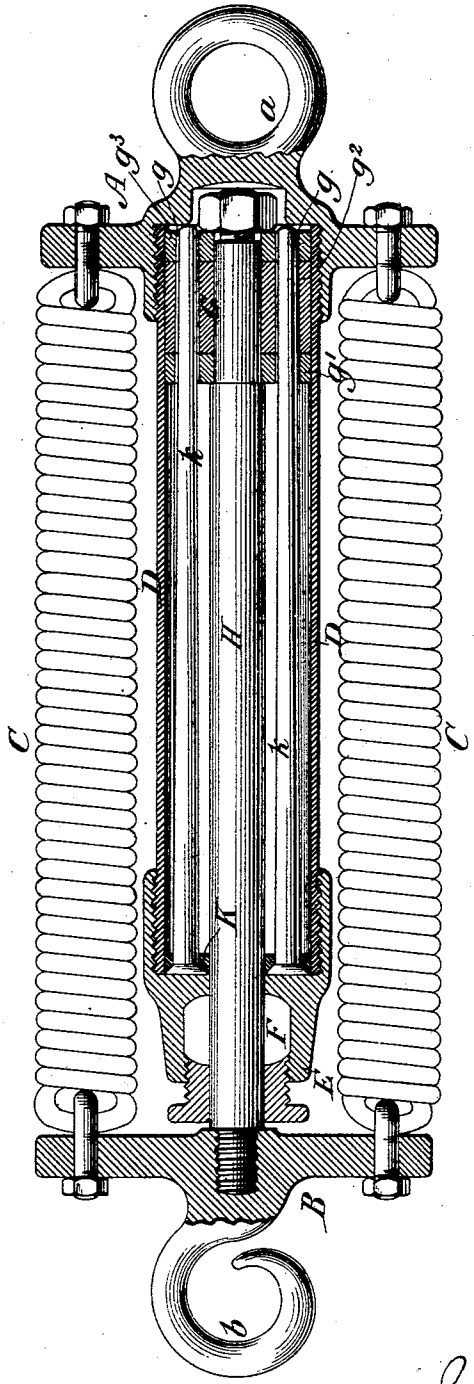
(No Model.)

J. F. RADERS.

YIELDING DEVICE.

No. 573,534. Patented Dec. 22, 1896.



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UNITED STATES PATENT OFFICE.

JOSEPH F. RADERS, OF NEW YORK, N. Y.

YIELDING DEVICE.

SPECIFICATION forming part of Letters Patent No. 573,534, dated December 22, 1896.

Application filed June 7, 1895. Renewed May 20, 1896. Serial No. 592,368. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH F. RADERS, a citizen of the United States, residing at New York, in the county and State of New York, have invented new and useful Improvements in Yielding Devices, of which the following is a specification.

My invention relates particularly to apparatus designed to prevent sudden jars in starting a load by the application of a force or jars caused by variations in a force acting on a load.

I will first describe an article embodying the features of my invention, and will then point out the novel features in the claims.

In the accompanying drawing the figure is a cross-sectional view, partly in side view, of a device embodying my improvement.

The article which I have chosen for illustration represents a yielding device which may with advantage be interposed between the traces of a horse and the point of attachment to a movable vehicle. I do not, however, wish to limit myself to the application of my invention to this specific device, but intend it to be applicable to various yielding devices where the same or similar conditions exist.

The device shown in the drawing combines two springs attached at their ends to two metal plates or heads, each provided with a ring or hook. The springs offer resistance to the separation of the heads and are aided by means of a piston attached to one plate or head working in a cylinder attached to the other head.

Means are provided for increasing the resistance offered to the movement of the piston the farther it travels in the cylinder.

In the drawing two helical springs C C are attached at their ends to two metal plates or heads A and B, provided with a ring *a* and a hook *b*, respectively. If now this apparatus be attached to the traces and whiffletree of a vehicle, the yielding of the springs will prevent any sudden jars due to the variation in the amount of force applied to the traces, but the springs are apt to stretch beyond their limit of resistance and break. To obviate this difficulty, a means is employed whereby the resistance to the separating of the heads A and B is increased as the distance between the heads increases, or, in other words, the farther the heads separate the greater is the resistance offered to farther separation. The means for effecting this increase of resistance is the following: Into the head A is screwed a hollow cylinder D in such a manner as to project therefrom parallel to and between the springs C and in the direction of the head B. The head A closes one end of this cylinder, and a cover E, provided with a stuffing-box F, is screwed over and closes the other end. In the cylinder D works a piston G, attached to the end of a piston-rod H, which passes through the cover E and the stuffing-box F and is securely fastened to the head B. In the piston G are holes *g g*, through which pass tapering rods *k k*, securely held in a disk K, placed near the stuffing-box end of the cylinder D. This disk K may be held stationary in the cylinder D or may be free to revolve around the piston-rod H, but is prevented from reciprocating with the piston. The rods *k*, instead of being attached to the disk K and free at the other end, may be firmly held at both ends by any suitable means, as by passing into or through the heads of the cylinder. The diameter of the rods *k* is greater at the disk K, being either as great as or greater than the diameter of the holes *g*, and gradually diminishes toward the other end, being there somewhat less than the diameter of the holes *g*.

