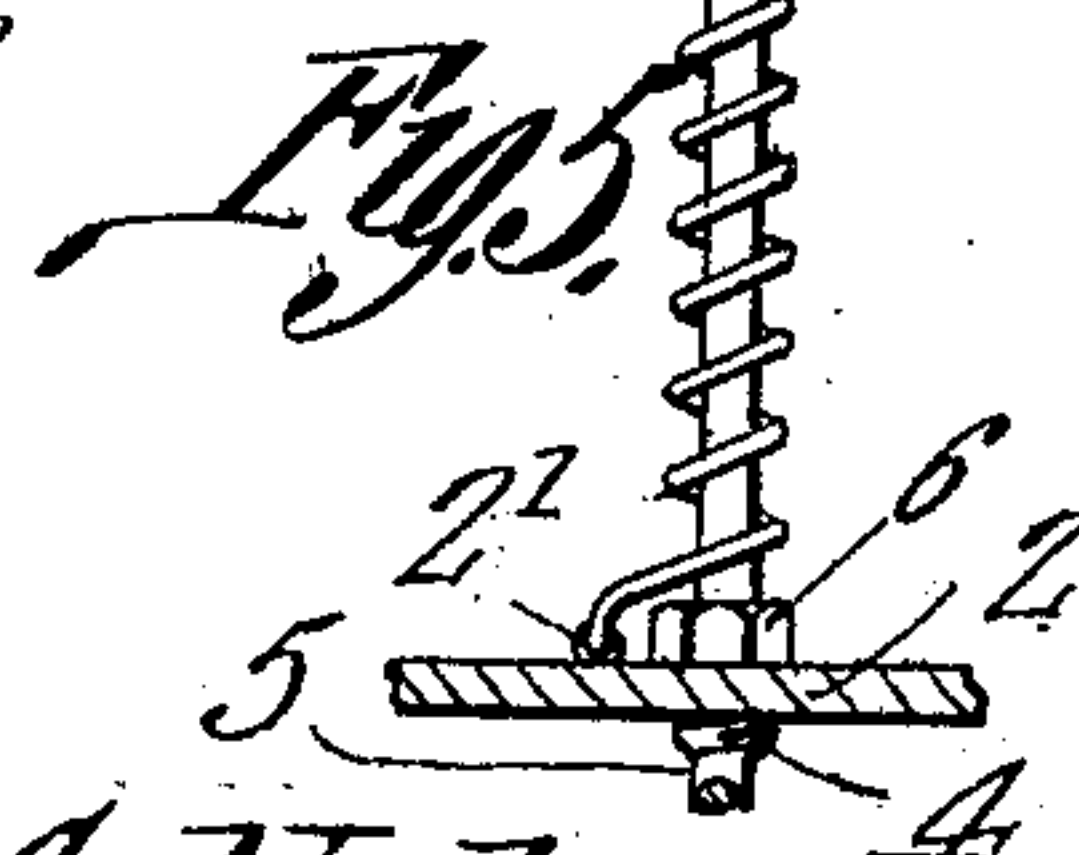
