

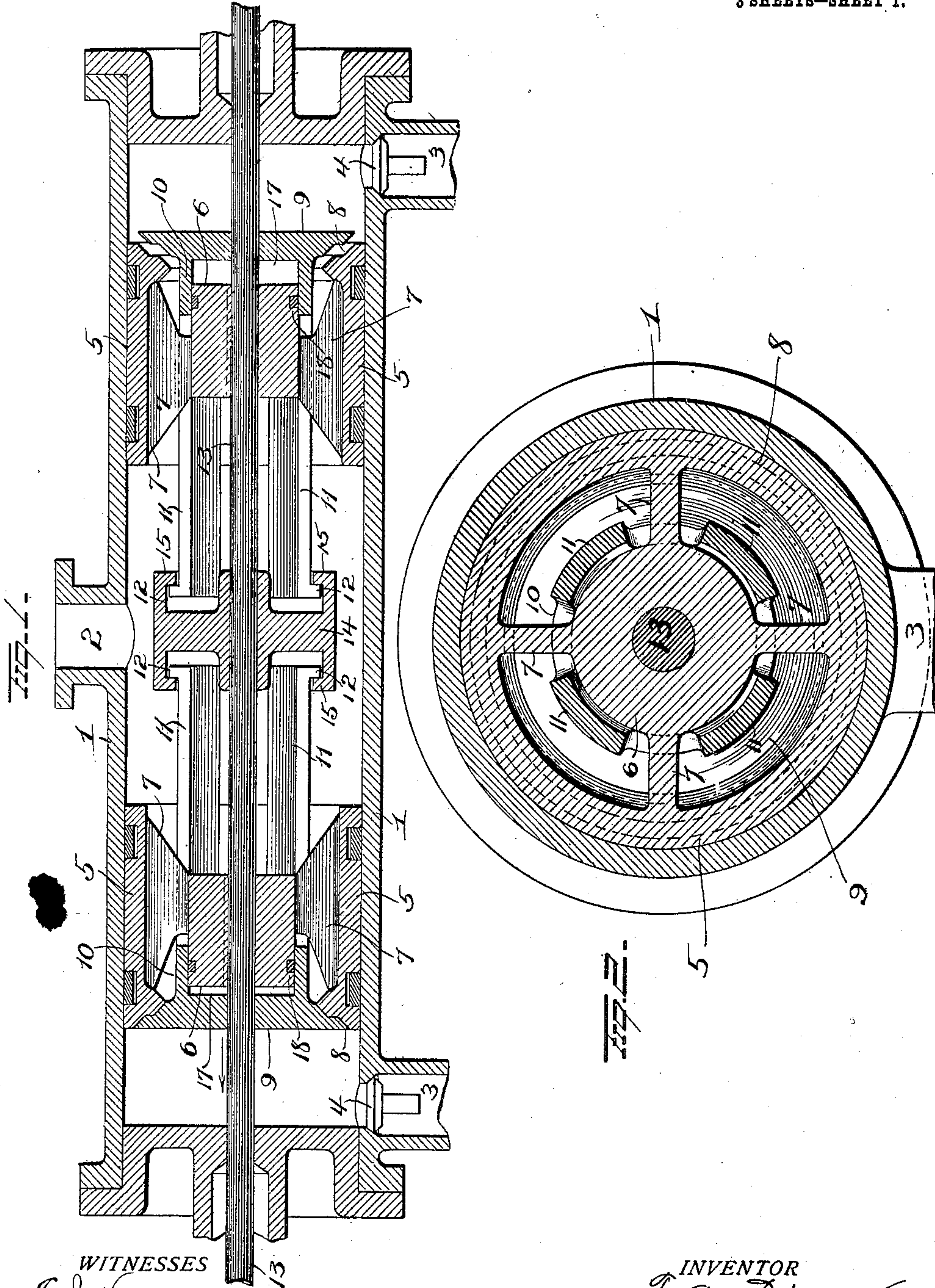
F. A. RIDER.  
COMPRESSOR.

