

No. 696,208.

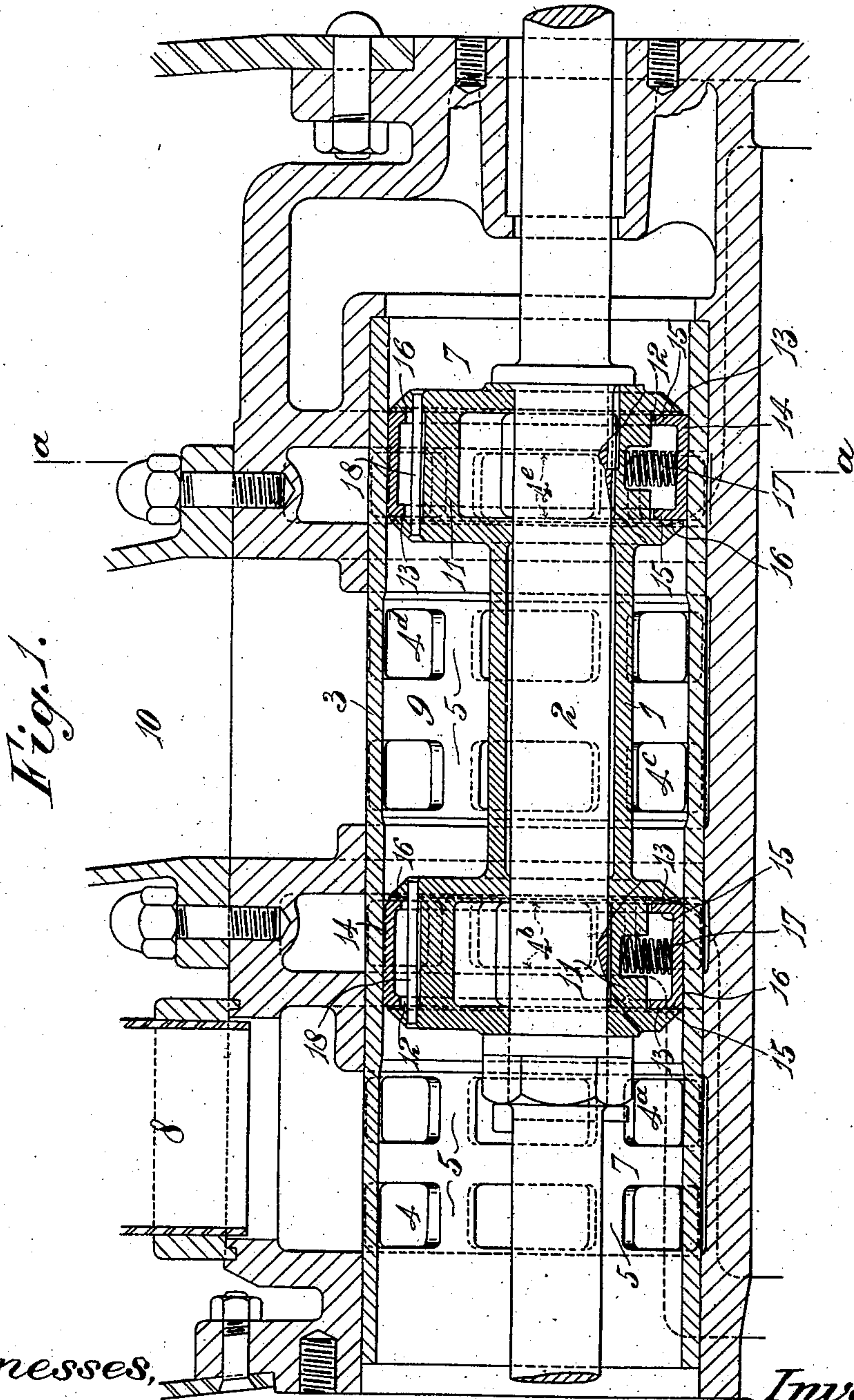
Patented Mar. 25, 1902.

A. SPENCER.
PISTON VALVE.

(Application filed Dec. 13, 1900.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses,

R. Pearson
W. H. Humphrey.

Inventor,

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by A. V. Kerwin
Att'y.

No. 696,208.

