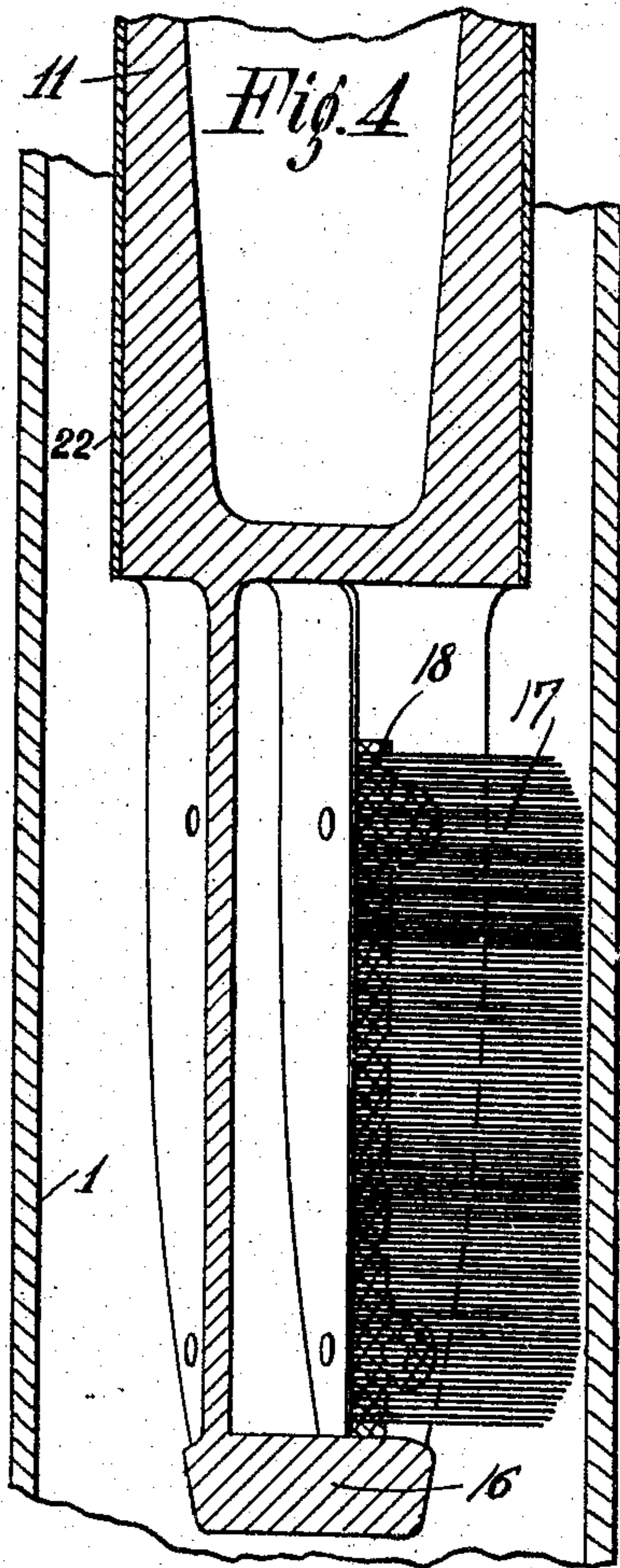
