I. J. STADELMANN.

PNEUMATIC SPRING.

APPLICATION FILED APR. 6, 1910.

979,044.

Patented Dec. 20, 1910.

Fig. 1.

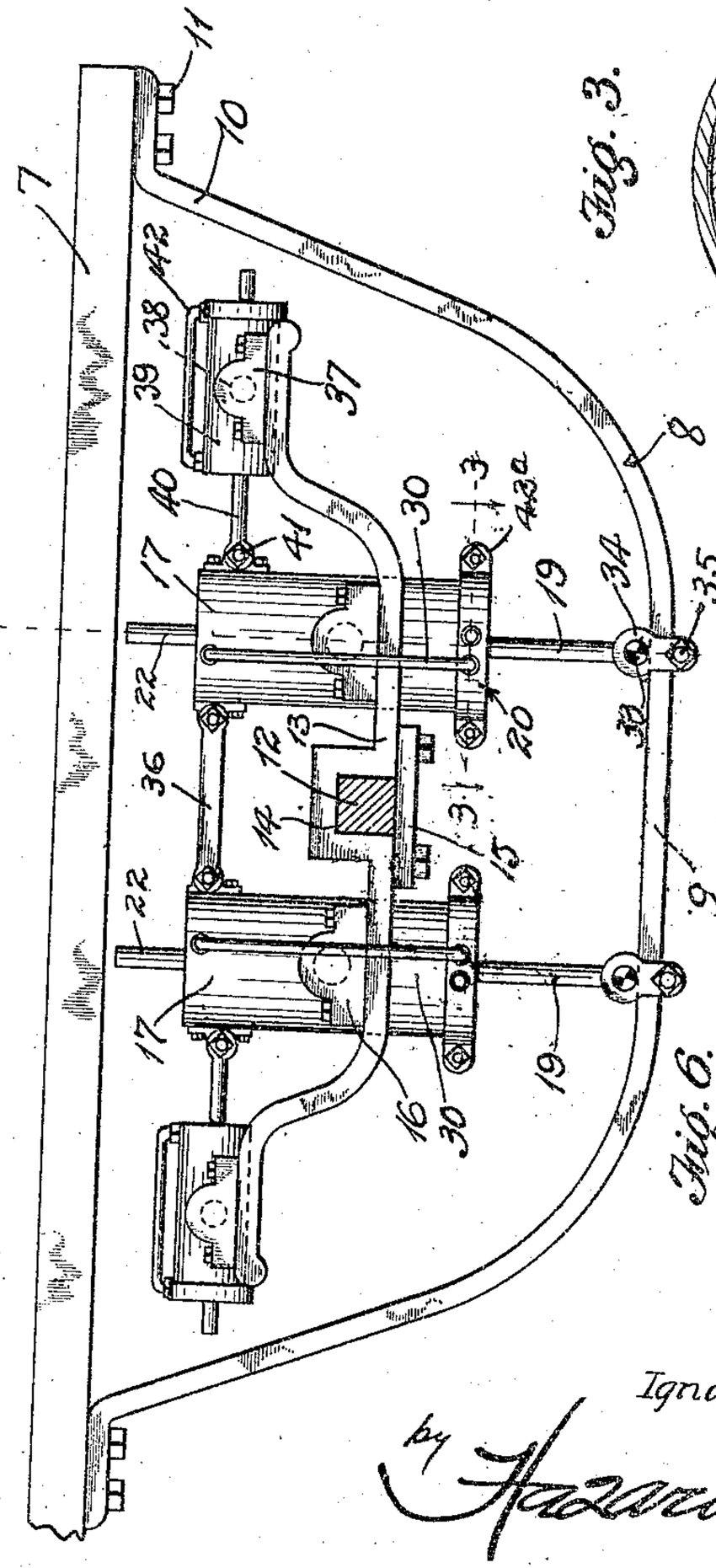

Fig. 2.

