

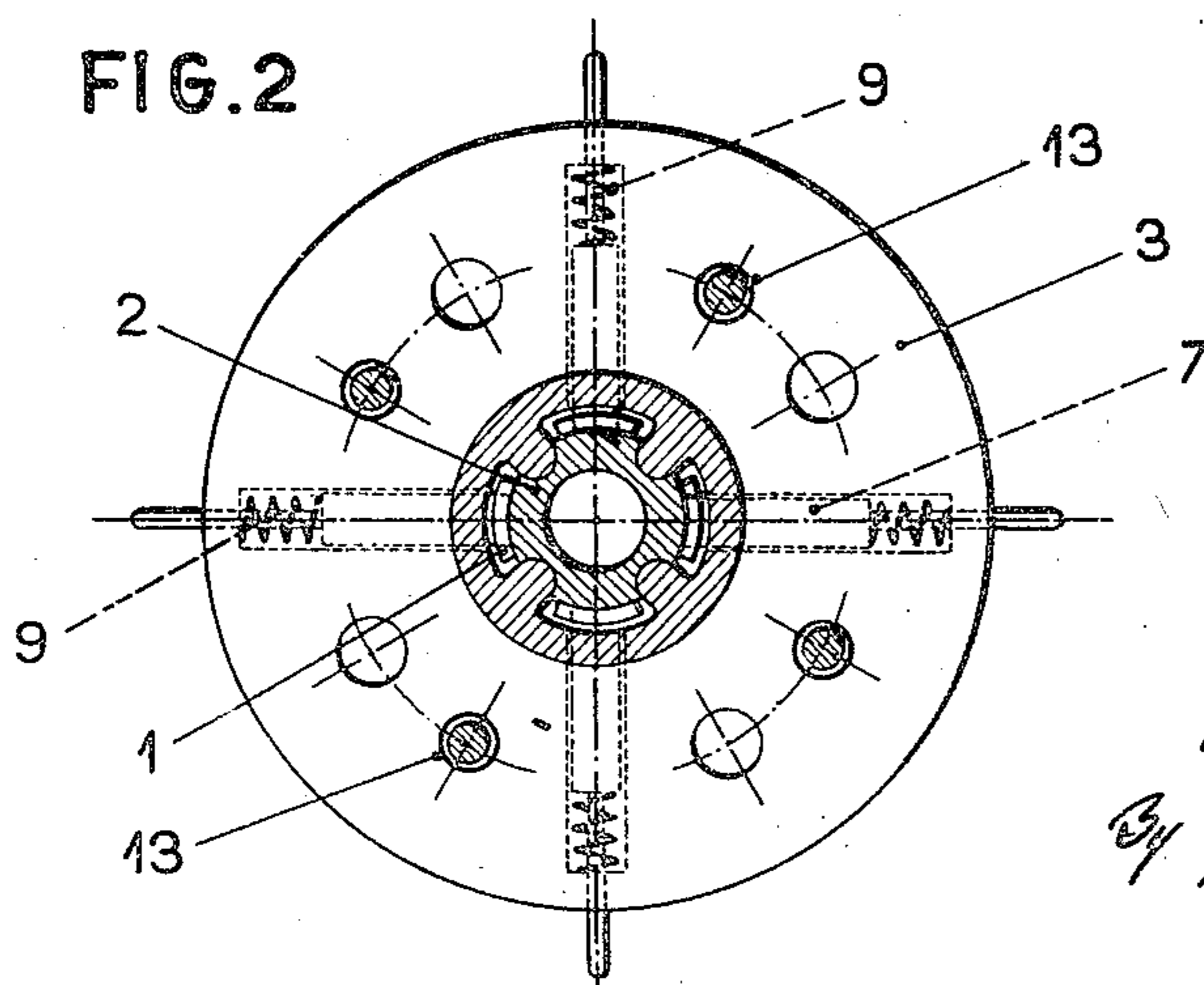