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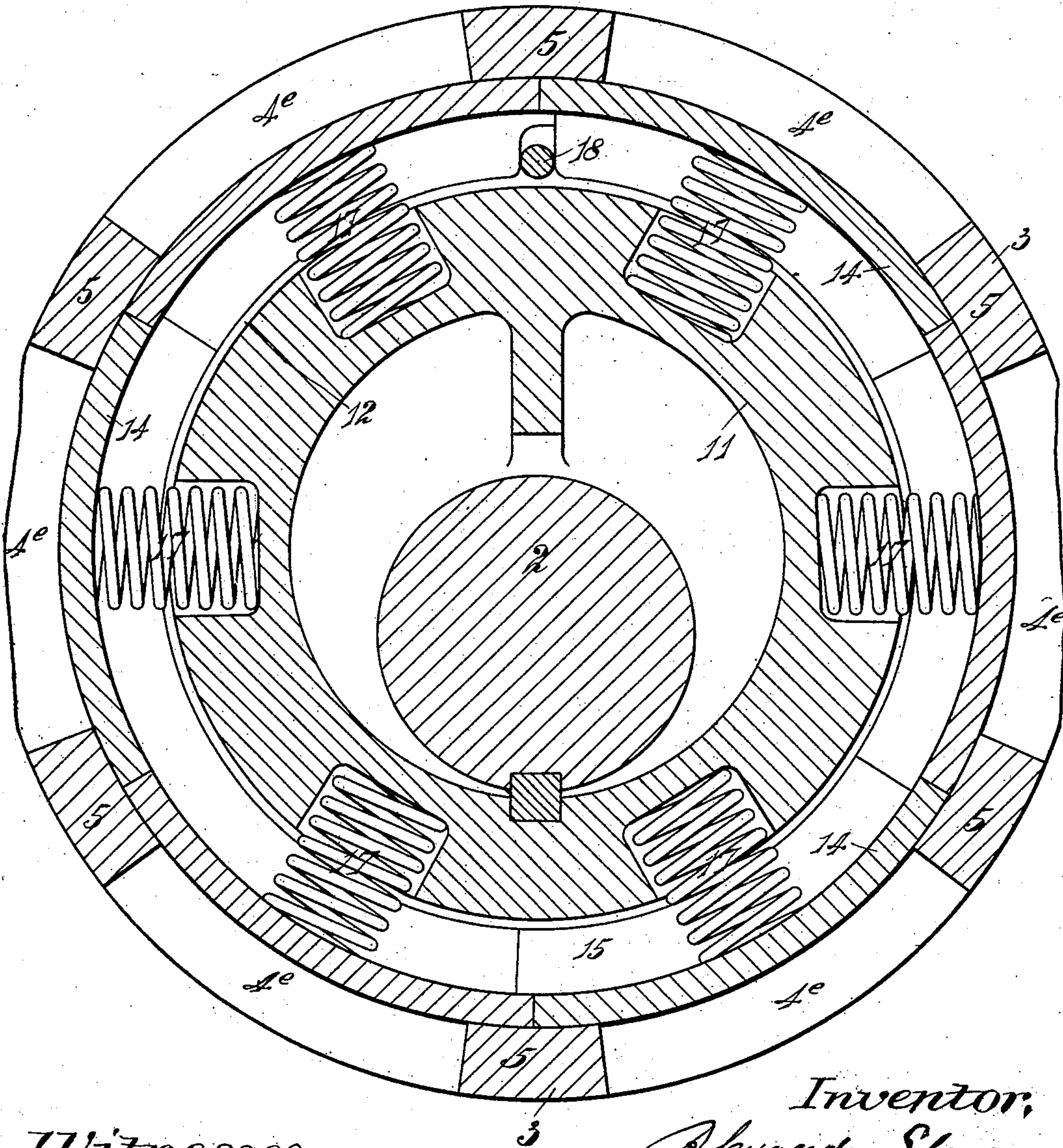
A. SPENCER.
PISTON VALVE.

(Application filed Dec. 13, 1900.)

(No Model.)

4 Sheets—Sheet 2.

Fig. 2.



