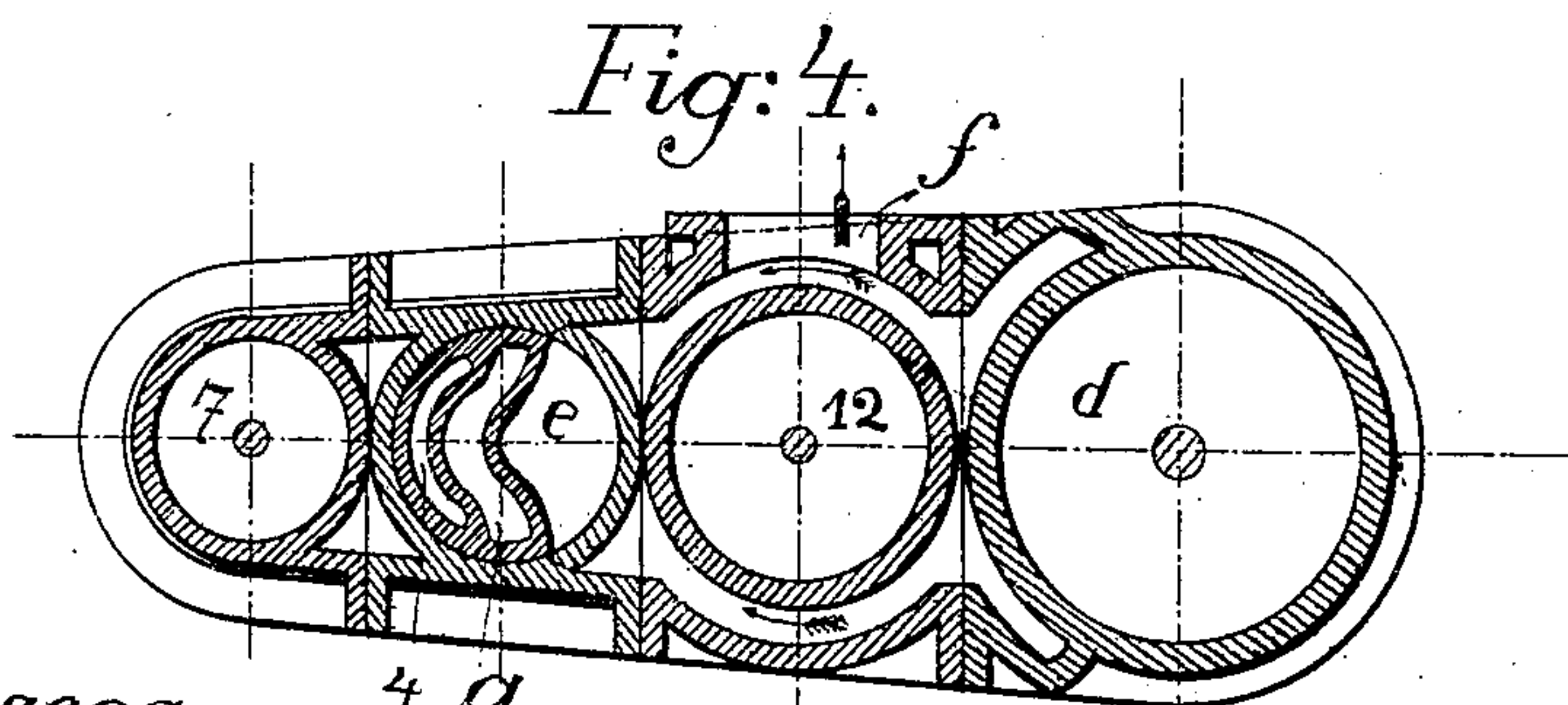
