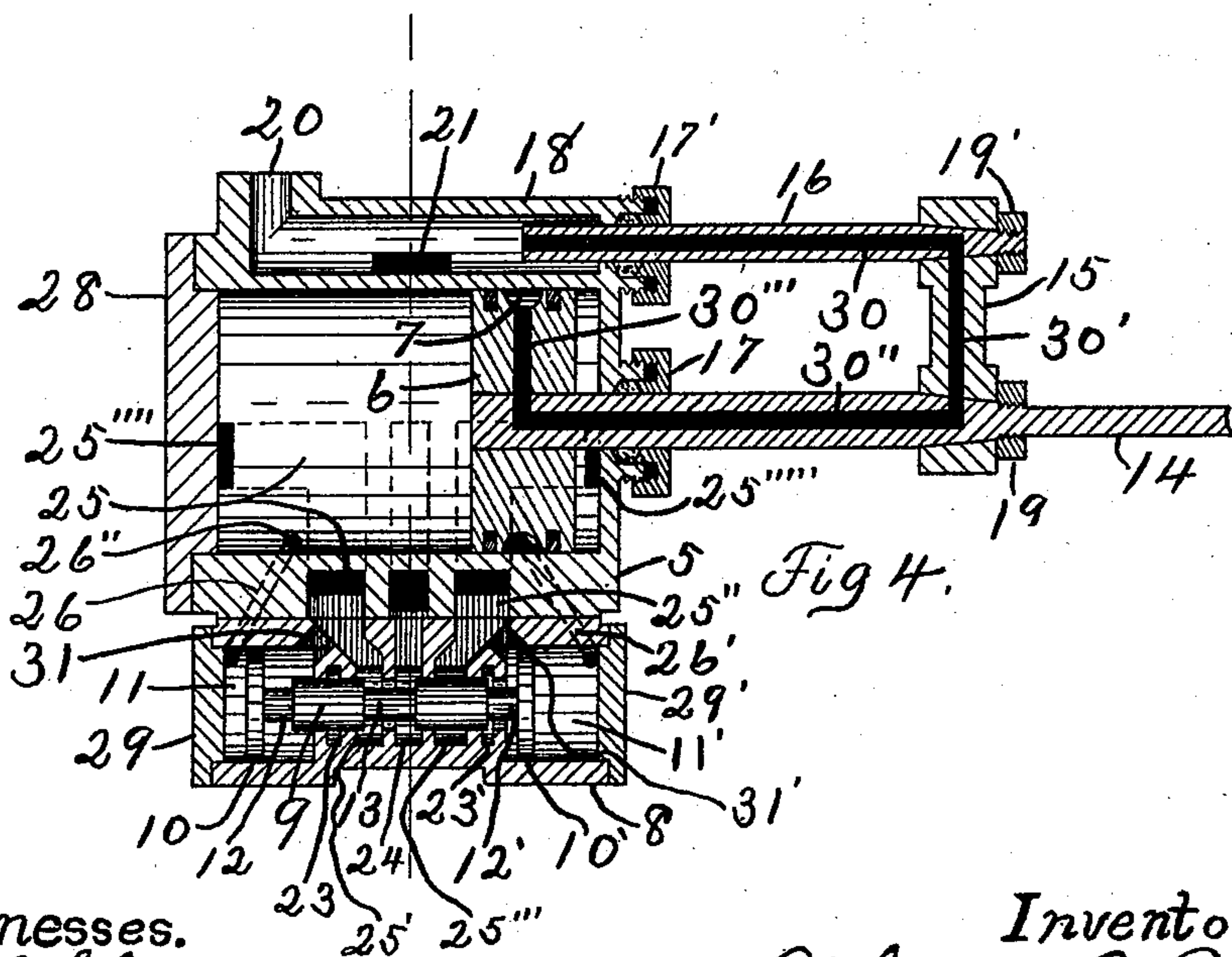