Witnesses,
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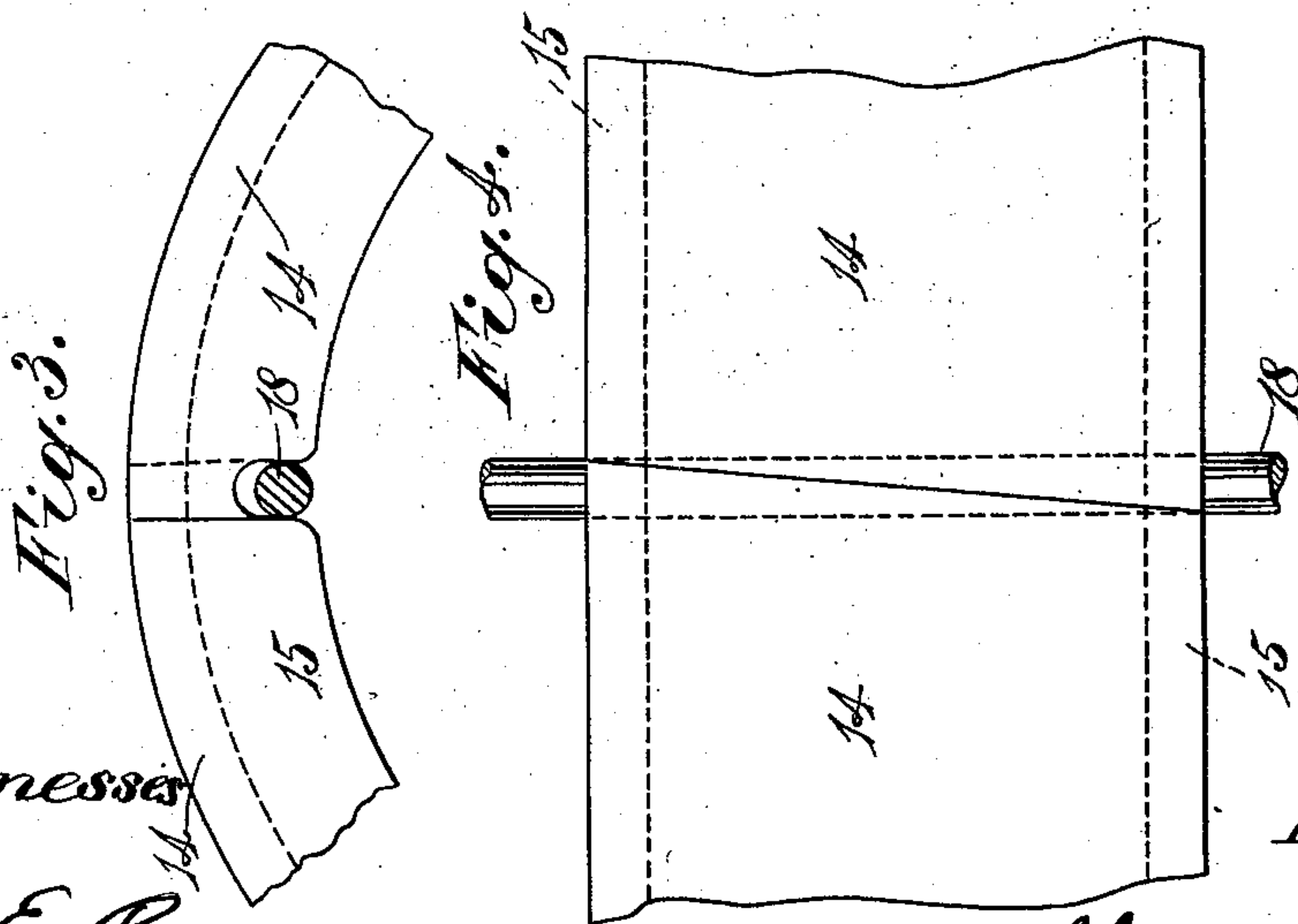