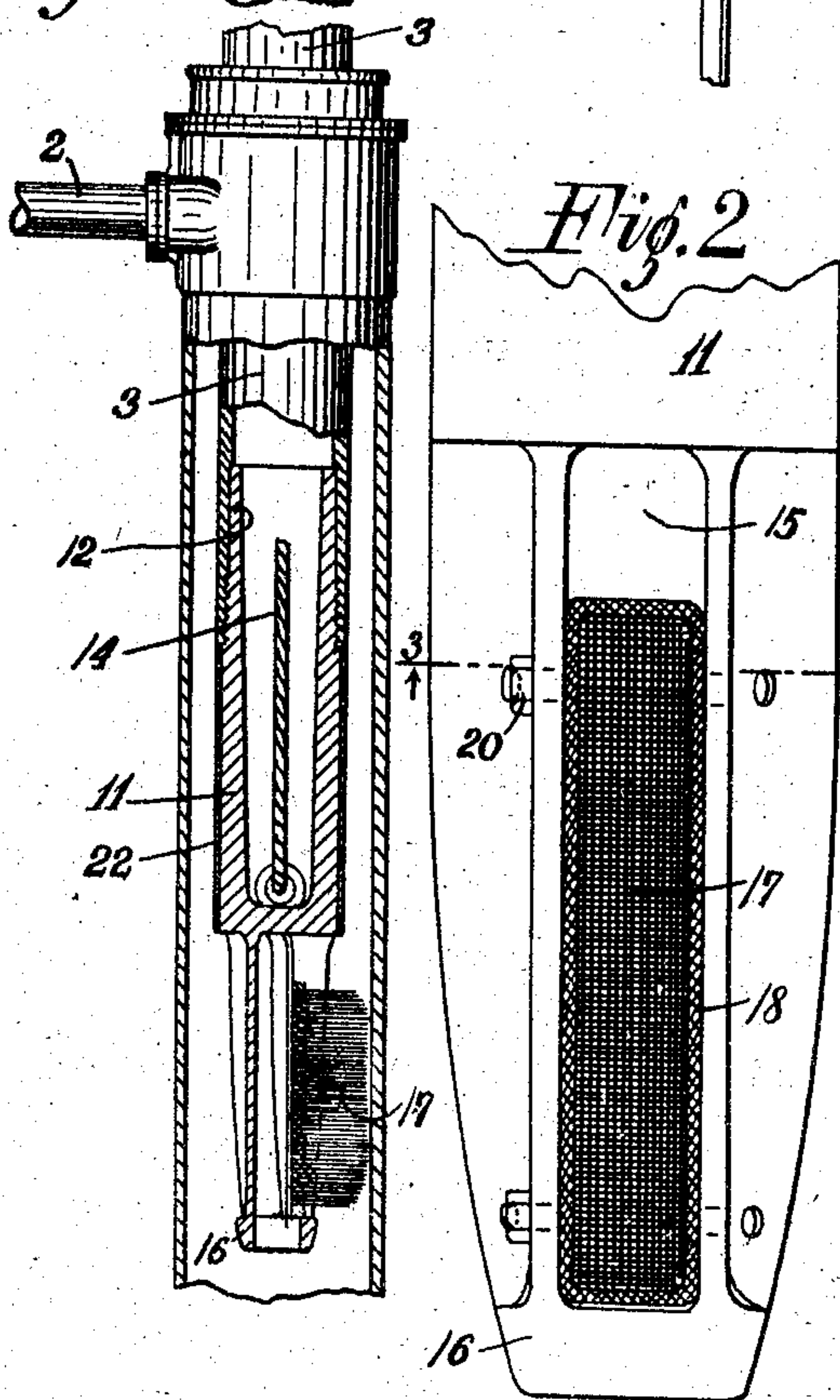
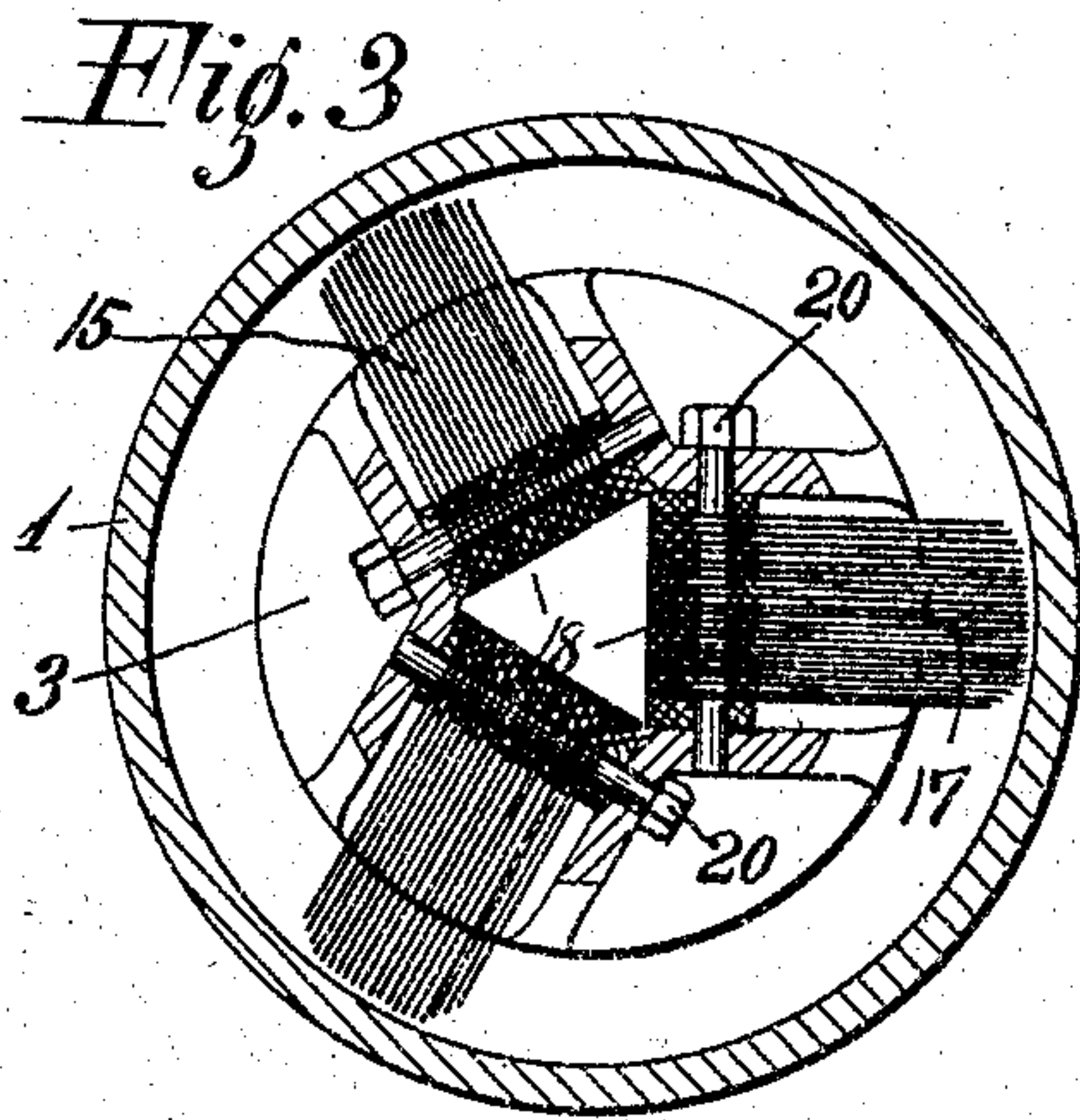