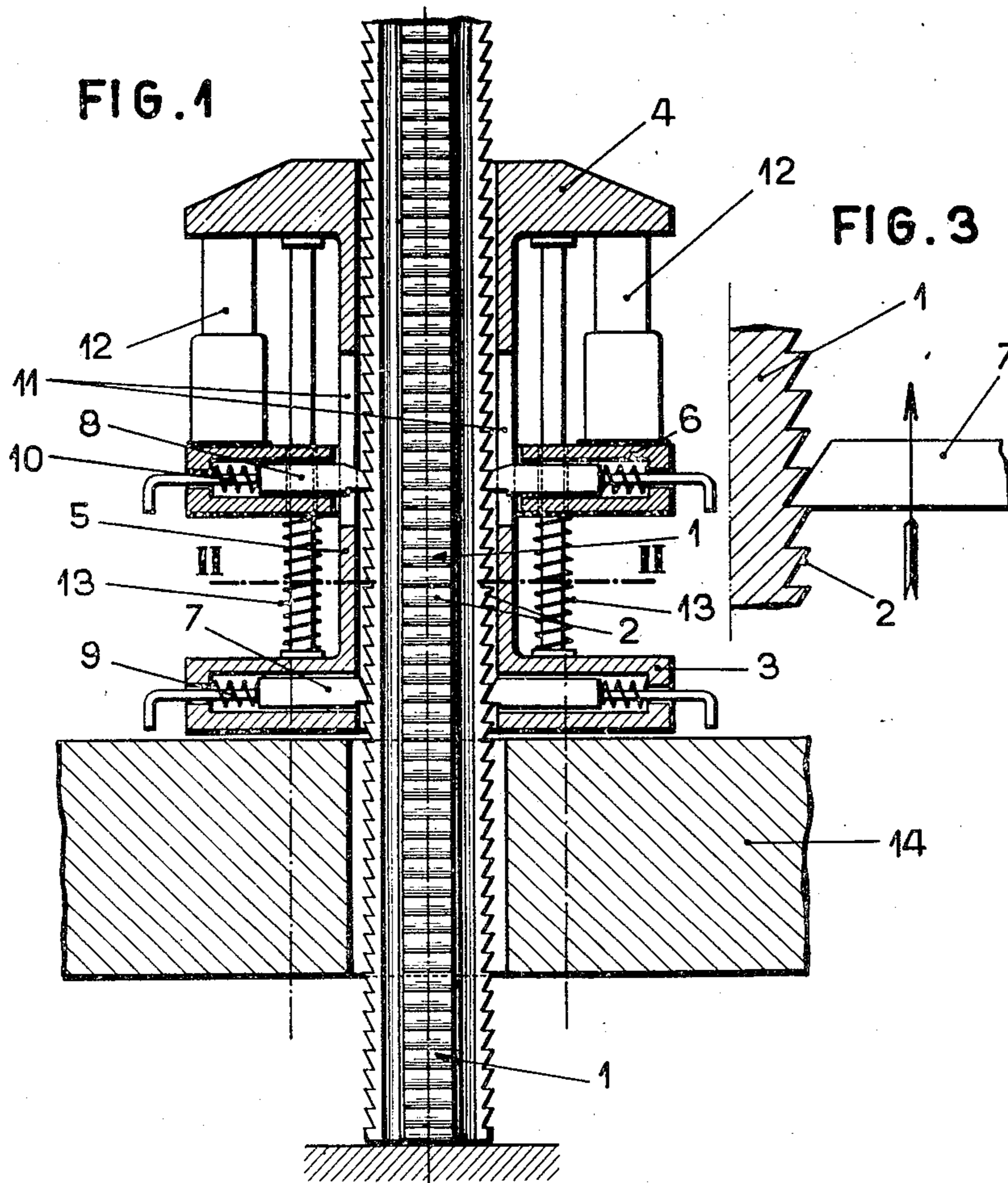
Feb. 6, 1951