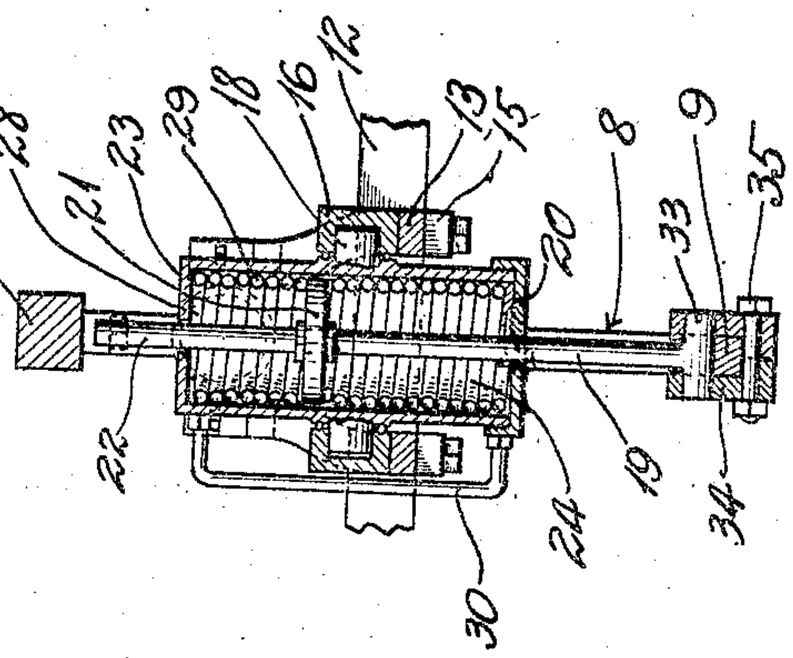

Fig. 3.

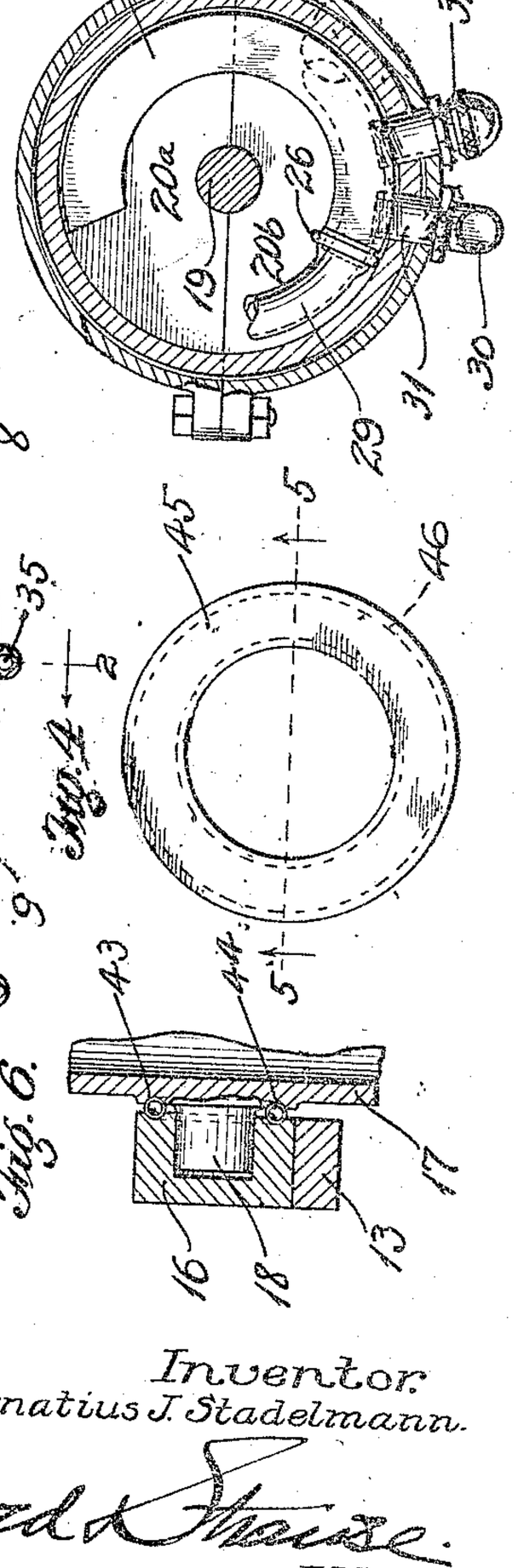

Fig. 4.