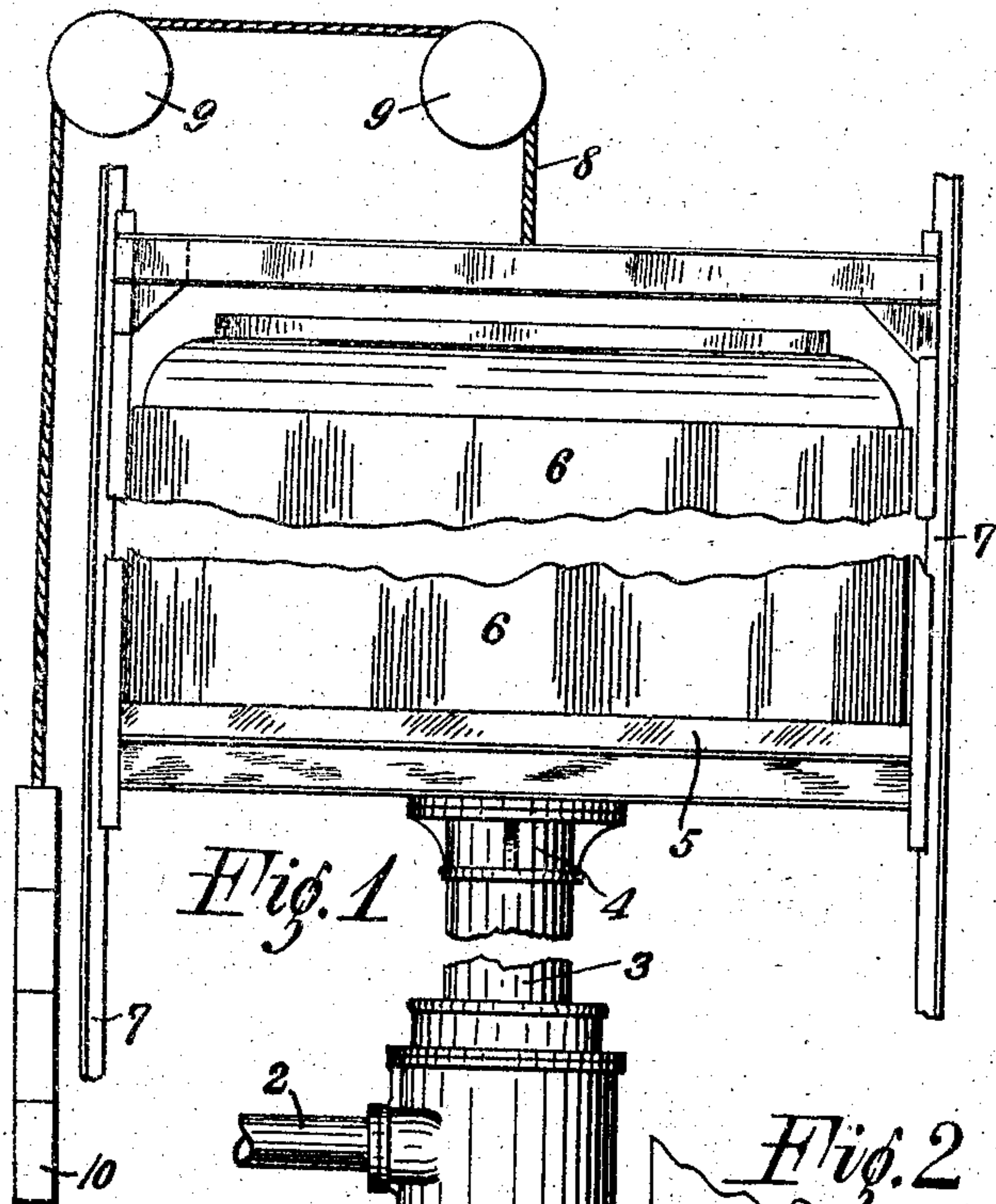