B. LAFFAILLE  
LIFTING APPARATUS

2,540,679

Filed April 26, 1946

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

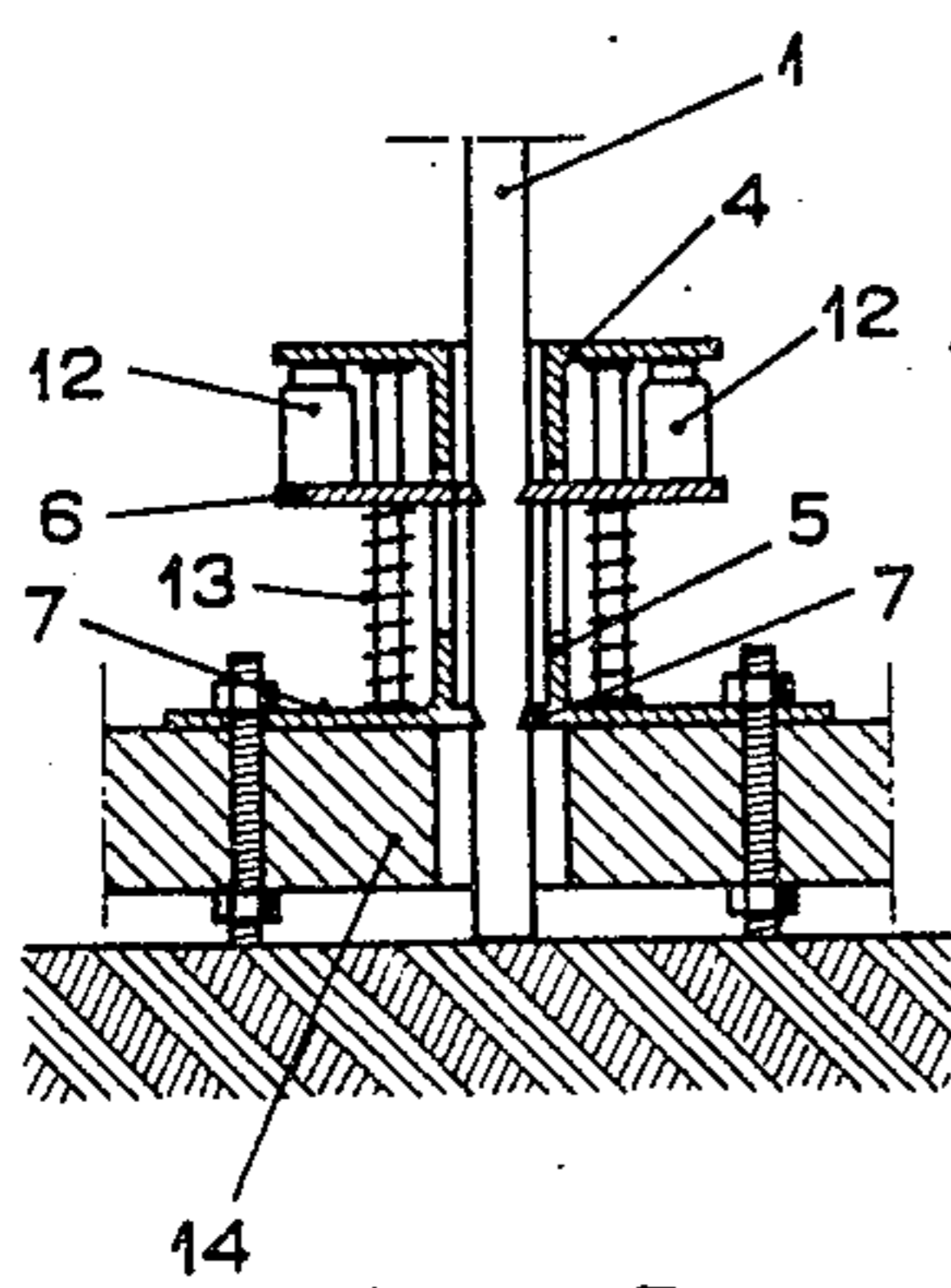


FIG. 4