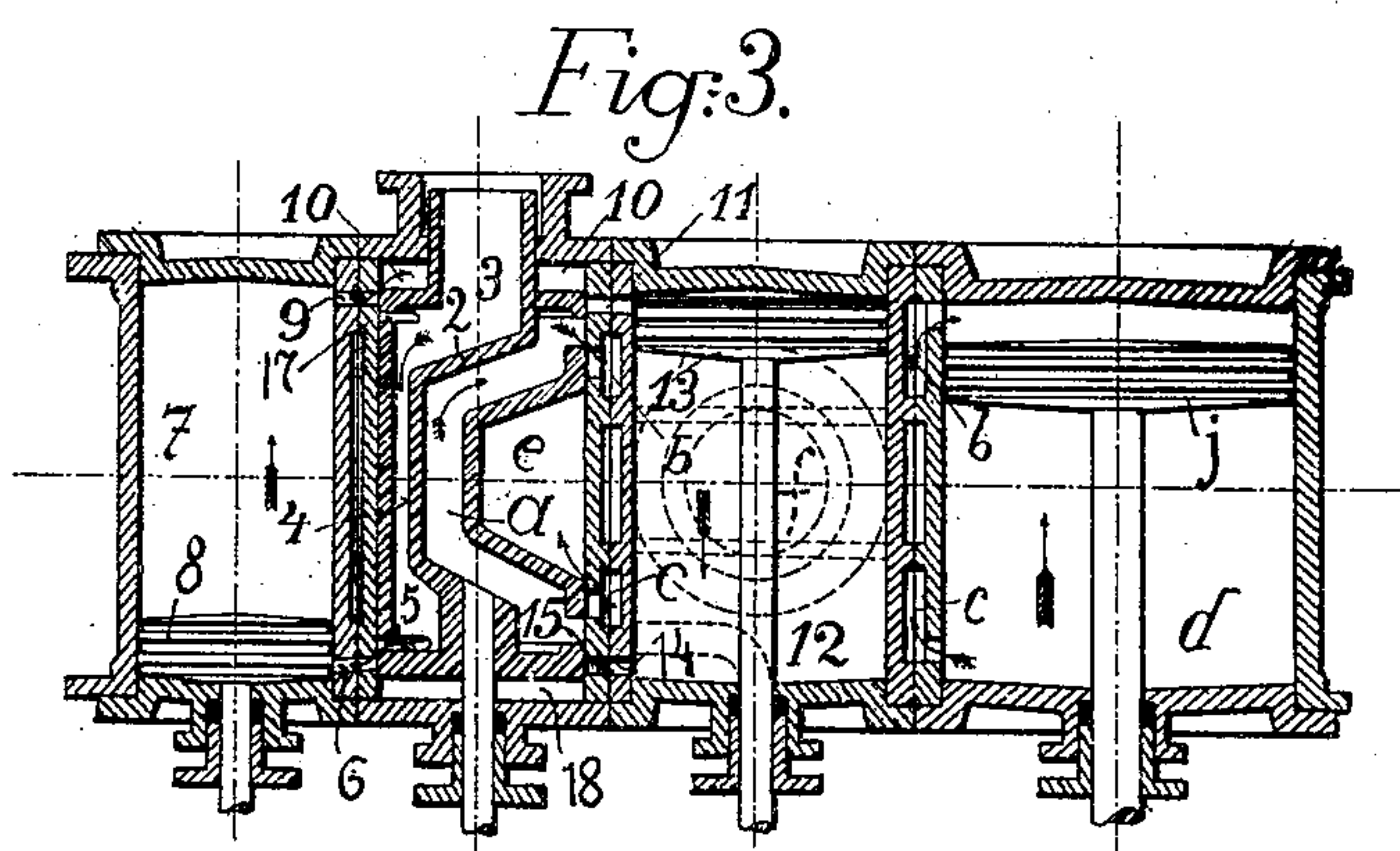
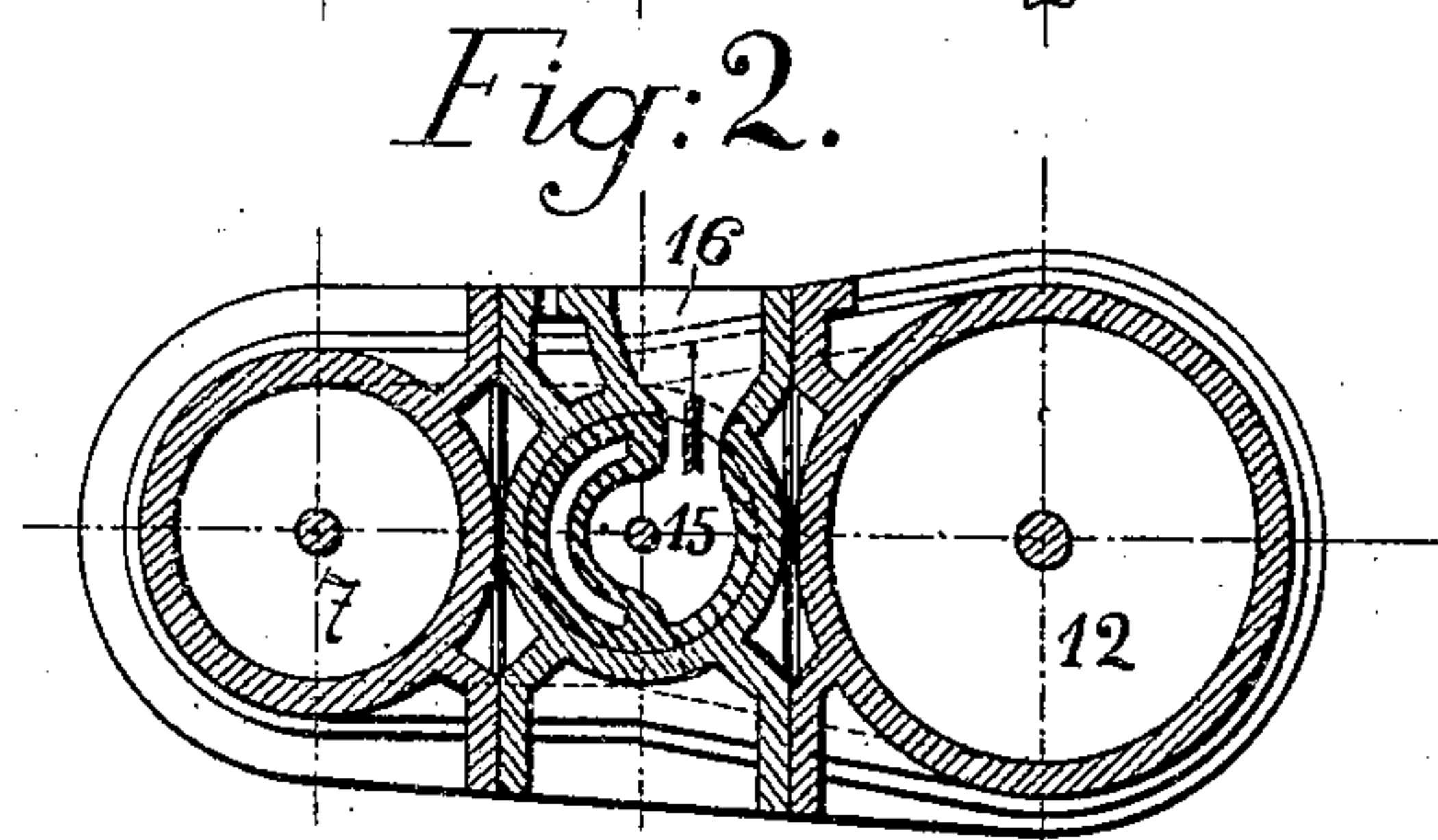