APPLICATION FILED AUG. 28, 1908.

921,890.

Patented May 18, 1909.

3 SHEETS—SHEET 1.



WITNESSES

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*G. J. Downing*

INVENTOR

*F. A. Rider*  
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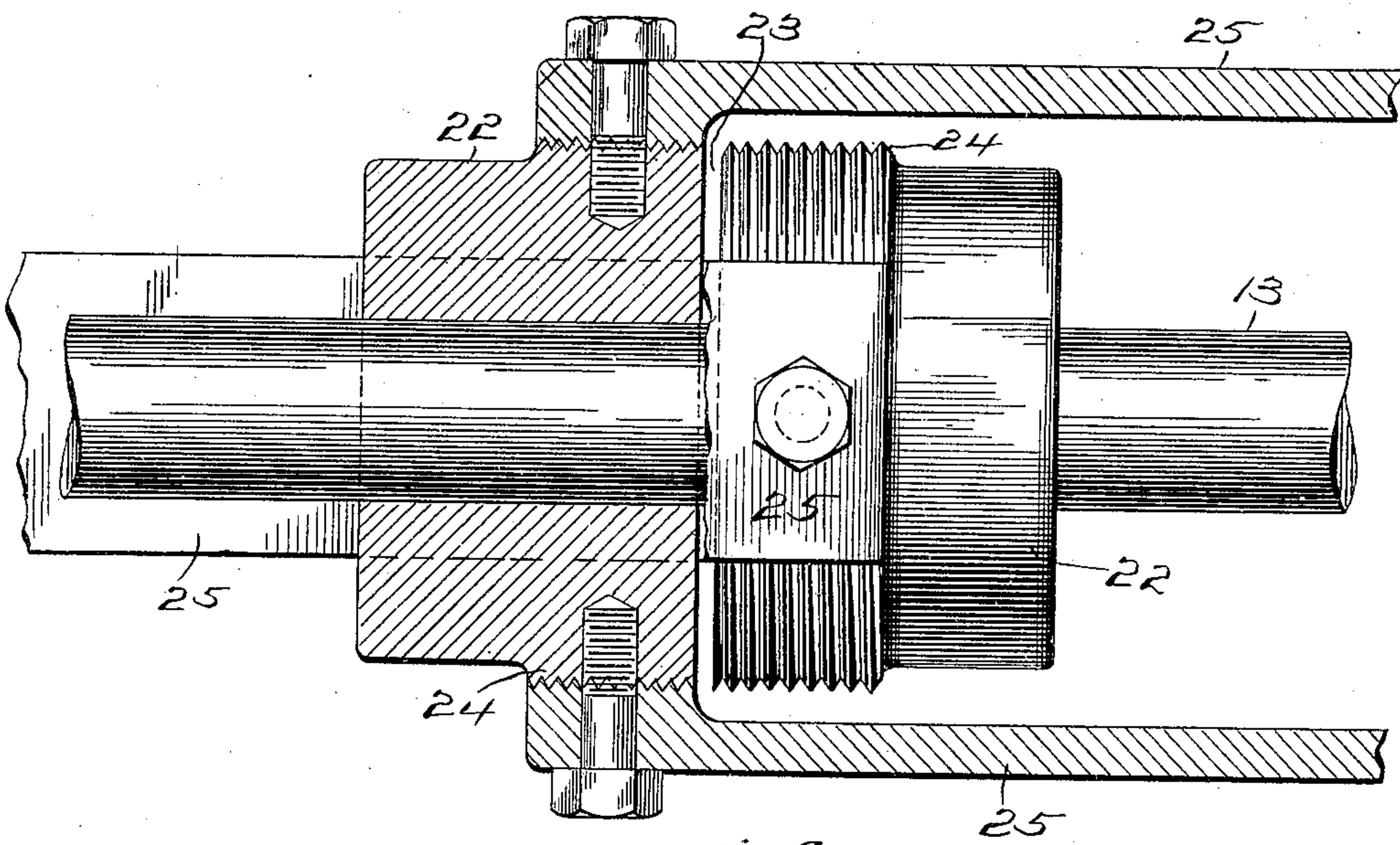
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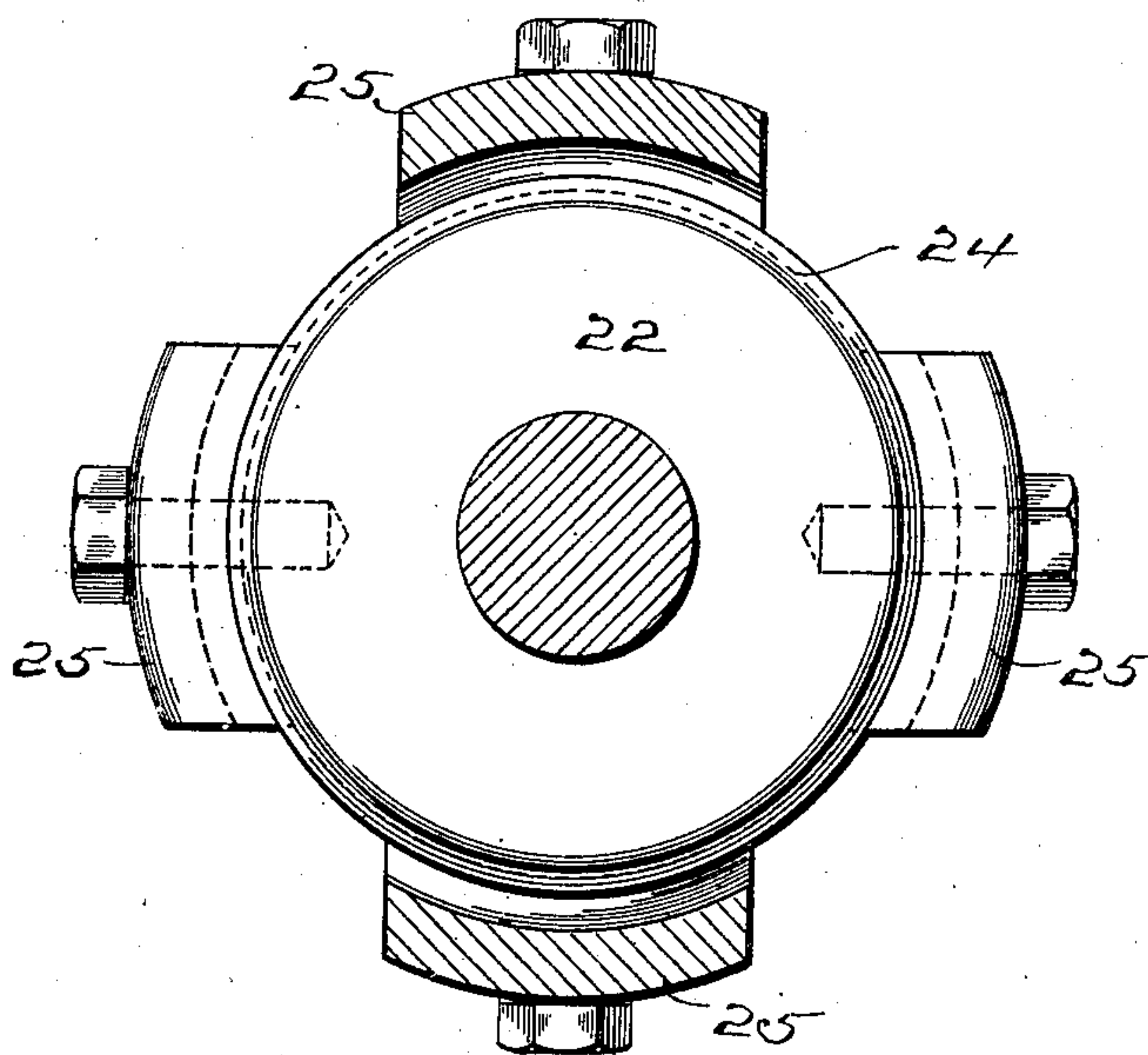
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3 SHEETS—SHEET 2.