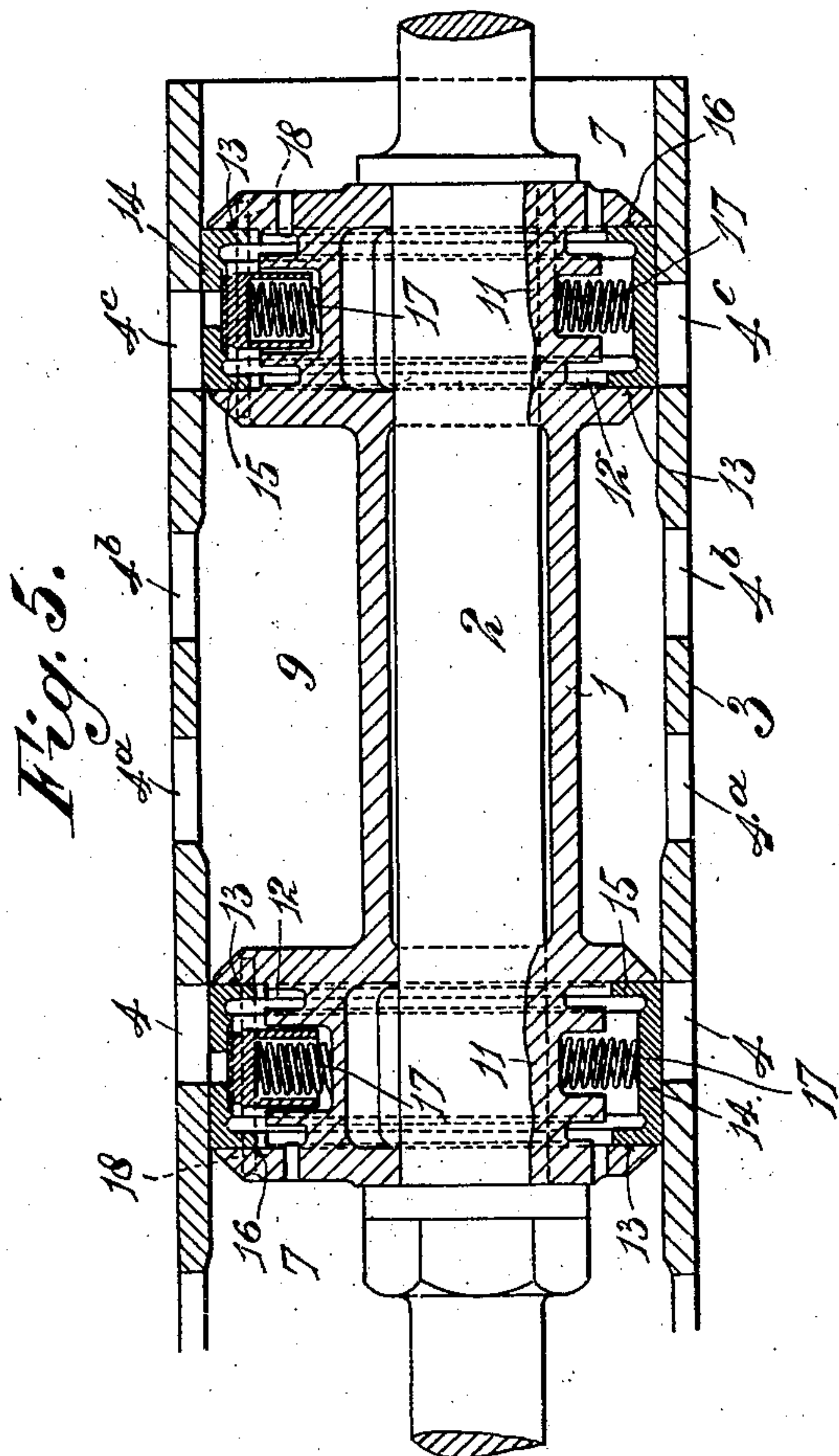
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A. SPENCER.
PISTON VALVE.