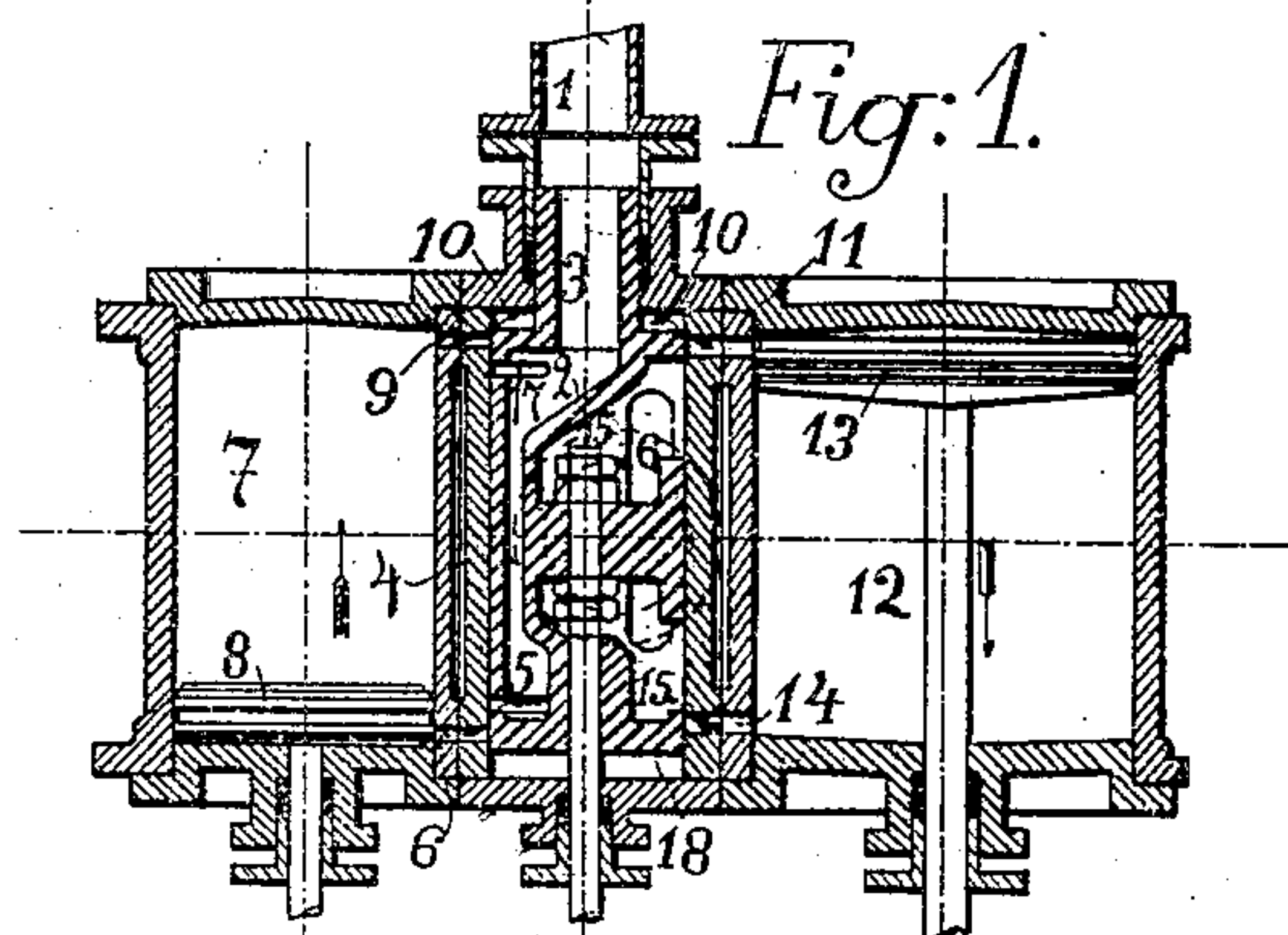