No. 781,435.

PATENTED JAN. 31, 1905.

T. LARSSON.  
HYDRAULIC ELEVATOR.  
APPLICATION FILED JAN. 2, 1904.



Witnesses  
George H. Kerr.  
William S. Hooper.

Thure Larsson Inventor  
By his Attorney C. Edwards.



# UNITED STATES PATENT OFFICE.

THURE LARSSON, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO HIMSELF AND FRED A. JONES, OF WORCESTER, MASSACHUSETTS, AND WILLIAM E. D. STOKES, OF NEW YORK, N. Y.

## HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 781,435, dated January 31, 1905.

Application filed January 2, 1904. Serial No. 187,489.

*To all whom it may concern:*

Be it known that I, THURE LARSSON, a subject of the King of Sweden and Norway, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Hydraulic Elevators, of which the following is a full, clear, and exact specification.

This invention relates to hydraulic elevators, and has for its object to provide means for steadying the plunger as it travels up and down in the cylinder.

In hydraulic elevators of the direct-plunger type where there is considerable rise the plunger on account of its length is subject to considerable lateral vibration both within and without the cylinder. This vibration is caused by the tendency of the plunger to buckle, due to its own weight, the weight of the load, and sudden starting and stopping. When the plunger is partly within the cylinder and partly without, the vibration sets up injurious strains upon the cylinder and its fastenings, and to overcome this vibration I propose to provide a resilient bearing for the lower end of the plunger which, in connection with the vertical guides for the car, will prevent any vibration. By leaving the lower end of the plunger free the vibrations travel back and forth in a manner similar to a stretched string; but by confining the plunger at both ends this cannot happen.

The invention will be more fully described in connection with the accompanying drawings, in which—

Figure 1 is a view, partly in section, showing an elevator with the invention applied thereto. Fig. 2 is an enlarged view of the lower end of the plunger. Fig. 3 is a cross-section on the line 3 3 of Fig. 2; and Fig. 4 is a sectional view of Fig. 2, showing a portion of the cylinder.