Fig. 5.

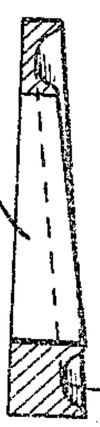

Fig. 6.

Witnesses.
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UNITED STATES PATENT OFFICE.

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PNEUMATIC SPRING.

979,044. Specification of Letters Patent. Patented Dec. 20, 1910.

Application filed April 6, 1910. Serial No. 553,694.

To all whom it may concern:

Be it known that I, IGNATIUS J. STADELMANN, a citizen of Switzerland, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Pneumatic Springs, of which the following is a specification.

This invention relates to pneumatic springs, such as are used for supporting vehicle bodies on their axles.

The object of the invention is to produce a device of this class which is simple in construction, and which will give the necessary resiliency without the use of metal springs.

A further object of the invention is to construct the device so that it will have great resiliency in a front and rear direction in a horizontal plane as well as in a vertical plane.

In the annexed drawings forming a part of the specification, Figure 1 is a side elevation showing a portion of the vehicle frame to which the device is applied, the axle being shown in cross section. Fig. 2 is a vertical section on the line 2—2 of Fig. 1. Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 1. Fig. 4 is a plan showing a modified form of a coil seat, which constitutes a feature of the invention. Fig. 5 is a cross section taken on the line 5—5 of Fig. 4. Fig. 6 is a vertical section taken at the side of one of the dash-pot cylinders, and showing the means for pivotally mounting the cylinders and the means for packing the pivot or trunnion to exclude the dust.

Referring more particularly to the parts, 7 represents the frame of the vehicle, to the under side of which a hanger 8 is attached. This hanger has a horizontal middle extension 9, and upwardly disposed end extensions 10, which are secured to the under side of the frame by suitable fastening devices 11.

In the space between the frame 7, and the hanger 8, the axle 12 is located. To the upper side of the axle I attach a cross head 13, which cross head is off-set upwardly at the axle to form a socket 14 of angular form corresponding to the form of the axle and receiving the axle as indicated. This cross head is held rigidly to the axle by means of a clip 15, attached at the socket 14, as shown.

As indicated in Fig. 2, two cross heads are arranged opposite to each other. On the upper side of the cross heads near the axle, trunnion boxes 16 are attached, and between these boxes vertical dash-pots 17 are mounted. These dash-pots have trunnions 18 near their middle points, which project outwardly on a horizontal axis, and these trunnions are supported in the boxes 16 as shown most clearly in Fig. 2.

Piston rods 19 extend downwardly from the dash-pot cylinders to the lower heads 20 thereof, and to these piston rods, piston heads 21 are attached within the cylinders. Beyond the piston heads 21, tail rods 22 are provided, which extend upwardly through the upper heads 23 of the cylinders, and these tail rods operate as guides for the pistons. Below each piston 21, a pneumatic coil or hose 24 is arranged in a helix, and this coil extends from the piston to the lower head 20. The lower end of the coil is attached to a coil seat 25, of the form shown in Fig. 3. This coil seat is arc-shaped, and has an enlarged butt end to which the coil is attached by a suitable coupling 26. At this point the coil seat is formed with a chamber 27 which communicates with the interior of the coil when attached. A similar coil seat 28 is arranged at the upper end of the cylinder, and the coil 29 is attached to this coil seat 28, which is disposed in the upper part of the cylinder as shown in Fig. 2. The ends of the coils 24 and 29 are closed adjacent to the piston head 21.

The coil seats are connected by a by-pass pipe 30, which extends longitudinally of the cylinder, and connects at its ends with nipples 31, which are screwed into the butt end of the coil seat so as to communicate with the chamber 27 as shown in Fig. 3.