No. 810,589.

PATENTED JAN. 23, 1906.

J. VENATOR.
COMPOUND ENGINE.
APPLICATION FILED MAY 15, 1903.

2 SHEETS—SHEET 1.



Witnesses
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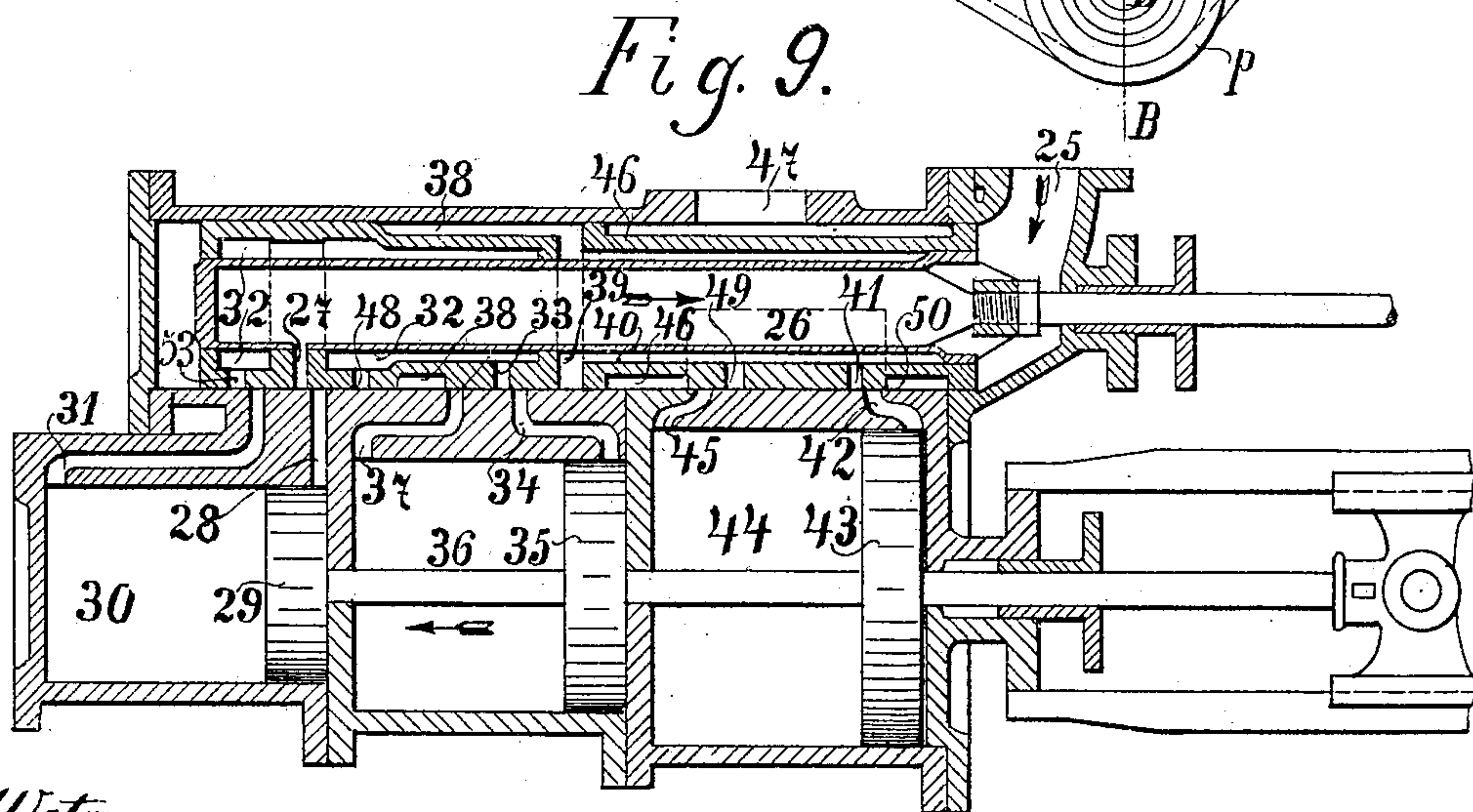
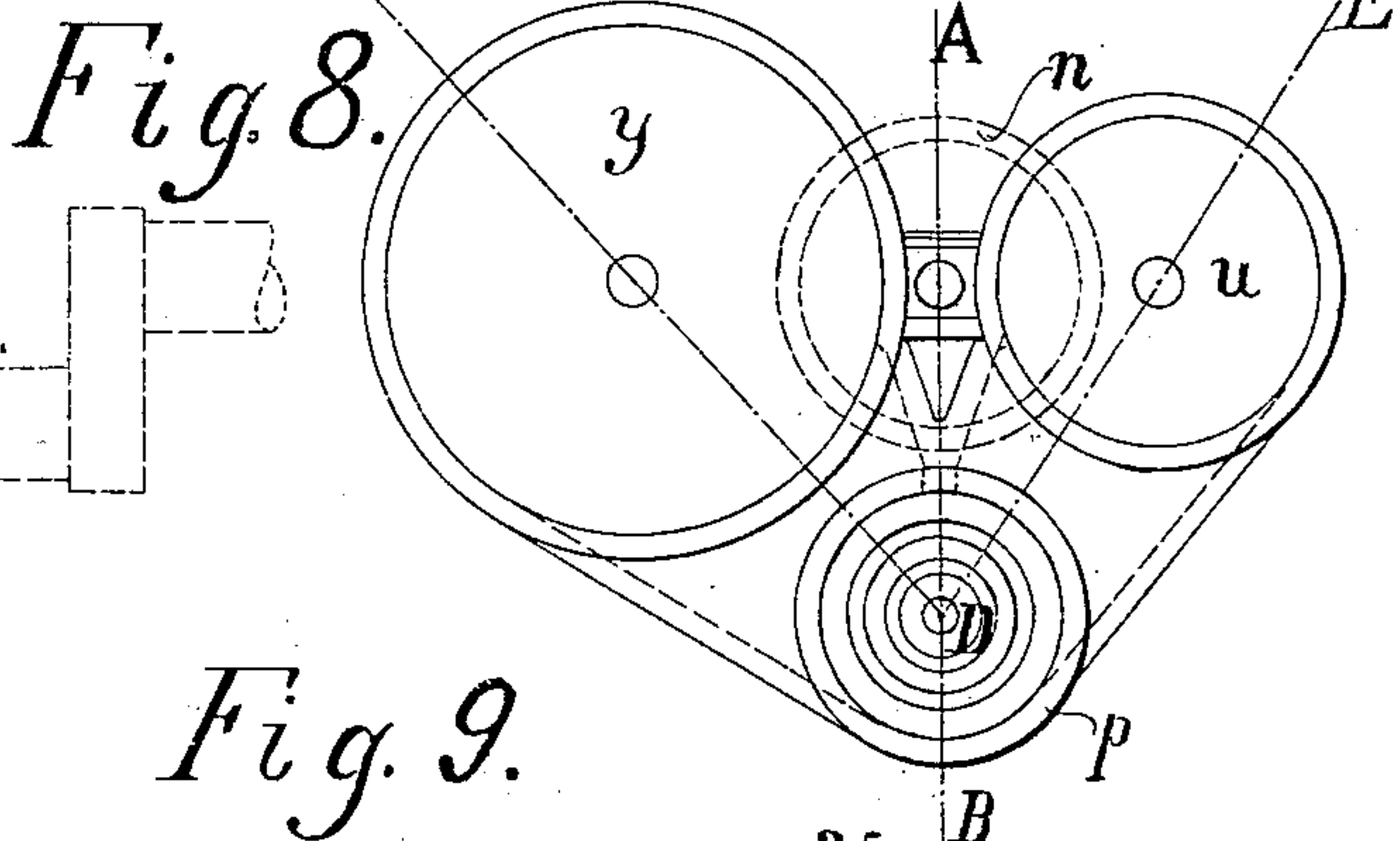
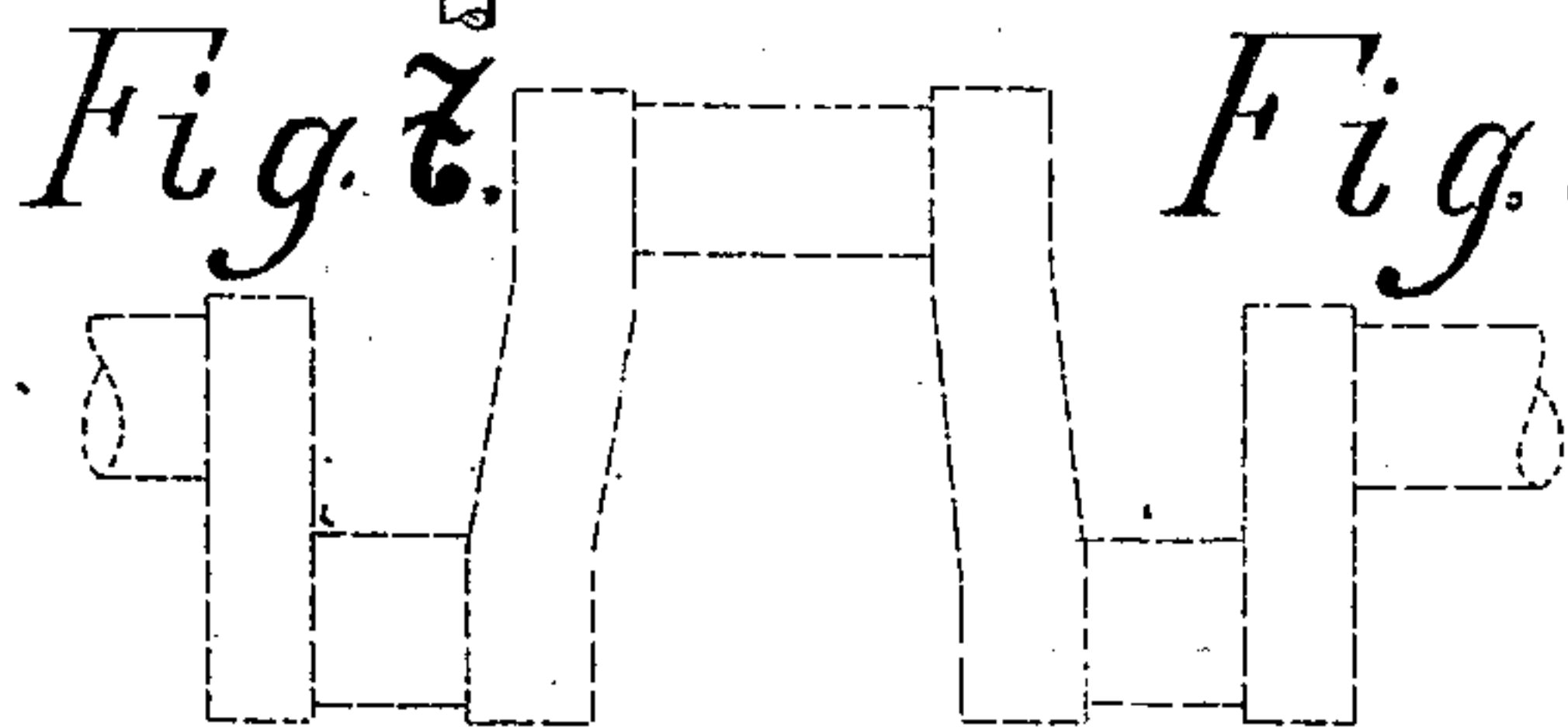