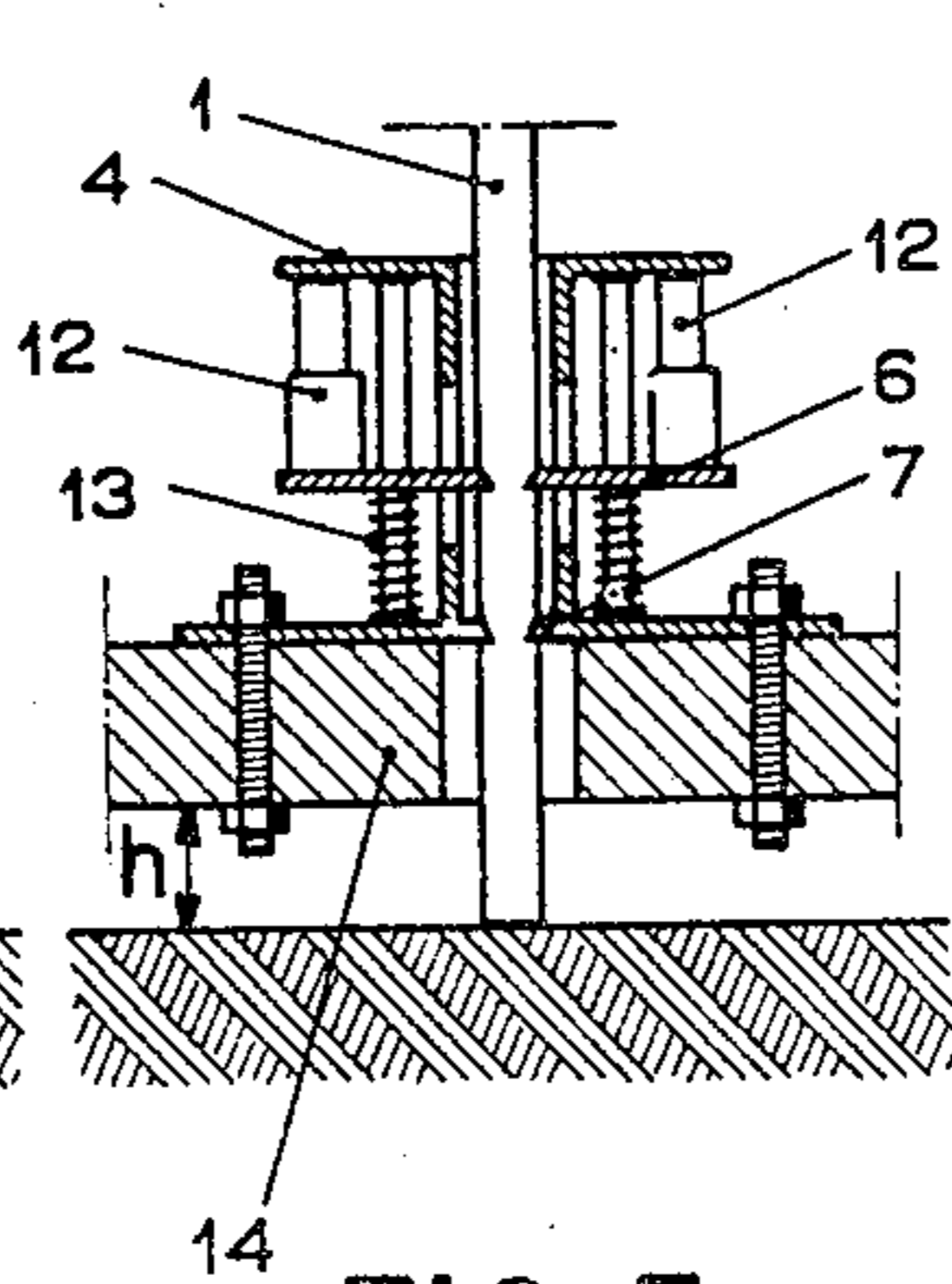


FIG. 5

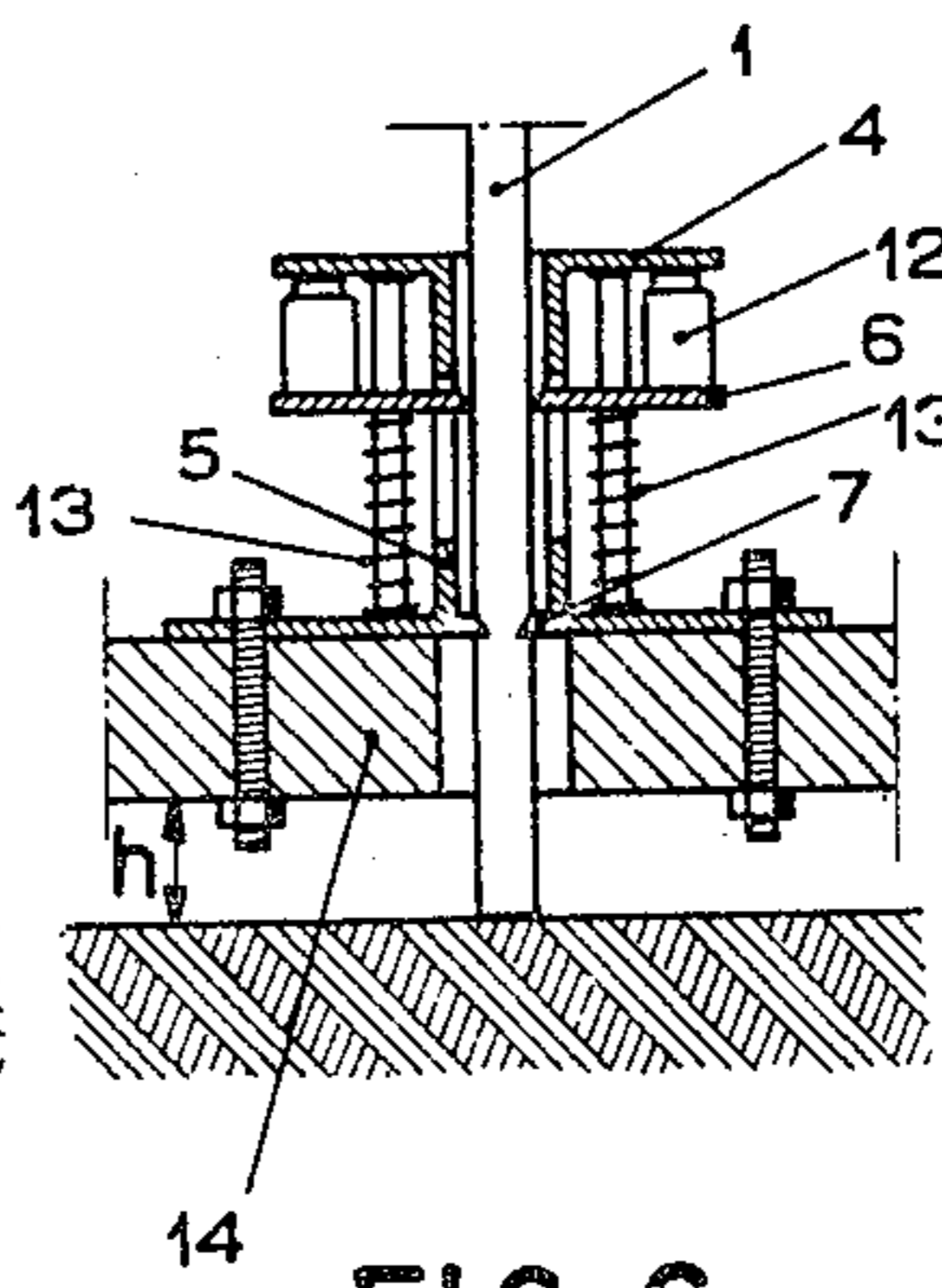


FIG. 6