(Application filed Dec. 13, 1900.)

(No Model.)

4 Sheets—Sheet 3.



Witnesses

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No. 696,208.

Patented Mar. 25, 1902.

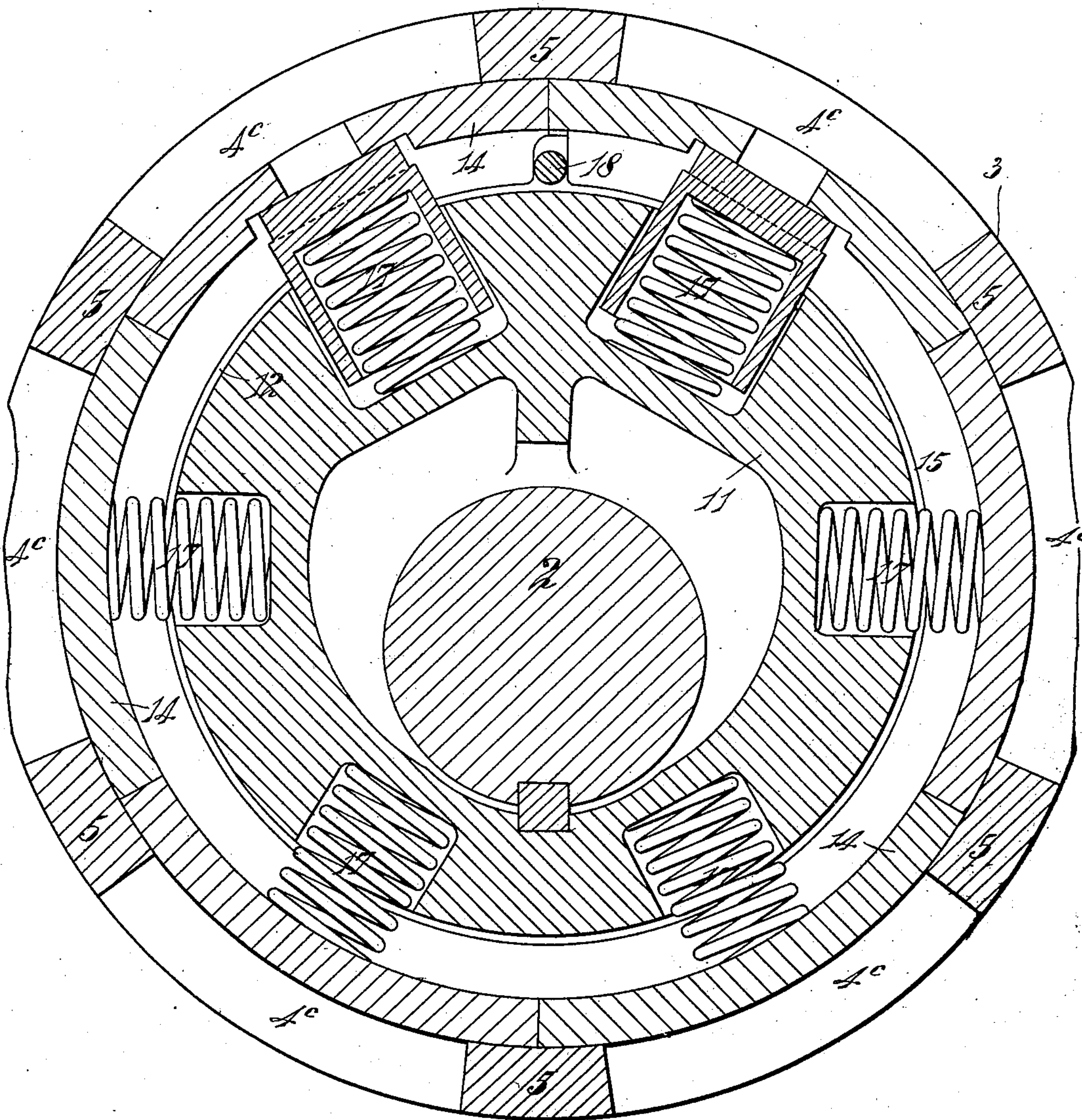
A. SPENCER.
PISTON VALVE.

(Application filed Dec. 13, 1900.)

(No Model.)

4 Sheets—Sheet 4.

Fig. 6.



Witnesses,

R. V. Carson
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Inventor,

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UNITED STATES PATENT OFFICE.

ALEXANDER SPENCER, OF LONDON, ENGLAND.

PISTON-VALVE.

SPECIFICATION forming part of Letters Patent No. 696,208, dated March 25, 1902.

Application filed December 13, 1900. Serial No. 39,680. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER SPENCER, a subject of the Queen of Great Britain and Ireland, residing at London, England, have
5 invented Improvements in and in Connection with Pistons Suitable for Use as Piston-Valves and as Engine, Pump, and Like Pistons, of which the following is a specification.