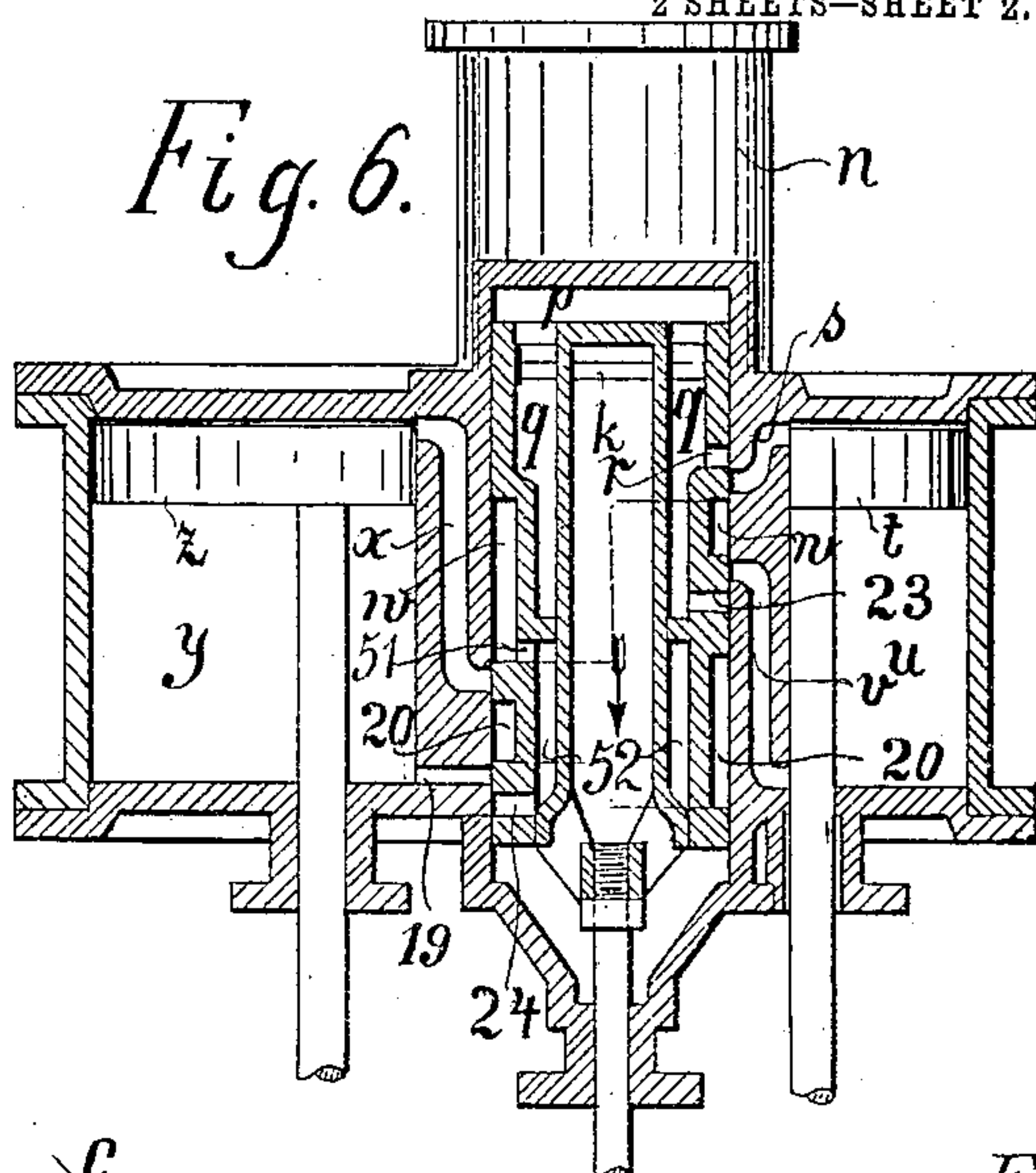
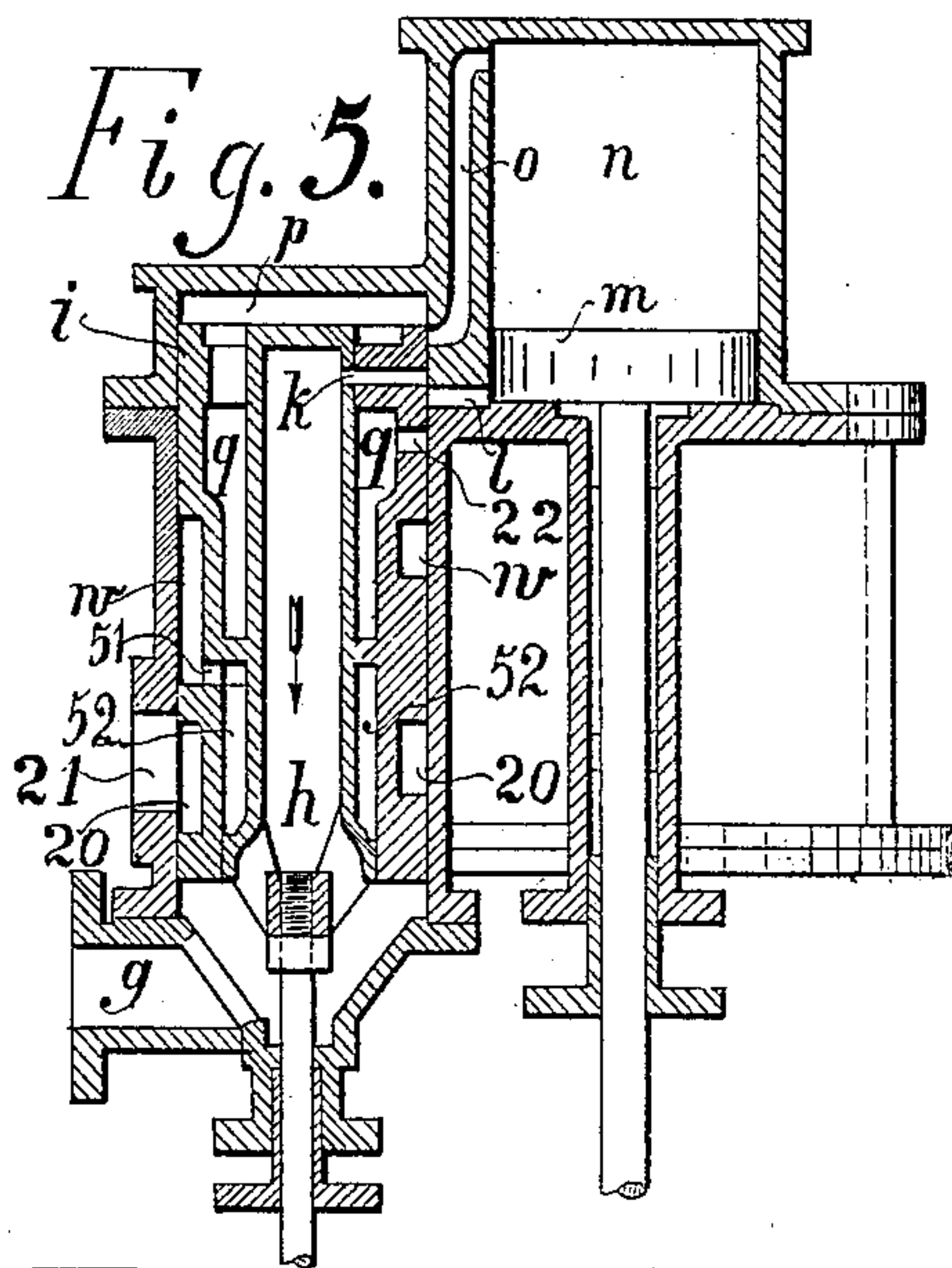
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2 SHEETS—SHEET 2.