~~Fig. 3.~~



~~Fig. 3.~~<sup>a</sup>



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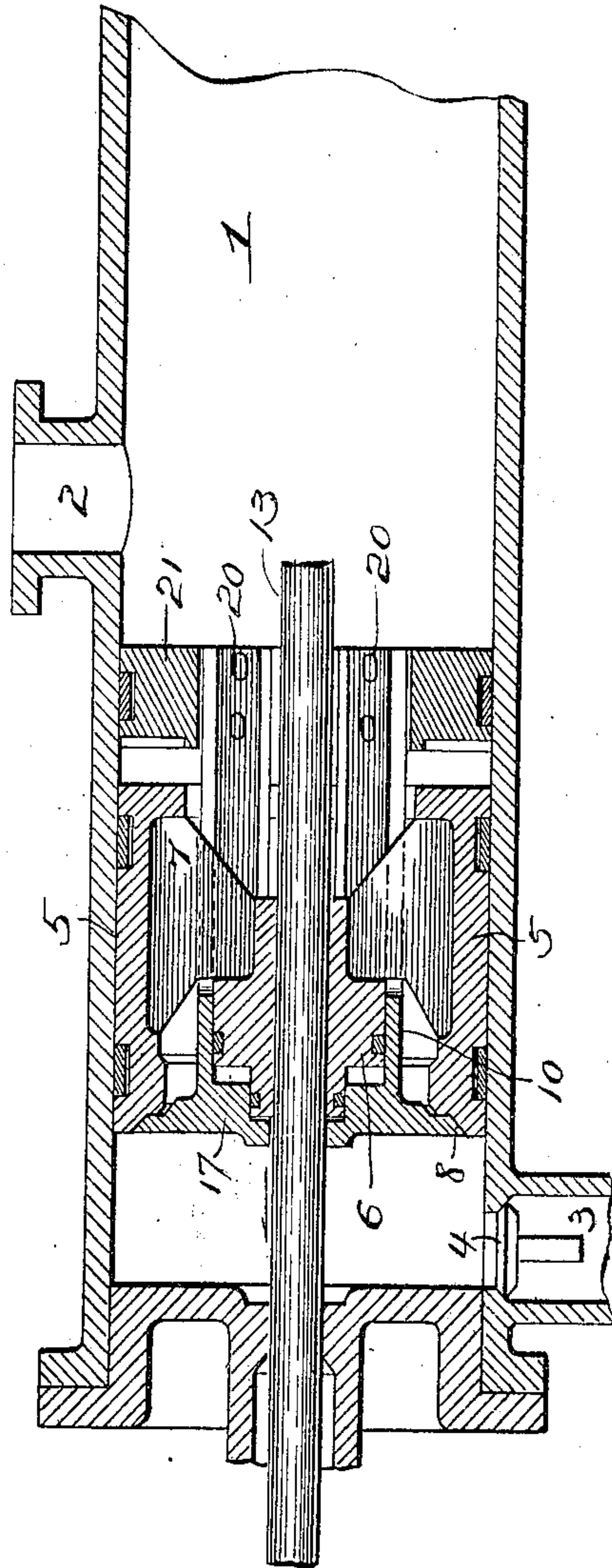
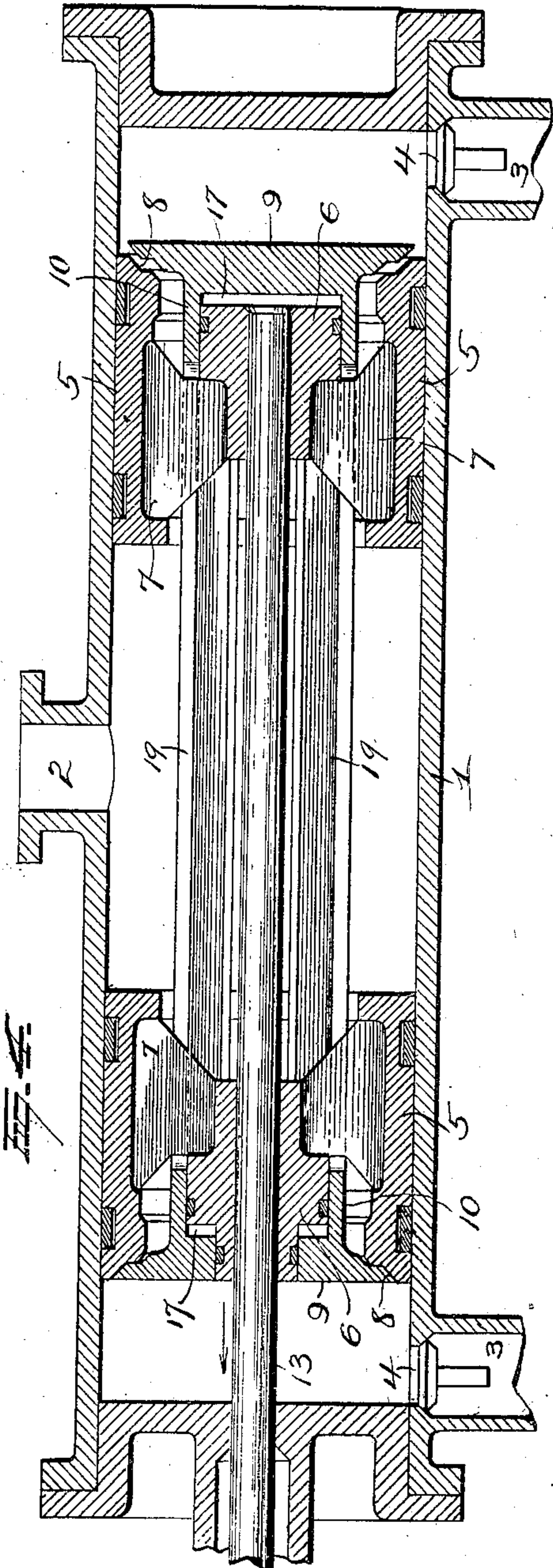
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# UNITED STATES PATENT OFFICE.