FIG. 7

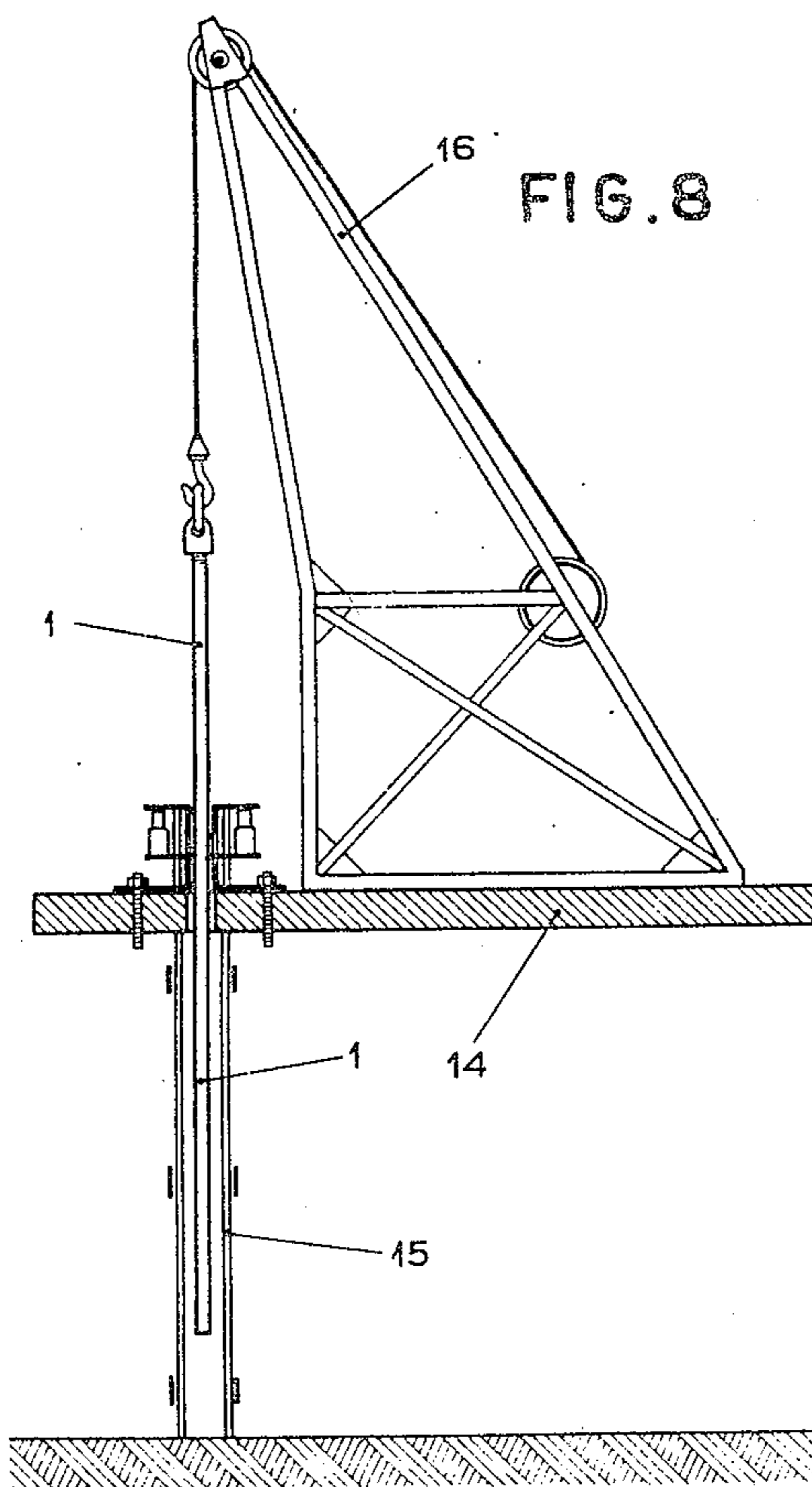
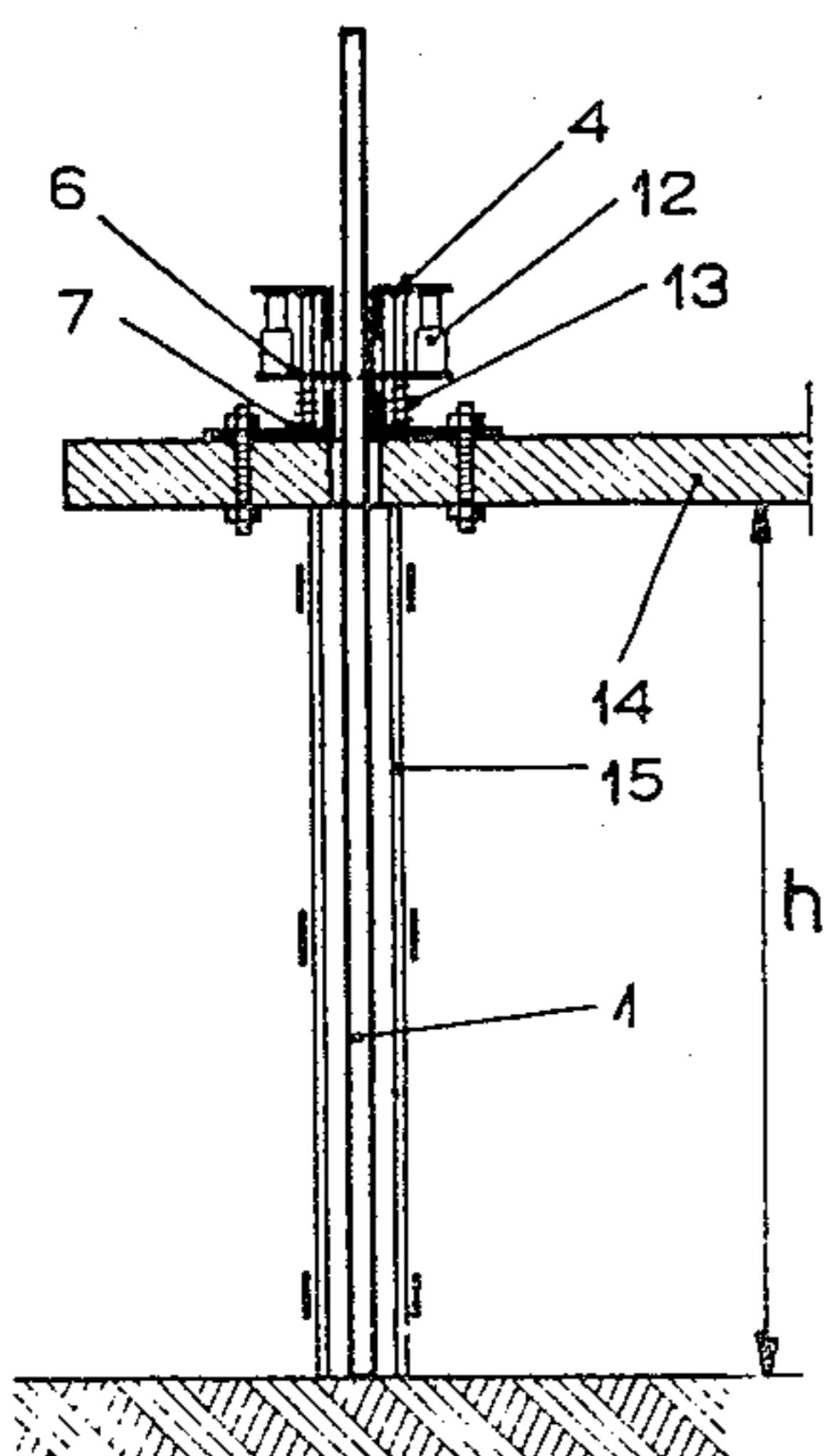