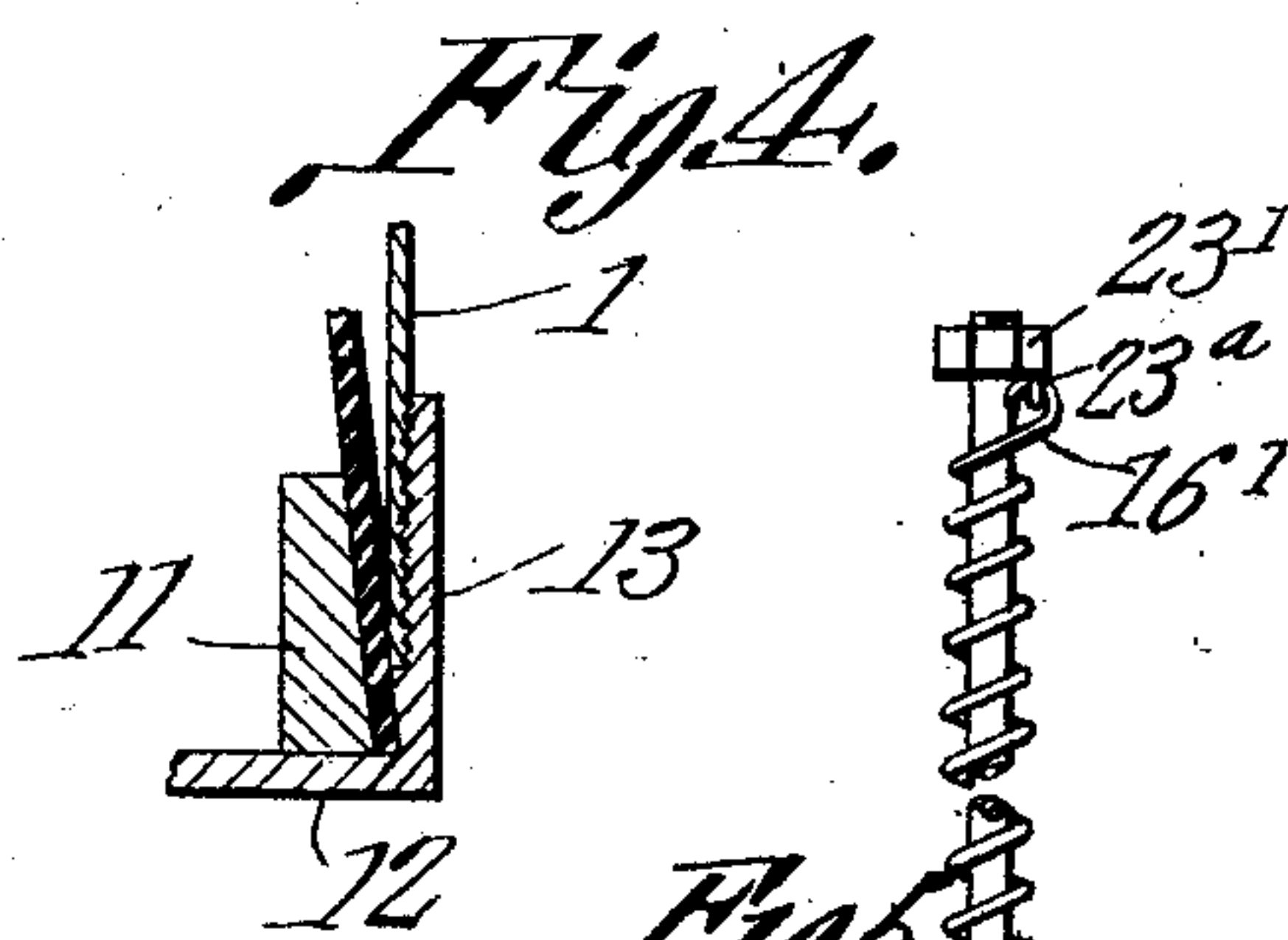
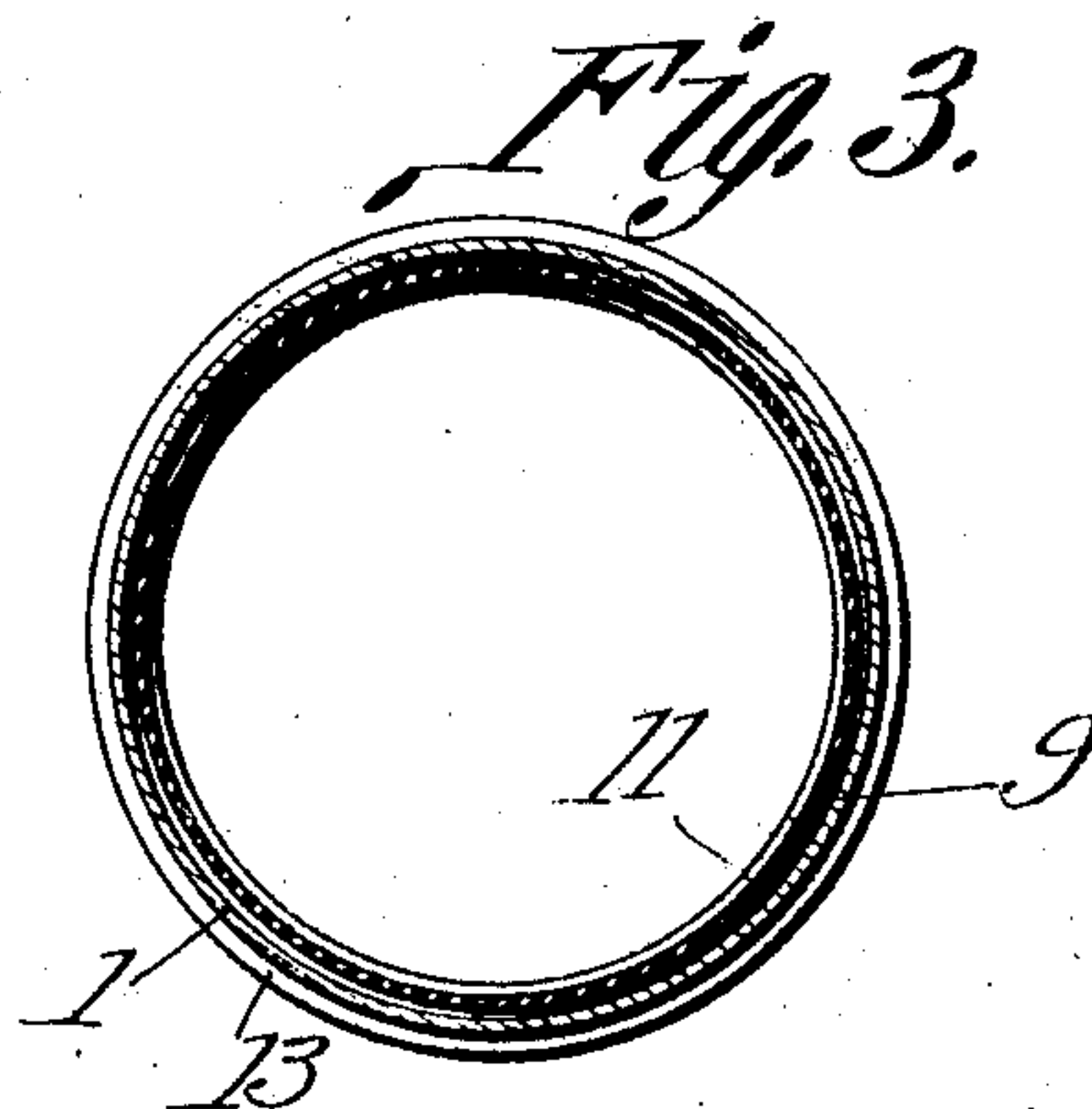