Witnesses
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UNITED STATES PATENT OFFICE.

JEAN VENATOR, OF CASSEL, GERMANY.

COMPOUND ENGINE.

No. 810,589.

Specification of Letters Patent.

Patented Jan. 23, 1906.

Application filed May 15, 1903. Serial No. 157,316.

To all whom it may concern:

Be it known that I, JEAN VENATOR, a subject of the German Emperor, residing at Cassel, Germany, have invented certain new and useful Improvements in Compound Engines with Common Distributing Valve-Motions, of which the following is a specification.

The primary object of my invention is to provide a construction of distributing mechanism for two or more cylinders in which the steam after being used in one cylinder will be returned to the valve in its passage to a second cylinder and will thereby be subjected to a reheating action.

Other objects of the invention will appear as the construction is more fully disclosed.

To effect the objects sought, the invention includes the combination and arrangement to be hereinafter described and the details of construction set forth in the claims.

In the accompanying drawings, which illustrate several embodiments of my invention, Figure 1 is a longitudinal sectional view of a two-cylinder engine, illustrating one embodiment of my invention. Fig. 2 is a cross-sectional view of the same. Fig. 3 is a longitudinal sectional view of a three-cylinder engine embodying my invention. Fig. 4 is a cross-sectional view of the same. Fig. 5 is a longitudinal sectional view, taken on the line A B of Fig. 8, of an engine equipped with a modified construction of valve mechanism. Fig. 6 is a longitudinal sectional view of the same on the line C B E, Fig. 8. Fig. 7 is a view of a crank-shaft used with this type of engine. Fig. 8 is a plan view of the latter, and Fig. 9 is a longitudinal sectional view of a further modification.

Figs. 1 and 2 show my invention embodied in an engine having two cylinders arranged side by side. In this form of the device the steam is admitted from the boiler to the engine through the pipe 1 and enters the tube 3, which serves for guiding the slide-valve 2, and is received in the live-steam passage-way 4, which extends lengthwise of the valve 2. As soon as the valve moves a short distance lower down from the position shown in Fig. 1 the steam passes through the ports 5 and thence into the high-pressure cylinder 7 and forces up the piston 8. The steam which is at this time over the piston 8 is forced into the low-pressure cylinder 12 through the port 9, passage 10, and port 11 and acts to force the piston 13 down. The used steam beneath the piston in the cylinder 12 passes

into the second lengthwise passage-way 15 in the valve through the port 14 and escapes from said second passage-way through the exhaust-port 16. As soon as the pistons 8 13 have reached the opposite positions to that shown in the drawings the valve is moved sufficiently to bring the ports 9 17 into register, and then the live steam admitted by the pipe 1 and tube 3 passes into the cylinder 7 through the ports 9 17 and passes from the cylinder 7 to the low - pressure cylinder through the port 6, passage 18, and port 14. The used steam escaping from the cylinder 12 passes through port 11 into the second lengthwise passage-way 15 and escapes therefrom through the port 16.