This invention has reference to an improved
10 and simple construction of piston suitable for use as a piston-valve or as an ordinary engine, pump, or like piston, whereby a practically fluid-tight joint can be maintained between the spaces at the respective sides of the
15 piston without the necessity of using tongues or equivalent auxiliary jointing means such as have heretofore usually been employed for preventing the passage of steam or other fluid from one side of the piston to the other side
20 thereof through the space or spaces ordinarily left between the ends of the split packing-ring or between the several parts of a segmental packing-ring on such piston.

The accompanying drawings illustrate, by
25 way of examples, piston-valves suitable for use in the valve-chest of a locomotive-engine.

Figure 1 is a longitudinal section; Fig. 2, a transverse section on the line *a a*, Fig. 1; and Figs. 3 and 4 are detail views hereinafter
30 referred to. Figs. 5 and 6 are corresponding views to Figs. 1 and 2, respectively, of a modified construction. Figs. 1 and 5 are drawn to a smaller scale than the other figures.

In each of the piston-valves illustrated there
35 are two compound piston-valves of the kind hereinafter described connected by a common sleeve 1 and fixed upon a valve-spindle 2, that extends through them and which, though shown arranged eccentrically to the valves,
40 may be arranged concentrically thereto, if desired. The two connected compound valves are arranged to slide in a liner 3, formed with parallel annular rows of ports 4 4^a 4^b 4^c 4^d 4^e. The ports in each annular row are separated
45 by straight longitudinally-arranged bridge-pieces 5, and the spaces 7 7 at the two ends of the liner at the outer sides of the two compound valves are in communication with the steam-supply pipe or passage 8, and the space
50 9 within the liner and between the two compound piston-valves is in communication with the exhaust 10.

Each piston-valve comprises according to

this invention a piston-body 11, connected to the sleeve 1 (or equivalent) and formed with
55 an annular groove 12, the opposite annular side surfaces 13 of which are made flat and smooth, and a series of arc-shaped segmental slide-valves 14, having the same radius as the valve seat or liner 3, in which they are
60 to work. The valves 14 are made with slightly inclined or beveled ends, as shown in Fig. 4, and with side flanges 15, the outer surfaces 16 of which are also made flat and
65 smooth. These slide-valves are fitted in the annular groove 12, so as to bear closely against one or other, or both, of the opposite annular sides 13 of the said groove, and are made of such peripheral length that the adjacent in-
70 clined or beveled ends of each adjacent pair fit practically close against one another, the sum of the whole of the spaces between the ends of the several segmental slide-valves 14 amounting to, say, not more than about one
75 one-hundred-and-twenty-eighth of an inch. The annular groove 12 and the side flanges 15 are made of such radial depth that a fluid-tight joint will be formed between their ad-
80 jacent flat surfaces 13 and 16, respectively, when they are pressed together. The segmental slide-valves 14 are pressed outward and into close contact with the valve seat or liner 3 by suitable springs 17, such as coiled
85 springs, interposed between them and the body of the piston, such action being assisted or not, as may be desired, by steam or other fluid under pressure admitted to the inner side of the slide-valves 14. The slide-valves
90 14 are prevented from turning around the piston-body by suitable means, such as a pin 18, that extends across the groove 12 and passes through radial slots (see Fig. 3) formed in the opposite flanges on two of the adjacent
95 slide-valves 14 by cutting away the inner end portions of the said flanges. The pin 18 is fixed in the opposite side walls of the groove. In this way there is formed a compound piston-valve having an annular series of slide-
100 valves that not only make a fluid-tight joint with the piston-body and the valve seat or liner, in which the compound valve works, but also with themselves without the aid of additional jointing devices.

The bridge-pieces 5 of the valve seat or liner 3 are equal in number to the inclined or
105 beveled planes of division between the ad-

adjacent ends of segmental slide-valves, the adjacent end portions of the said slide-valves working against the said bridge-pieces when the compound valve is moving over the ports.