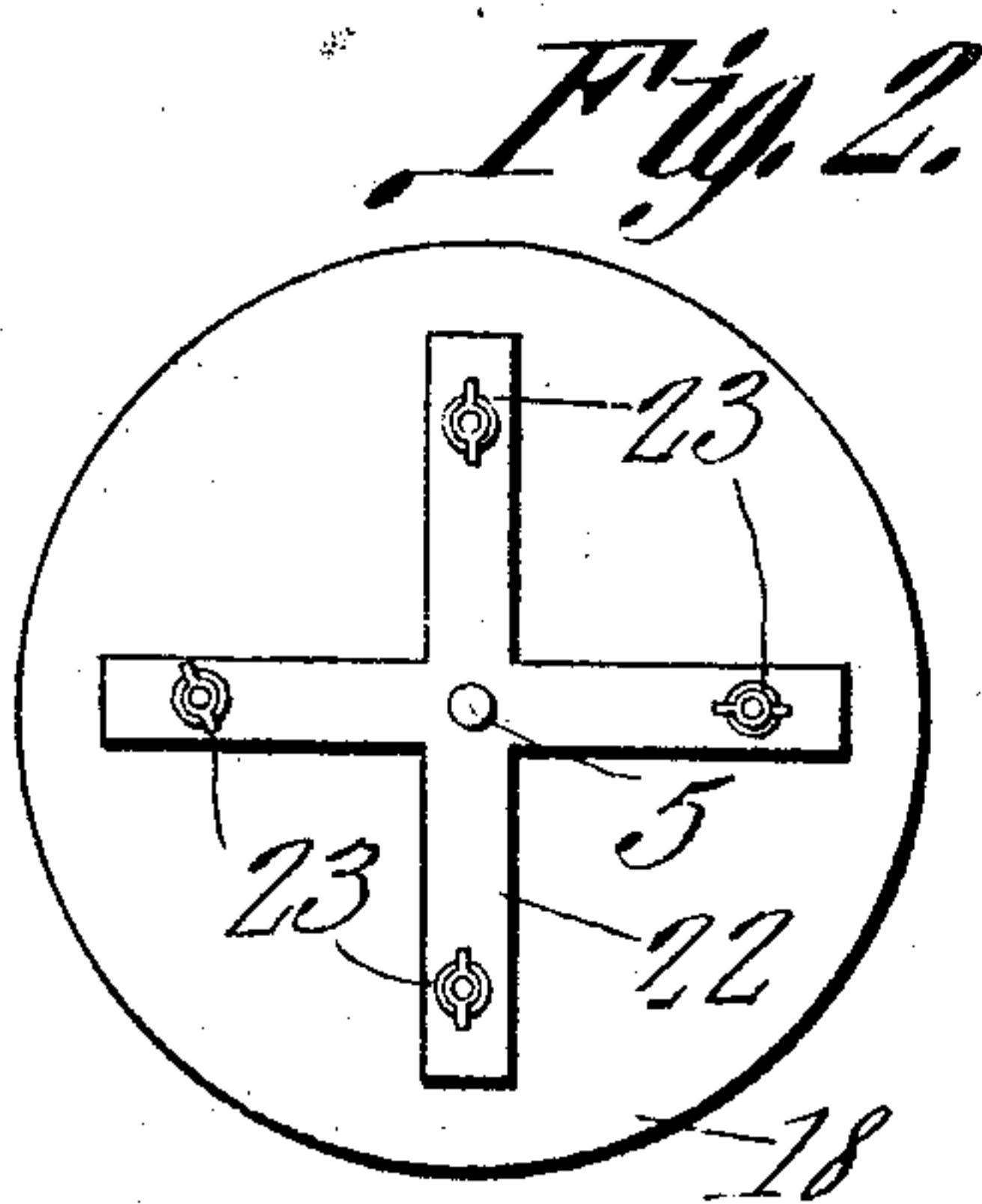