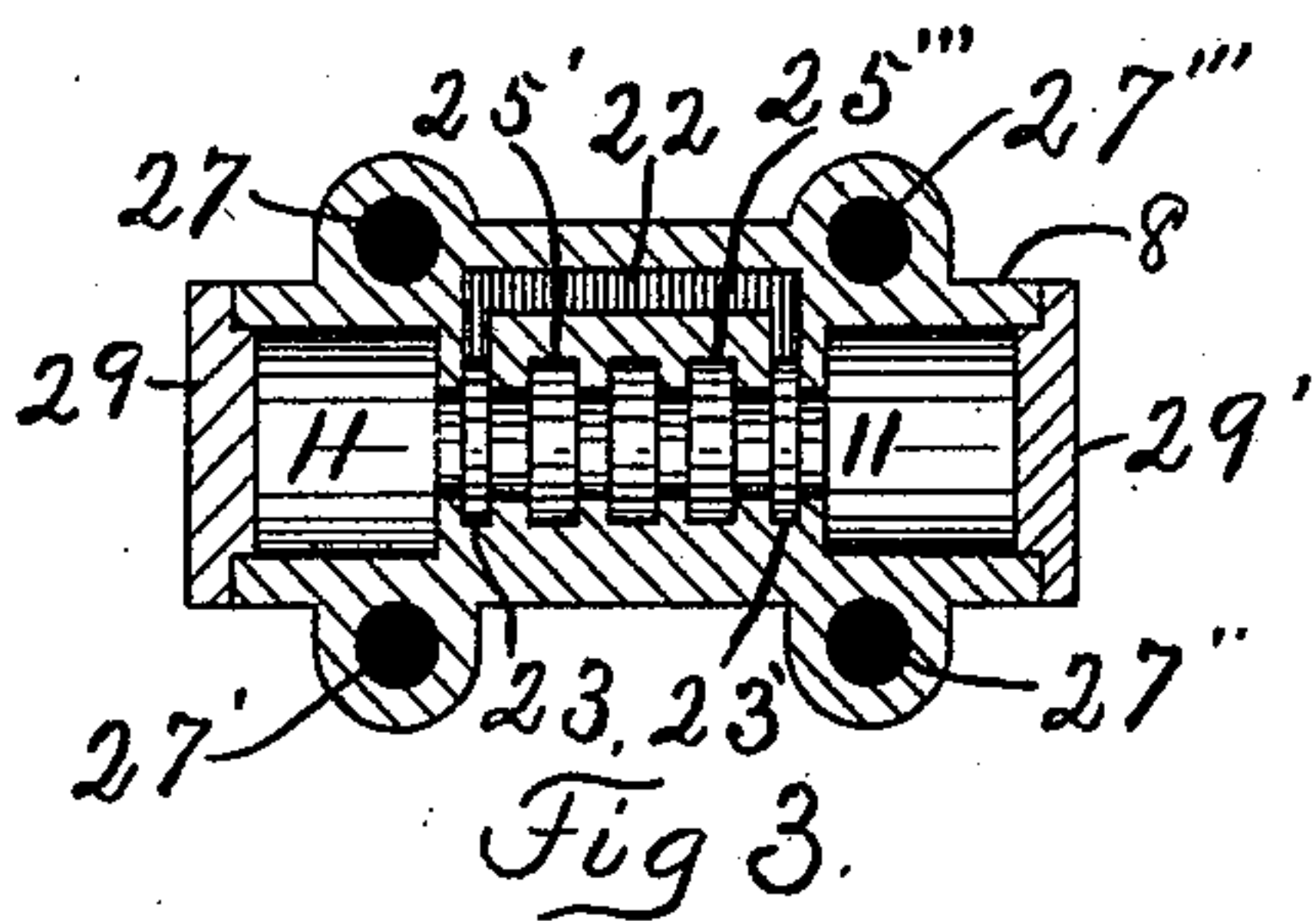