1 represents the cylinder, having the usual supply and exhaust pipe 2, connected with suitable valves and a source of supply. 3 represents the plunger, having the socket 4 at its upper end secured to the floor 5 of the car 6.

7 7 are vertical guides for the car. 8 is a cable attached to the top of the car, leading over the shaft 9 and carrying a counterweight 10. These parts just mentioned may be of any desired construction. The plunger 3 may be composed of a number of tubular sections suitably attached together. The lower end of the plunger is closed by a plug 11, which has a reduced upper end or nipple 12, threaded into the lower section of the plunger.

14 is a cable attached to the inside of the plug 11 and to the body of the car. The cable is kept under a state of tension and serves to prevent the plunger from separating from the car and also to a certain extent to stiffen it in connection with the brushes.

The lower end of the plug 11 is reduced in diameter and has a plurality of channels 15, closed by a collar 16 at the bottom. In the channels 15 are fastened resilient brushes 17, which may be composed of stiff wires suitably fastened in a back 18. The backs 18 are fastened rigidly in the channels 15 by fastening means, such as bolts 20, and may be readily removed for renewal, &c. The brushes are rounded at each end, so as to move freely over the joints of the cylinder, and are preferably of such length as to just escape contact with the inside of the cylinder when the plunger is at rest centrally of the cylinder. Any vibration, therefore, will cause the brushes to strike the side of the cylinder and by their resiliency absorb the vibration and prevent injury to the cylinder or its fastenings. As the upper end of the plunger cannot vibrate on account of the guides which engage the car, the plunger will thus be confined at both ends and the possibility of breakage or straining reduced.

22 is a jacket which may be fitted over the outside of the plug 11 to make a flush joint with the lower tubular section.

It will be observed that the brushes are so constructed that in case the plunger exceeds its normal travel they can pass easily through the stuffing-box instead of causing the cylinder-head to be broken off.

I do not restrict myself to the specific con-



struction of brushes which I have shown, and modifications and changes may be made without departing from the scope of the invention.

Having thus described my invention, I declare that what I claim as new, and desire to secure by Letters Patent, is—

1. In a hydraulic elevator, the combination with a cylinder, of a plunger connected with the car and having resilient means adapted to engage the interior of the cylinder, substantially as described.

2. In a hydraulic elevator, the combination with a cylinder, of a plunger having means at both ends for preventing lateral vibration, the means at one end being resilient, substantially as described.

3. In a hydraulic elevator, the combination with a cylinder, of a plunger having means at both ends for preventing lateral vibration, the means at the cylinder end being resilient and adapted to engage with the interior of the cylinder, substantially as described.

4. In a hydraulic elevator, the combination with a cylinder, of a plunger connected with the car and having brushes adapted to engage the interior of the cylinder, substantially as described.

5. In a hydraulic elevator, the combination with a cylinder, of a plunger connected with the car and having brushes adapted to engage with the interior of the cylinder, said brushes being rounded, substantially as described.

6. In a hydraulic elevator, the combination with a cylinder, of a plunger connected with the car and having resilient brushes adapted to engage the interior of the cylinder, substantially as described.

7. In a hydraulic elevator, the combination

with a cylinder, of a plunger having its lower end reduced in diameter, and brushes carried on said reduced portion and adapted to engage the interior of the cylinder, substantially as described.

8. In a hydraulic elevator, the combination with a cylinder, of a plunger fitted therein, said plunger having resilient means of larger diameter adapted to engage the interior of the cylinder, and also to pass through the cylinder-head, substantially as described.

9. In a hydraulic elevator, the combination of a cylinder containing a plunger, guides at the top for the upper end of said plunger, means on the lower portion of the plunger adapted to bear against the inside of the cylinder and also to pass through the stuffing-box, substantially as described.

10. In a hydraulic elevator, the combination of a cylinder, a plunger engaging with guides at its upper portion, resilient means on the lower portion engaging with the interior of the cylinder, and means within the plunger for connecting its lower portion with the car, whereby vibration of the plunger is prevented, substantially as described.

11. In a hydraulic elevator, the combination of a cylinder and a plunger, and means on the plunger adapted to engage the interior of the cylinder, and to pass through the stuffing-box, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

THURE LARSSON.

Witnesses:

JULIAN S. WOOSTER,  
GEORGE N. KERR.