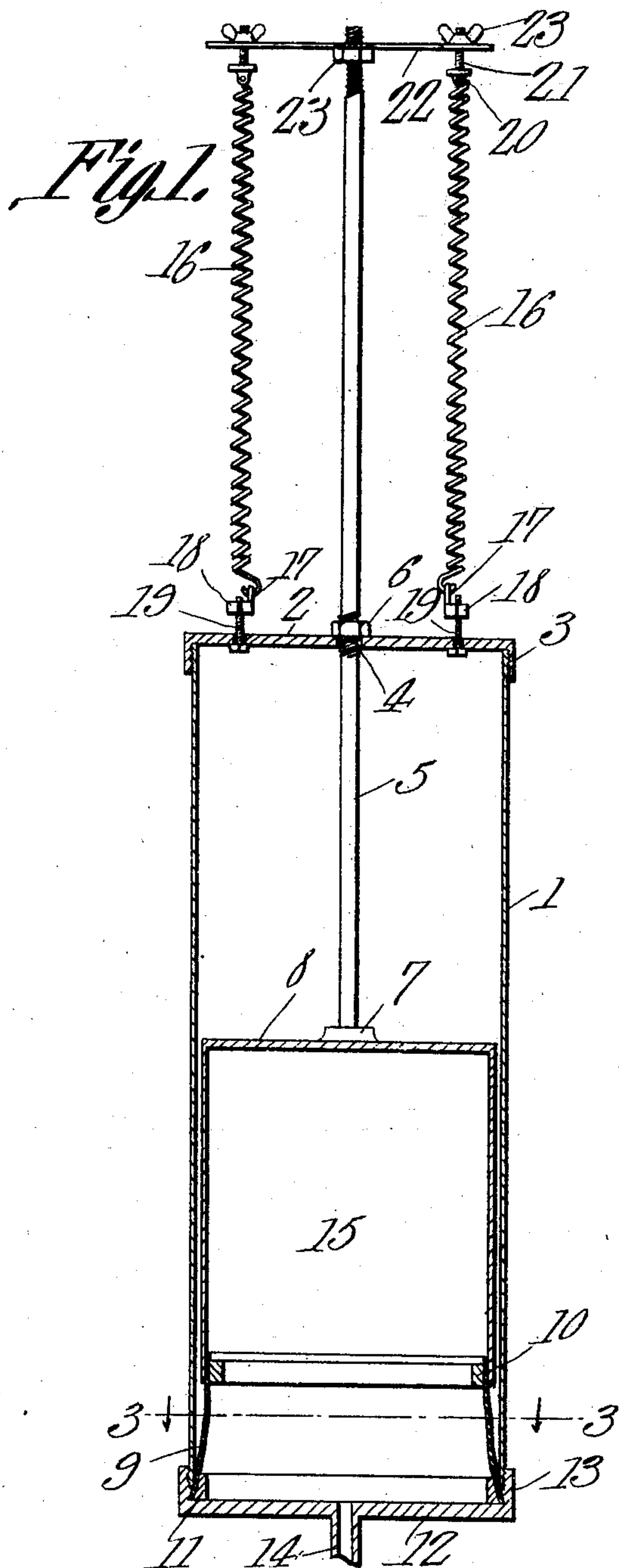