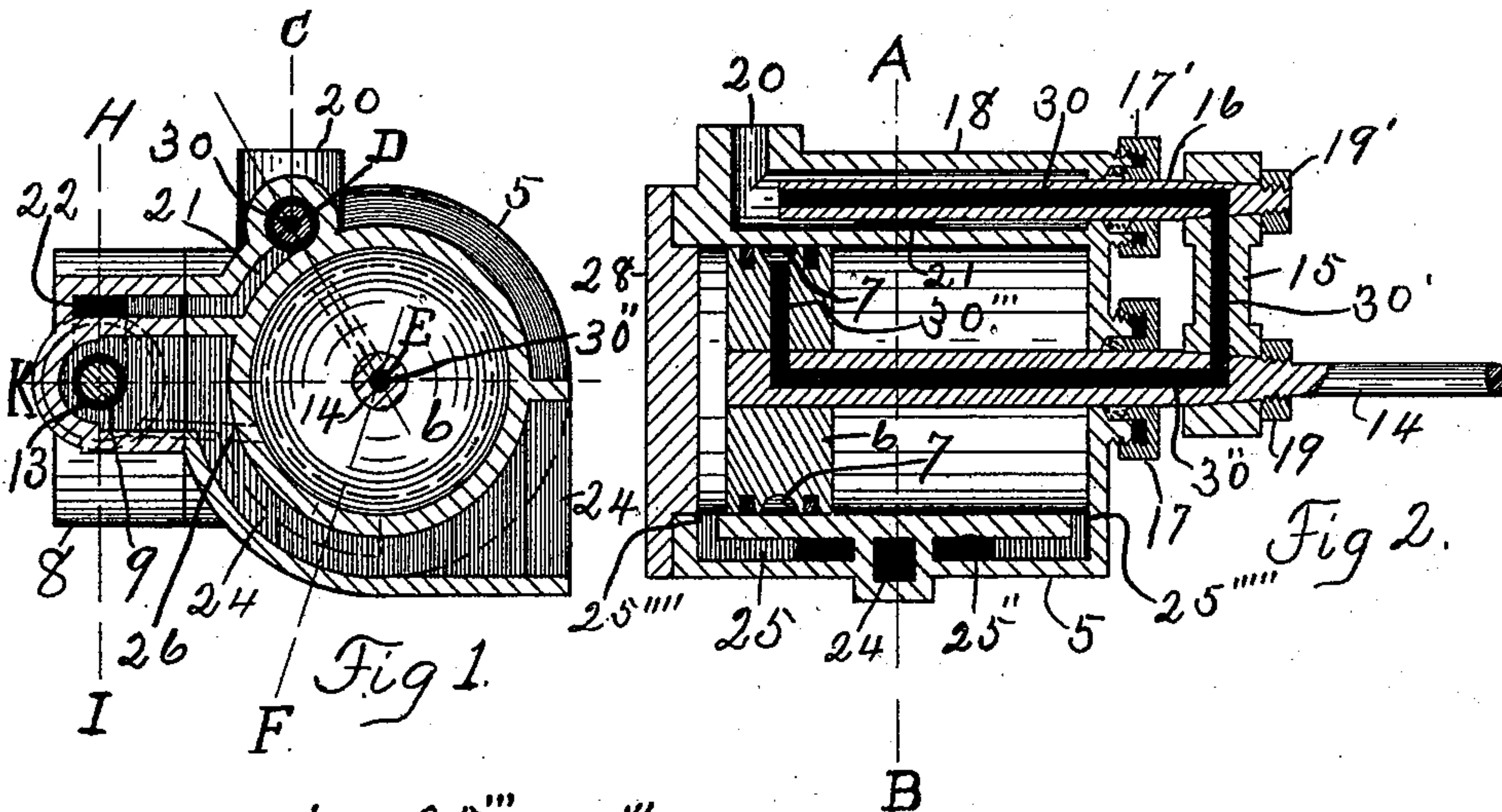