FIG. 8

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## UNITED STATES PATENT OFFICE

2,540,679

## LIFTING APPARATUS

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Application April 26, 1946, Serial No. 665,120  
In France October 24, 1944Section 1, Public Law 690, August 8, 1946  
Patent expires October 24, 1964

2 Claims. (Cl. 254—105)

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The present invention relates to a lifting apparatus more especially designed for the management of considerable loads and essentially characterised by the combination, with a cylinder or column forming a fixed support and having rack teeth on the whole of its height; of two plates set at a distance from each other in the vertical direction, and made rigid with each other by a sleeve surrounding the fixed cylinder, the lower plate serving to secure the load to be raised; of a moving plate capable of sliding along the aforesaid sleeve between the upper plate and the lower plate supporting the load; of lifting jacks, such as screw-jacks, interposed between the moving plate and the upper plate; locking fingers borne, some by the lower plate, the others by the moving plate and gearing with the racks of the fixed cylinder, the fingers being subjected to the action of springs which tend to keep them in mesh; and finally, return springs placed between the moving plate and the lower plate.

In the accompanying drawing, the form of construction of the lifting apparatus forming the subject of the invention has been shown very diagrammatically, this form of construction being given merely by way of example and without limiting the scope of the invention.

Figure 1 is a vertical section through the center line of the apparatus;

Figure 2 is a horizontal section through II—II of Figure 1;

Figure 3 shows the detail of the rack and of a locking finger;

Figure 4 to 6 are diagrammatic arrangements illustrating the functioning of the apparatus;

Figures 7 and 8 are explanatory diagrammatic arrangements.

As can be seen in Figures 1 and 2, the lifting apparatus comprises a fixed cylinder or column 1, supported by its lower end on the ground or on any other suitable surface and having on the whole of its height a definite number (four in the example shown) of rows of rack teeth 2, which, by working with the locking fingers 7 and 8, mention of which will be made hereinafter, form a pawl-and-ratchet arrangement allowing movement in one direction but opposing movement in the opposite direction. Along the cylinder 1 there can be moved an arrangement consisting of a lower plate 3, an upper plate 4 and a sleeve 5 connecting the two plates and making them rigid with each other.

On the sleeve 5 there can be moved in its turn, between the plates 3 and 4, a plate 6.

In the radial housings provided in the plates

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3 and 4 are placed locking fingers (fingers 7 for the plate 3 and fingers 8 for the plate 6) thrust by springs 9 and 10 towards the racks 2 with which they mesh (see Figure 3). Longitudinal slots 11 are provided in the sleeve 5 in order to make way for the fingers 8 of the intermediate moving plate and to allow relative movements of the said plate and of the whole 3—5—4.