An inflating nipple 32 is provided, which communicates with the chamber 27 at the lower coil seat, and this nipple enables the coils to be inflated with air, as will be readily understood. The lower ends of the piston rods 19 are formed into wrist pins 33, to which clips 34 are pivotally attached. The lower ends of these clips are connected by bolts 35 so that the clips may clamp the piston rods to the middle extension 9 of the hanger. The upper ends of the cylinders 17 are connected by a link 36. The ends of the cross heads 13 are off-set upwardly, and provided with boxes 37 which receive trunnions 38 formed on horizontal dash-pots 39. These dash-pots 39 are arranged and constructed on the interior like the dash-pot shown in Fig. 2. Each dash-pot is provided with a

piston rod 40, which extends from its inner end, and is pivotally connected at 41 with the upper end of the dash-pots 17. The ends of each cylinder are connected by a by-pass pipe 42, similar to the pipes 30.

As indicated in Figs. 1 and 3, the lower heads 20 of the dash-pots 17 are split diametrically into two sections 20^a and 20^b, and these sections are provided with lugs 42^a by means of which they are attached together as shown. In order to pack the trunnions of the dash-pots the sides of the cylinders are provided with grooves 43, which form seats for pneumatic packing rings 44, the outer sides of the packing rings being pressed against the inner faces of the boxes of the dash-pots. These rings operate as dust rings to prevent the dust from working into the trunnions.

In Figs. 4 and 5 I have illustrated an annular coil seat 45 having a groove 46. These seats may be used in pairs, the flat faces contacting with the faces of the piston 21, the grooves 46 forming seats for the inner closed ends of the coils 24 and 29. This construction serves to hold the inner ends of the aforesaid coils securely in place and prevents any lateral movement thereof during an operation of the device.

As indicated in Fig. 2, in the vertical dash-pots 17, the piston heads 21 are disposed normally slightly above the middle line of the cylinders, and this arrangement is adopted because a greater resiliency is necessary in the downward movement of the pistons than in the upward movement. The greater resiliency referred to arises from the greater number of coils disposed below the piston heads.

When in use, if the body supported on the frame 7 should tend to move downwardly the piston heads 21 compress the coils 24 beneath them and force the air into the upper coils through the by-pass 30. An upward movement of the piston heads 21 will be resisted by the upper coil, and the air in the upper coil would be forced down into the lower coils. On account of the manner of supporting the cylinders 17, it will be seen that the frame can swing in a forward or rearward direction relatively to the axle, a slight rotation taking place on the trunnions 18. This swinging movement is resisted by the coils in the dash-pots 39. In this way a very resilient suspension for the frame is effected.

What I claim, is:

1. In combination, a rrame, an axle, a vertically disposed pneumatic dash-pot connected between said frame and said axle and adapted to absorb shocks in a vertical plane, a pneumatic dash-pot arranged in a horizontal plane, connected with said first dash pot and adapted to absorb shocks in a horizontal plane, all of said dash pots being pivotally mounted.

2. In combination, a frame, an axle, cross heads attached to said axle, a pair of pneumatic dash-pots pivotally mounted on said cross heads, piston heads moving in said dash-pots and having pistons connecting with said frame, other dash-pots disposed with their axes in a horizontal plane, and having pistons connecting with said first dash-pots and tending to prevent the swinging movement thereof.

3. In combination, a frame, an axle, a cross head carried by said axle, a pair of pneumatic dash-pots pivotally supported on said cross head, a link connecting said dash-pots, said dash-pots having piston rods extending therefrom connecting with said frame, a second pair of dash-pots arranged respectively at opposite sides of said first dash-pot, mounted to swing on a horizontal axis, connected with said last named dash-pots, and having piston rods connecting with said first dash-pots.

In witness that I claim the foregoing I have hereunto subscribed my name this 29th day of March, 1910.

IGNATIUS J. STADELMANN.

Witnesses:
F. D. AMMEN,
EDMUND A. STRAUSE.