(No Model.)

R. L. FROST.  
STEAM ACTUATED VALVE.

No. 497,470.

Patented May 16, 1893.



Witnesses.  
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# UNITED STATES PATENT OFFICE.

RICHARD L. FROST, OF MANISTEE, MICHIGAN.

## STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 497,470, dated May 16, 1893.

Application filed October 14, 1892. Serial No. 448,910. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD L. FROST, a citizen of the United States, residing at Manistee, in the county of Manistee and State of Michigan, have invented certain new and useful Improvements in Steam-Actuated Valve Tripping or Reversing Mechanism for Steam-Pumping Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improved construction of the valve mechanism of the steam cylinders for steam pumping-engines. It has reference more particularly to that class of valves which are operated by the direct application of live steam pressure to the end surfaces of the steam valves, or steam valve plungers.

The improvement consists, generally speaking, of a steam piston provided with an annular depression or groove in the periphery thereof, which connects to the live steam pipe by a passage from said annular depression or groove in the piston, through the piston, piston-rod, arm or cross-head, and pipe or tube attached to the arm or cross-head, to a larger pipe on the outside of said steam cylinder, said passage and annular depression or groove co-operate with passages or ports leading from the end chambers of the valve-chest to the ends of the steam cylinder, by which the main piston is adapted to serve as a valve to control the admission of live steam to the end chambers of the valve-chest for the purpose of reversing the steam-valve, or alternately driving it back and forth in the valve-chest.

Referring to the drawings, Figure 1 represents a vertical cross-section on the line A. B. of Fig. 2. Fig. 2, represents a longitudinal vertical section on the broken line C. D. E. and F, of Fig. 1, with the steam piston in the left hand end of the steam cylinder. Fig. 3, represents a longitudinal vertical section of the steam-chest on the line H. I of Fig. 1. Fig. 4, represents a longitudinal section on the broken line C. D. E. and K. of Fig. 1, so as to show the steam valve and passages from the live steam pipe to the annular depression or groove in the steam piston, and with the steam piston in the right hand end of the steam cylinder, also the passages from the ends of the steam chest end chambers to

the openings near the ends of the steam cylinder.

Referring to the drawings, 5, represents the steam cylinder, 6, is the steam piston head having an annular depression or groove 7 in the periphery of said steam piston head as shown in Figs. 2 and 4. 8, is a steam chest, having therein, what is usually termed a "float valve" 9 of ordinary construction, said valve 9 having enlarged heads 10 and 10' one at each end, which play back and forth in the internal end chambers 11 and 11' in the ends of the steam-chest.

Referring to Fig. 4, the valve 9 is shown having an annular depression 12 and 12' at each end and also a central annular depression at 13.

In the drawings, 14, is a piston-rod one end of which is attached to the piston head 6, the other end is to be attached to an ordinary water pump piston, said water piston is not shown in the drawings as it is in no way connected to my invention. To the central portion of said piston-rod 14, is attached by a taper fit and jam nut 19, or in any other satisfactory manner, the arm or cross head 15 containing the steam passage 30'. To this arm or cross head 15 is similarly attached one end of the tube or pipe 16. The other end of the tube or pipe 16 is journaled in the stuffing-box 17' and works back and forth longitudinally in said stuffing-box 17'. The stuffing-box 17' is attached to the pipe 18. Said pipe 18 is in turn longitudinally attached to the outside walls of the steam cylinder and arranged internally to receive the tube or pipe 16. To the left hand end of this tube or pipe 18, is the opening 20, to receive a steam supply-pipe.

21, is a port leading from the pipe 18 to the port 22 in the steam-chest the two ends of which open into the ports 23' and 23' in the steam chest.

24 is an exhaust port in the steam chest and on the bottom side of the steam cylinder which leads into the atmosphere or into a condenser.

25, is a steam port leading from the annular steam port 25' in the steam-chest to the left hand end of the steam cylinder 5, while the port 25'' leads from the annular port 25''' in the steam-chest to the right hand end of the steam cylinder 5. Said steam ports 25 and 25'' cut or open into the steam cylinder



5 on the bottom side at 25'''' and 25'''' respectively, and running upward around the outside walls of said steam cylinder 5 and into the steam chest.

5 26, is a small port or passage one end leading from the left hand end of the steam chest end chamber 11 to the opening 26'' near the left hand end of the steam cylinder 5. 26', is a similar port or passage in the other end  
10 of the engine one end leading from the right hand end of the steam chest end chamber 11' to near the right hand end of the steam cylinder 5.

15 27, 27', 27'', and 27''' in Fig. 3, are bolt holes to fasten the steam-chest to the steam cylinder 5.

28, is a steam cylinder head of ordinary construction.

20 29, and 29', are steam-chest heads of ordinary construction.