FRANK A. RIDER, OF PITTSBURG, PENNSYLVANIA.

## COMPRESSOR.

No. 921,890.

Specification of Letters Patent.

Patented May 18, 1909.

Application filed August 28, 1908. Serial No. 450,719.

*To all whom it may concern:*

Be it known that I, FRANK A. RIDER, of  
Pittsburg, in the county of Allegheny and  
State of Pennsylvania, have invented certain  
5 new and useful Improvements in Compressors;  
and I do hereby declare the following to be a  
full, clear, and exact description of the in-  
vention, such as will enable others skilled in  
the art to which it appertains to make and  
10 use the same.

My invention relates to improvements in  
compressors, and more particularly to im-  
proved valved pistons for ammonia com-  
pressors,—the object of the invention being  
15 to provide simple and efficient means for  
effecting the operation of the valves in the  
pistons of ammonia compressors, without  
the use of springs and so that the valve will  
be closed quickly after the piston has finished  
20 its retreating stroke and just before it begins  
the compression stroke.

A further object is to provide means for  
effecting the alternate opening and closing of  
valves carried by two pistons of a com-  
pressor and to so construct such means that  
25 the valves of both pistons will be closed for a  
limited time at the end of each stroke.

A further object is to provide means oper-  
ative by the weight and inertia of an inde-  
pendently-movable part, for controlling the  
operation of a valve in the piston of a com-  
pressor.

With these objects in view the invention  
consists in certain novel features of con-  
struction and combinations of parts as here-  
inafter described and pointed out in the  
claims.