5 The segmental slide-valves 14 may conveniently be made from wide internally-grooved valve-rings, the external peripheries and sides of which are first turned to respectively fit the interior of the cylindrical valve seat or
10 liner 3 and the groove 12. From such valve-rings segments are then cut of such peripheral length that when a suitable number of them are placed together within and around the groove in the piston-body there will be
15 practically no or very little space between their adjacent inclined or beveled ends. Conveniently there may be six segmental slide-valves of an equal peripheral length of practically sixty degrees each on a grooved piston-body, five of them being cut, as by saw-
20 ing, from one turned valve-ring of the kind referred to and the remaining one being cut from another similar turned valve-ring.

In the examples illustrated the inner flanged
25 side of each segmental slide-valve will, owing to there being a greater steam-pressure in the spaces 7 than in the space 9, be pressed close against the adjacent annular surface of the inner wall of the groove 12 containing such
30 slide-valve, so as to form a fluid-tight joint therewith, while the adjacent ends of the slide-valves will be so close together as to effectually prevent the passage of steam between them.

35 When it is desired that the compound piston-valve shall provide for the ready escape of water of condensation from a cylinder through the cylinder-ports controlled by such valve, the latter may be provided with a relief-valve adapted when subjected to sufficient water-pressure to open and allow of the escape of the water from the cylinder through the body of the piston-valve. One arrangement for this purpose is shown in Figs. 5 and
40 6, wherein two of the segmental slide-valves 14 of each of the compound piston-valves are each formed at the central portion with a hole 20, that is normally closed by a relief-valve in the form of a hollow cylinder 21, closed at
50 its outer end, which is pressed against the perforated portion of the slide-valve by a coiled spring 22, arranged between the said outer end of the cylinder and the body 11 of the piston-valve. Instead of two of the valves
55 being provided with relief-valves one or more than two may be so provided. The piston-valve body is formed on the steam side with one or more relief ports or passages 23, through which water of condensation can escape into the steam-chest when the relief valve or valves is or are forced inward by such water and through which steam can enter the annular space at the inner side of the slide-valves and assist in forcing them outward
65 against the valve-seat against which they work.

A piston having a segmental packing-ring

constructed and arranged as described may advantageously be used in the cylinders of engines, pumps, and the like. In this case the
70 pin for preventing rotation of the segmental slide-valves on the piston-body may sometimes be omitted.

What I claim is—

1. A piston-valve comprising a body portion formed with an annular groove, the opposite side walls of which are flat and smooth, a series of arc-shaped segmental packing-rings having the same radius as the valve seat, liner or cylinder in which the piston is to work and
80 made with slightly inclined or beveled ends and with flanged sides, the outer surfaces of which are also flat and smooth, and springs for pressing the packing-rings outward, the said packing-rings being fitted in the annular
85 groove in the piston-body so as to bear closely against one or both of the opposite annular sides of the said groove, and being made of such peripheral length that the adjacent ends of each adjacent pair fit practically close
90 against one another so that a practically fluid-tight joint is produced between the packing-rings and the piston-body and between the adjacent packing-rings, substantially as described.
95

2. In a piston, the combination with the piston-body having a peripheral annular groove, the sides of which are flat and smooth, of a series of segmental packing-rings having flat and smooth sides and formed by turning undivided rings to a diameter to fit the cylinder or liner in which the piston is to work, and then dividing the said rings by radial inclined cuts into segments and arranging within the said groove a number of these segments of
100 such peripheral length as will cause their adjacent ends to come into close contact with one another and produce practically fluid-tight joints between them and form a segmental ring of the same diameter as that of each
105 of the undivided rings from which the segments are cut, as set forth.

3. In a piston-valve, the combination with the piston-body having a peripheral annular groove, the sides of which are flat and smooth, of a series of segmental packing-rings having flat and smooth sides, a water-relief port in one of said segmental packing-rings normally closed by a spring-actuated relief-valve, a drain-passage in the piston-body through
115 which water that enters the piston-body through said relief-valve can drain away, so that when the piston is used as a steam-distributing valve in a cylinder it will allow of the escape through itself of condensed water
120 as set forth.

Signed at 77 Cannon street, in the city of London, England, this 28th day of November, 1900.

ALEXANDER SPENCER.

Witnesses:

RICHARD THOMSON GLASCODINE,
H. BISHOP.