17, is an ordinary stuffing-box attached to the end of the steam cylinder 5, for the purpose of journaling the piston-rod 14.

25 In the operation of the engine, referring to Fig. 4, live steam from the source of supply through the pipe opening 20, has filled the steam pipe 18, and from thence a portion of the steam has filled the steam passage 22, from thence it has filled the annular induction ports 23 and 23'.

30 Another portion of the steam from the pipe 18 has entered and passed through the passages 30', 30'', 30''', and 30'''' in the tube 16, the arm 15, the piston-rod 14, and the piston-  
35 head 6 and has filled the annular depression in the steam piston periphery and thus it is seen that this annular depression 7 is constantly full of live steam from the source of supply. From this annular depression 7 in  
40 the periphery of the steam piston-head, 6, steam has entered and passed through the port 26' into and filled the end chamber 11' and driven the valve 9 to the left until it has opened the right hand annular port 23' and  
45 the steam from the right hand annular port 23' has passed through the annular depression 12' in the valve 9 and filled the end chamber 11' on the left hand side of the right hand valve head 10', from thence through the  
50 port 31 into the right hand induction or steam port 25'', and into the right hand end of the cylinder 5. Since the outer surfaces of the ends 10 and 10' of the valve exceeds the inner surfaces of said heads the steam which  
55 enters the end of the steam-chest through the port 26' counterbalances the pressure of the live steam against the inner surfaces of said head 10' and thus prevents abnormal displacement of said valve. The steam which  
60 entered the steam cylinder through the right-hand induction or steam port 25'' has forced the steam piston 6 over to the left hand end of the steam cylinder as shown in Fig. 2, during which action the exhaust steam passed  
65 through the left hand induction or steam port 25, thence through the annular port 25' and on through the annular depression 13, in the valve

9, thence into the exhaust port 24 into the atmosphere or condenser. Now that the annular depression 7 in the steam piston 6 is constantly full of live steam from the supply  
70 pipe 20, and the said steam piston 6, having been driven to the left hand end of the steam cylinder until the annular depression 7 registers with the port opening 26'', the live  
75 steam from said annular depressions 7 passes through the port 26 into the left hand end chamber 11 for the purpose of driving the valve 9 to the right, which of course would reverse the position of said valve 9 and cause  
80 the live steam to pass through the left hand part of the steam port or passage 22, and left hand annular port 23, the annular depression or passage 12 in the left hand end of the valve  
85 9, the end chamber 11 on the inside of the valve head 10, the port 31, and thence through the induction or steam port 25 into the left hand end of the steam cylinder 5, and thus driving the piston to the right-hand end of  
90 said steam cylinder 5. The annular depression 7 of the steam piston head 6 will now register with the right hand port 26' which communicates with the cylinder and the steam chest at the right hand end of said chest and  
95 cylinder, which will of course reverse the action of the valve 9 and so on.

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

1. The combination of a cylinder of an engine, a valve-chest having ports or passages  
100 connecting the end chambers thereof with the ends of the cylinders, respectively, and the live steam pipe 18, the tube 16, the arm 15, the piston-rod 14, the piston 6, with the  
105 annular depression 7 in the periphery, the live steam ports 30, 30', 30'', and 30''' from the pipe 18 to the annular depressions 7, whereby, live steam is admitted alternately in volume  
110 to the outer ends of the end chambers of the valve chest to promptly move the valve to reverse the engine, substantially as described.

2. In a steam engine, the steam chest, the steam actuated valve, suitable ports, passages, and chambers, the engine cylinder, the  
115 live steam pipe 18, provided with a stuffing box 17' to receive the tube 16, the tube 16 provided with the longitudinal port 30, the arm 15 provided with the port 30', the piston  
120 rod provided with the port 30'', the annularly chambered piston 6 provided with the port 30''' and annular groove 7, and suitable ports and passages connecting the same and adapted to reverse the stroke of the piston,  
125 substantially as shown and described.

In testimony of the foregoing I have hereunto subscribed my name in presence of two witnesses.

RICHARD L. FROST.

Witnesses:

GEO. M. BURR,

LOUIS J. FUZLAFF.