In the accompanying drawings, Figure 1 is  
a longitudinal sectional view of a compressor  
40 embodying my improvements; Fig. 2 is a  
transverse sectional view, and Figs. 3, 4 and  
5 are longitudinal sectional views illus-  
trating certain modifications; Fig. 3<sup>a</sup> is a  
transverse sectional view of the structure  
45 shown in Fig. 3.

1 represents a cylinder of a compressor  
provided at an intermediate point with an  
inlet 2 and at its respective ends with outlets  
3, in which latter check-valves 4 may be  
50 located. Two pistons 5, 5, are located with-  
in the cylinder at respective sides of the  
center thereof and each of said pistons is  
provided centrally with a hub 6 connected  
with the main or body portion of the piston

by means of webs 7. The forward end of 55  
each piston is open and provided with a seat  
8 for a valve 9. Each valve 9 is provided  
with an inwardly projecting annular flange  
or collar 10 which surrounds the forward por-  
tion of the piston hub and from each flange 60  
or collar 10 a series of arms or rods 11 pro-  
ject through the spaces between the webs 7  
and terminate a comparatively short distance  
beyond inner ends of the pistons, in shoul-  
ders 12. A piston rod 13 (to which power is 65  
applied from any convenient source) passes  
through the two pistons and is secured in any  
suitable manner to the hubs of the latter and  
this piston rod also passes loosely through  
the valves 9. Mounted upon the piston rod 70  
13 intermediate of the two pistons and  
adapted to be movable independently of  
both is a member 14 which, for convenience,  
may be termed an "inertia piece". The  
member 14 has a sliding fit on the piston rod 75  
13 and is provided at its respective ends  
with heads 15 provided at their edges with  
inwardly projecting flanges which afford  
cylinders 16 to coöperate with the shoulders  
12 on the valve rods 11. The space between 80  
the outer ends of the piston hubs and the  
rear faces of the valves, will constitute gas  
cushions 17. With the construction herein  
described, the valves of both pistons will be  
closed for a limited time at the end of each 85  
stroke which, in the practical operation of  
the compressor, is advantageous.

When the pistons start from one end of  
their stroke to travel to the opposite end  
thereof, a partial vacuum will be formed be- 90  
hind the rear piston and the effect of this will  
be to cause the valve of said rear piston to  
open. The valve of the forward piston must  
of course be closed, and this will be permit-  
ted by the pressure in front of said forward 95  
piston. During the movement of the pistons  
from one end of the stroke to the other, the  
shoulders 12 of the rods 11 of both valves  
will be in engagement with the shoulders 16  
of the inertia piece or member 15. When 100  
the pistons reach the end of the stroke the  
inertia piece will continue to move for-  
wardly a short distance and effect the closing  
of the valve of the rear piston, but will not  
open the valve of the forward piston because 105  
the forward shoulder 16 of the inertia piece  
will move away from the shoulder 12 of the  
rods of the forward piston valve. By such



lost motion between the inertia piece and the valve of the forward piston, the valves of both pistons will remain closed for a brief period at the end of a stroke. As soon how-  
 5 ever, as the pistons stop in the reverse direction, the partial vacuum behind the rear piston (which was formerly the forward piston) will cause the valve in this piston to open and permit the fluid to flow from the inlet 2  
 10 through the rear piston to the space behind the latter, ready to be forced through an outlet 3 at one end of the cylinder when the piston begins to move in the reverse direction. It will be observed that after the piston has  
 15 completed its stroke and delivered its charge of compressed gas, it starts to return on a suction stroke. If the valve opened immediately it would have the effect of closing the opposite valve quickly, which is the desired  
 20 effect, but owing to some gas being compressed in the clearance space the retreating piston cannot open its valve until the pressure of this gas in the clearance has expended itself. While so doing, of course, both  
 25 valves would be closed, but this is only for a small fraction of time and is represented on the indicator card by a rounded corner.