R. C. NELSON.
PRESSURE REGULATOR.
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978,925.

Patented Dec. 20, 1910.



Witnesses

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UNITED STATES PATENT OFFICE.

REUBEN C. NELSON, OF HEALDSBURG, CALIFORNIA.

PRESSURE-REGULATOR.

978,925.

Specification of Letters Patent.

Patented Dec. 20, 1910.

Application filed May 25, 1910. Serial No. 563,385.

To all whom it may concern:

Be it known that I, REUBEN C. NELSON, a citizen of the United States, residing at Healdsburg, in the county of Sonoma and State of California, have invented a new and useful Pressure-Regulator, of which the following is a specification.

This invention relates to pressure regulators such as are adapted particularly for use in connection with steam boilers, although the device of the present invention can be used in other connections if desired.

The object of the invention is to provide a strong, simple, durable and inexpensive pressure regulator which will act delicately and without friction and which is thoroughly practical and efficient in operation.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of invention herein disclosed can be made within the scope of the claim without departing from the spirit of the invention.

In the accompanying drawings forming part of this specification:—Figure 1 is a vertical section partly in elevation, through a pressure regulator constructed in accordance with the present invention. Fig. 2 is a plan view thereof. Fig. 3 is a cross section on the line 3—3 of Fig. 1. Fig. 4 is an enlarged detail view showing one of the lower corners of the device. Fig. 5 is a detail view of a modified construction.

Like reference numerals indicate corresponding parts in the different figures of the drawings.

The pressure regulator of the present invention is constructed with a tubular casing 1 which is provided at its upper end with a removable cap 2, the means for removing the cap preferably consisting of a depending annular flange 3 which is threaded onto the outside of the casing 1. The cap 2 is provided centrally with an opening 4 through which loosely extends a piston rod 5, the rod 5 being limited in its downward movement by means of a nut 6 which is threaded on the rod 5 so as to be capable of adjustment thereon. By reason of the fact that the piston rod 5 extends loosely through the opening 4 in the cap 2, it will be obvious that no friction occurs at that point during the