Figs. 3 and 4 represent the valve mechanism embodied in a three-cylinder engine. In this construction the valve is provided with an additional steam - passage. The live-steam passage is designated by 4, the second steam-passage by *a*, and the third passage, which communicates with the exhaust, by *e*. The third cylinder is designated by *d*. In this construction of engine when the valve is moved into position to bring the ports 5 6 into register the steam admitted through the tube 3 and passage 4 passes into the cylinder 7 through the ports 5 6, while the used steam in the latter cylinder passes therefrom through the port 9, passage 10, and port 11 into the cylinder 12. The used steam in the latter passes therefrom through the ports 14 and 15 into the second steam-passage *a* and from the latter through the port *b* into the cylinder *d*. The steam under the piston in the latter cylinder passes therefrom through the port *c* into the passage *e* and escapes from the latter through the exhaust. When the pistons in the cylinders occupy the opposite positions to that in which they are shown and the slide-valve is moved to bring the ports 9 17 into register, the live steam admitted through the tube 3 passes into the cylinder 7 through said ports 9 17, while the used steam in said cylinder passes therefrom through the port 6, through the passage 18, and port 14 into the cylinder 12. The used steam in the latter passes therefrom through the port 11, passage-way *a*, and port *c* into the cylinder *d*. The used steam in the latter passes therefrom through the port *b*, passage *e*, to the exhaust.

Fig. 8 shows the ground plan of another embodiment of my invention, and Figs. 5 and 6 show sections of the same on the lines

a b and *c d e*, while Fig. 7 represents the crank-shaft in this type of engine. In this form of engine the steam admitted by the tube *g* into the passage-way *h* in the valve will pass by the ports *k l* under the piston *m* of the high-pressure cylinder, while the steam over this piston will pass into the steam-chest *p* through the port *o* and from thence into the hollow chamber *q* of the slide-engine. The steam passes from this chamber into the cylinder *u* through the ports *r s*, being reheated during its passage through the chamber *q*. The piston *t* in the chamber *u* forces the used steam through the port *v* into the passage *w* and through port 51 into passage 52, where a reheating of the steam occurs. The steam is then admitted into the low-pressure cylinder *y* through the port *x* and serves to force the piston *z* downward. The steam beneath the piston passes by the port 19, passage-way 20, and port 21 into the atmosphere or into a suitable condenser associated with the engine. When the pistons reach the opposite ends of the cylinder, the position of the slide-valve is reversed and the steam sent through the cylinders in a reverse direction, as will be understood.

Fig. 9 represents another embodiment of my invention, in which three cylinders are employed arranged tandem. In this construction of engine the live steam admitted through the port 25 passes through the live-steam passage 26 and ports 27 28 under the high-pressure piston 29. The steam in advance of the latter is forced through the ports 31 53 into the passage-way 32 and therefrom through the ports 33 34 back of the piston of the mean-pressure cylinder 36, being reheated in its travel through the passage 32. The used steam in advance of the piston 35 passes by the ports 37 into passage 38 40 and therefrom by ports 41 42 back of the piston 43 in the low-pressure cylinder 44, being again reheated in its travel. The steam in advance of the piston 43 passes from the cylinder 44 through port 45, passage 46, and port 47 into the atmosphere or into the condenser. As will be understood, when the pistons reach the opposite end of the cylinders to that shown in the drawings the valve is reversed, as in the previously-described forms of the

invention, and the steam sent through the cylinders in reverse directions.

What I claim, and desire to secure by Letters Patent, is—

1. In a compound engine and in combination, two cylinders, a piston working in each cylinder, ports located in the opposite ends of each cylinder, a valve-chamber, a valve shiftable longitudinally therein, said valve having closed ends a steam-space between the ends of the valve and the ends of the valve-chamber for the passage of steam from one cylinder to the other, said valve having steam-passages extending longitudinally thereof, one of which opens out directly through one of the closed ends of the valve to communicate with the live-steam supply, and the other passage communicating with an exit for the used steam, said valve further having ports leading from the first passage to register with the ports of the first cylinder, and additional ports in communication with the second steam-passage to register with the ports of the second cylinder, substantially as described.

2. In a compound engine and in combination, two cylinders, a piston working in each cylinder, ports located at opposite ends of each cylinder, a valve-chamber, a valve shiftable therein controlling the ports, said valve having two steam-passages extending longitudinally of the same arranged side by side, one of which is in direct communication through one of its ends with the live steam, said valve further having ports leading from the latter passage designed to register with the ports of one of said cylinders, and additional ports for opening communication between the second passage in the valve and the other cylinder, and a third cylinder having a piston working therein and ports, adapted to communicate with the second passage in said valve.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JEAN VENATOR.

Witnesses:

CARL RIVOIR,
OTTO FLÖTHER.