Between the intermediate plate 6 and the upper plate 4 screw-jacks 12 are placed in a convenient number and of a type suitable for the magnitude of the loads to be raised.

Finally, return springs 13 are also housed between the plates 3 and 6.

The method of functioning of this apparatus is as follows:

The load 14 to be raised is secured to the lower plate 3. The fingers 8 of the plate 6 are in mesh with the racks 2 of the cylinder 1. Under these conditions the plate 6 is supported on the cylinder and is therefore immobilised. Then the screw-jacks 12 are operated and these, supported on the intermediate plate 6, raise the upper plate 4. Through the medium of the sleeve 5 the plate 4 draws the plate 3 upwards and with it the load 14 to be raised. During this operation the locking fingers 7 of the lower plate 3 behave as pawls and slip on the racks 2 while opposing any downward movement of the plate 3 and of the parts which are rigid with it. (See Figure 3.)

Figure 5 shows very diagrammatically the state of the apparatus when the screw-jacks 12 are at the end of their travel, the load 14 having been raised by a height  $h$  corresponding to the extension of the screw-jacks.

The locking fingers 7 of the lower plate being, by construction, in mesh with the racks, at this instant, the aforesaid plate is immobilised at that height with the load 14.

The screw-jacks are then brought back to their starting condition. In this operation the intermediate plate 6 rises along the sleeve 5 under the action of the return springs 13, which become slackened while the screw-jacks are resuming their original condition. During the raising of the plate 6, the locking fingers 8 of this plate slip on the racks, acting as pawls, until the said plate has resumed its starting position (Figures 4 and 6) with respect to the upper plate 4. At the end of the upward movement, starting conditions again are obtained with the difference that the load has been raised by a height  $h$ . When this height  $h$  is reached, the final construction support is placed into position, a support which may be for example a hollow pillar 15 (Figure 7) capable

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of supporting the load in the place of the column 1.

It is sufficient to repeat the operation hereinbefore described as many times as may be necessary in order to bring the load to the required height.

It must also be noted that in order to repeat a lifting operation, it is necessary to remove the cylinder 1 after placing the supports 15 into position. For this purpose the cylinder 1 is raised, as can be seen in Figure 8, with the help of a crane 16, after having disengaged the fingers 7 and 8 to allow the racks to slide freely inside the sleeve 5.

In this construction, the arrangement of the lifting apparatus according to the invention lends itself to an extremely strong construction, permitting the handling of heavy loads under conditions of perfect safety.

It is obvious that the details of construction described and shown have been given only by way of an example of the possibilities of carrying out the invention and that the details in question could be modified in various ways, or that certain of the arrangements could be replaced by equivalent arrangements without the scope of the invention being thereby altered.

What I claim is:

1. A lifting apparatus particularly for heavy loads comprising in combination a cylinder forming a fixed support and having throughout its entire height rack teeth, a first element for carrying a load capable of being displaced from bottom to top of said rack, means coacting with said first element normally preventing the descent of this element carrying the load, a second element capable of being displaced upwardly and downwardly with relation to said first element carrying the load, and at least one jack interposed between said first and second elements and operable therebetween for raising said first element by taking support upon said fixed support.

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2. A lifting arrangement particularly for heavy loads comprising in combination a cylinder forming a fixed support and having throughout its height rack teeth, a first element for carrying the load capable of being displaced from the bottom to the top of said rack and comprising two plates separated vertically from one another by a predetermined distance and connected to one another by a coupling encircling said fixed cylinder, said coupling having elongated slots there-through a first series of spring catches cooperating with said first element and the rack of said fixed cylinder and normally preventing the descent of the element carrying the load, a second element formed by a movable plate capable of being displaced along said coupling between the upper of said plates and the lower of said plates, said second element having openings there-through a second series of spring catches slidably arranged in said openings in said second element and cooperating with the rack of said fixed cylinder through said slots in said coupling and normally preventing the descent of said second element, fluid jacks permitting raising said first element by taking support upon the fixed support through the intermediary of said second element fixed to said support by the said second mentioned catches, and return springs resting upon said first element and serving for raising said second element when fluid contained in said jacks is liberated.

BERNARD LAFFAILLE.

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