up and down movement of the piston rod 5 when the piston thereof is responding to the changes in pressure. The piston rod 5 at its lower end is connected at 7 with a cup shaped piston 8, the opening in which is directed toward the lower end of the casing 1. Extending into the open end of the cup shaped piston 8 is a tubular member 9 which is formed preferably of pure rubber or other equivalent elastic material. The rubber tube 9 is held in a water-tight manner within the cup shaped piston 8 by means such as the metallic ring 10 which is forced into position inside the rubber tube 9 and holds the same securely in position. At its lower end, the rubber tube 9 is secured to the walls of the tubular casing 1 in any suitable manner. In the form of invention illustrated, the means for securing the lower ends of the tubular member 9 in position consists of a ring 11 which is wedge shaped in cross section and is fitted into the lower end of the tubular member 9 so as to expand the same tightly into engagement with the inner wall of the casing 1. The means for forcing the wedge shaped ring 11 into position inside the rubber tube 9 preferably consists of a cap member 12 which is provided externally with an upstanding annular flange 13 interiorly threaded to fit the exterior threads of the casing 1. When the cap 12 is screwed into position upon the casing 1 it serves to force the wedge shaped ring tightly into the tubular member 9 and thus grip the same in a secure and water-tight manner in the lower end of the casing 1. Extending centrally through the cap 12 is a pressure pipe 14 which is in communication with the boiler or other element in which the pressure is to be regulated. The excess of pressure in the boiler causes water to pass or back through the pipe 14 and into the elastic or stretchable chamber which includes the tubular walls 9. The water pressure serves to raise the piston 8 and piston rod 5. The power for regulating the boiler pressure may be taken from the piston rod 5 in any suitable manner and as this forms no particular part of the present invention it is not specifically illustrated or described herein.

The means for counterbalancing the pressure in the expansion chamber 15 preferably comprises a plurality of springs 16 each of which at its lower end is connected with an eye 17 mounted upon a nut 18 which is threaded upon a bolt 19 that extends

through the upper cap 2 of the casing 1. At its upper end, each of the springs 16 is connected with an ear or lug 20 mounted on a bolt 21 which extends through a lateral arm 22 mounted upon the piston 5 and is provided at its upper end with a wing nut 23 by means of which the tension of each individual spring 16 may be adjusted so that all of said springs will be under equal tension. Any desired number of springs 16 may be employed. In the embodiment of invention illustrated four of these springs are used, and two cross pieces 22 are employed, said cross pieces being integrally connected with each other adjacent their centers so as to form a spider member mounted upon the piston rod 5, said spider member being held against downward displacement upon the said piston rod by means of a nut 25 which is threaded onto the piston rod 5 and can be moved upward or downward for the purpose of increasing or decreasing the tension of all the springs 16 in a simultaneous manner. The springs 16 serve not only to counteract the effects of normal pressure in the pressure or expansion chamber 15 but said springs also serve to hold the piston rods 5 in a central position within the opening 4 in the upper cap 3 of the casing 1. By holding the piston rod in a central position, said rod is prevented from contacting with the walls of the opening 4 and friction is thereby avoided.

It will be noted from Fig. 1 of the drawings that the cup shaped piston 8 is so loosely mounted within the casing 1 that its walls are annularly separated from the walls of said casing. This loose construction is permitted by reason of the fact that the tubular elastic walls 9 serve to prevent the escape of pressure around the piston 8. By reason of the loose fitting of the piston within the casing, friction between said member is avoided and the pressure regulator of the present invention is thereby caused to act in a very delicate or sensitive manner.

In the modified construction shown in Fig. 5, the four springs 16 are omitted and a single spring 16' is used. This spring surrounds the rod 5 and is secured at its lower end at 2' on the casing head 2 and at its upper end at 23^a to the nut 23'.

What is claimed as new is:—

A pressure regulator comprising a tubular casing having a cap threaded on the upper end thereof said cap being formed in its center with an opening, a piston rod extending loosely through said opening and having a nut adjustable thereon to engage the upper surface of said cap to limit the downward movement of said piston rod, a cup shaped piston mounted on the lower end of said rod within said casing and being annularly separated from the walls of said casing, a rubber tube fitted into the lower open end of said cup shaped piston, a ring fitted into said rubber tube for holding it in place in said cup shaped piston, a wedge shaped ring fitted into the lower end of said rubber tube and clamping the same firmly against the interior of the lower ends of said casing, a cap screwed on the lower end of said casing and engaging said wedge shaped ring to hold said rubber tube in place, a pressure pipe extending through said last named cap, a plurality of lateral arms on the upper end of said piston rod, means for adjusting said arms longitudinally on said rod, bolts adjustably mounted on the outer ends of said lateral arms, springs connected at their upper ends with said bolts, and bolts extending through said first mentioned cap and having nuts on the upper ends thereof provided with ears in engagement with the lower ends of said springs.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

REUBEN C. NELSON.

Witnesses:

E. D. EBY,
W. C. PETERS.