The piston G may consist of a small piece of metal or other material, or it may, as shown in the drawing, consist of a solid cylinder g^2, of rubber or other elastic material, placed between two metal disks $g' g^3$, so that as these disks press against the solid cylinder g^2 they tend to flatten it and press it against the interior surface of the cylinder D, thus preventing leakage. The piston G may be free to turn on the piston-rod H, so as to allow for any twisting occurring between the heads A and B.

The cylinder D with the parts therein arranged as described is filled with oil, glycerin, or some other fluid. If now a force be applied to separate the heads A and B, the springs C will yield and the piston G will move toward the stuffing-box end of the cylinder D. The fluid contained in the cylinder will flow through the spaces around

the rods k in the holes g, but as the piston continues to advance the rods k, because of their increasing diameter, will more and more nearly close the holes g, thus offering an increased resistance to the passage of the fluid through the same and a corresponding increase of resistance to the movement of the piston. It will thus be seen that the farther the heads A and B are separated the greater will be the force necessary to continue such separation, and therefore the greater will be the force necessary to break the springs. If, however, the diameter of the rods k varies in such a manner as to completely close the holes g before the springs C have been stretched to their elastic limit, farther separation of the heads A and B will be impossible and the springs cannot be broken. It will easily be understood that when the force is removed the springs C will bring the piston back to its original position, the fluid flowing back through the spaces in the holes g, these spaces constantly increasing in size. The number of rods k and holes g corresponding thereto is immaterial, as is also the number and mode of arrangement of the springs C.

For delicate mechanisms, where the desired increase of resistance is small, a gas may be employed in the cylinder D instead of a liquid.

By reversing the direction of tapering the rods k and by proportioning the parts so as to allow the plates or heads to approach each other the above-described yielding device could be employed for compression instead of for tension.

Without limiting myself to any special construction, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of oppositely-moving heads or plates, a cylinder for holding a fluid secured to one of the heads or plates, a piston provided with openings for the flow of the fluid from one face to the opposite, secured to the other head or plate, means for varying the area of these openings with the position of the piston, and springs extending between and secured to the heads, substantially as specified.

2. The combination of oppositely-moving heads or plates, a cylinder for holding a fluid secured to one of the heads or plates, passages or ducts placing the two ends of the cylinder in communication, a piston supported by the head opposite to that to which the cylinder is secured and movable lengthwise in said cylinder, means for throttling the flow of the fluid through said ducts or passages by the relative movement of the piston and cylinder, and springs extending between and secured to said heads, substantially as specified.

3. The combination with springs attached to plates or heads, of a hollow cylinder, containing a fluid, fastened to one head, and arranged symmetrically with respect to the springs; a piston, working in said cylinder and connected through the medium of a piston-rod with the other head; holes traversing said piston, to allow the flow of the fluid from one end of the cylinder to the other; tapering rods, passing into said holes, and prevented from reciprocating with the piston, whereby the opening in the holes is increased or diminished as the piston reciprocates, all arranged substantially as described, to vary the amount of resistance offered to the separation of the plates or heads for different amounts of such separation.

4. The combination with helical springs C, attached to plates or heads A and B, said heads having a ring a and a hook b, respectively, of a hollow cylinder D, containing a liquid, fastened to the head A, symmetrical to the spiral springs; a piston G, working in the cylinder D, and traversed by holes g, and connected to the plate or head B, through the medium of a piston-rod H; tapering rods k passing into the holes g and prevented from reciprocating with the piston, all arranged substantially as described to increase the amount of resistance offered to the separation of the plates or heads A and B, as the distance between them increases.

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

JOSEPH F. RADERS.

Witnesses:

ANTHONY GREF,

R. T. WALKER.