The object of the inertia piece is to cause the valve to close quickly at the end of the  
 30 suction stroke. If it does not do so, it will be drawn shut by the action of the other valve opening, due to a vacuum behind the latter. It will be seen that two means are provided for forcing the valve to close at the  
 35 end of the suction stroke, one being the inertia piece and this being assisted by the opening of the other valve when it has started back and produces a partial vacuum. If desired, packing rings 18 may be located in  
 40 suitable grooves in the hubs of the pistons where the collars 10 of the valves move on said hubs.

The operation of the construction shown in Fig. 3 is the same as that above described.  
 45 In Fig. 3 I have shown two inertia pieces 22—22 mounted on the piston rod so as to form a lost-motion space 23 between them equal to the opening of one valve. Each inertia piece is provided with a threaded por-  
 50 tion 24 with which the valve rods 25 are connected.

In the construction shown in Fig. 4, the lost motion devices above described are omitted and the valves of the respective pis-  
 55 tons are connected together by means of valve rods 19, so that when one of the valves is opened by the action of the partial vacuum behind it in the cylinder 1, the other valve will be closed,—the closing of the last men-  
 60 tioned valve and the opening of the other valve being assisted by partial vacuum behind the retreating piston.

In the construction shown in Fig. 5, the valve of each piston is connected through the  
 65 medium of its rod 20 with an inertia piece or

member 21 mounted within the cylinder and having frictional contact with the wall of the latter,—said inertia piece or member being spaced from the main body of the piston  
 70 when the valve is closed. With this construction the inertia of the member 21 and its frictional contact with the wall of the cylinder will effect the opening and closing of the piston valves at the ends of their strokes,—  
 75 the valve in one piston being opened and the valve in the other piston closed.

Other slight changes might be made in the details of construction of my invention without departing from the spirit thereof or limiting its scope and hence I do not wish to re-  
 80 strict myself to the precise details herein set forth.

Having fully described my invention what I claim as new and desire to secure by Letters  
 85 Patent, is:—

1. The combination with a cylinder, two pistons therein, and a piston rod secured to said pistons, of a valve for each piston, and means for operating said valves to close one and open the other for each stroke of said  
 90 pistons, and means to permit both to be closed simultaneously.
2. The combination with a cylinder, a piston therein, and a rod secured to said piston, of a valve for controlling the passage  
 95 of fluid through said piston, and an inertia member movable with the valve and having lost-motion relation to the piston, whereby it will move the valve when the piston stops.
3. The combination with a cylinder, two  
 100 pistons therein, and a piston rod secured to and connecting said pistons, of a valve for each piston, and lost motion connections between the valves of the respective pistons.
4. The combination with a cylinder, two  
 105 pistons therein, and a piston rod secured to and connecting said pistons, of a valve for each piston, an inertia member mounted on the piston rod between the pistons, and lost motion connections between said inertia  
 110 member and the valves of the respective pistons.
5. The combination with a cylinder, of a piston therein, having a hub, a rod secured to said hub, a valve for opening and closing  
 115 communication through said piston, said valve having an annular flange embracing and movable on the hub of the piston, valve rods projecting from said flange and passing  
 120 through the piston, and means coöperating with said valve rods for controlling the opening and closing of the valves.
6. The combination with a cylinder, two  
 125 pistons therein, and a piston rod secured to and connecting said pistons, of valves for said pistons, each valve provided with a rod having a shoulder at its free end, and an inertia member mounted on the piston rod between the pistons and provided with  
 130 shoulders to coöperate with the shoulders of



the valve rods, the shoulders of the valve rods and the shoulders of the inertia member being so disposed as to permit lost motion between them.

- 5 7. The combination with a cylinder, two pistons therein, and means for moving said pistons simultaneously, of a valve in each piston, and connections between the valves of the two pistons and tending to close one of

said valves when the other opens, and means 10 to permit both to be closed simultaneously.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

FRANK A. RIDER.

Witnesses:

B. B. WHITING,  
A. E. THOMAS.