

No. 656,963.

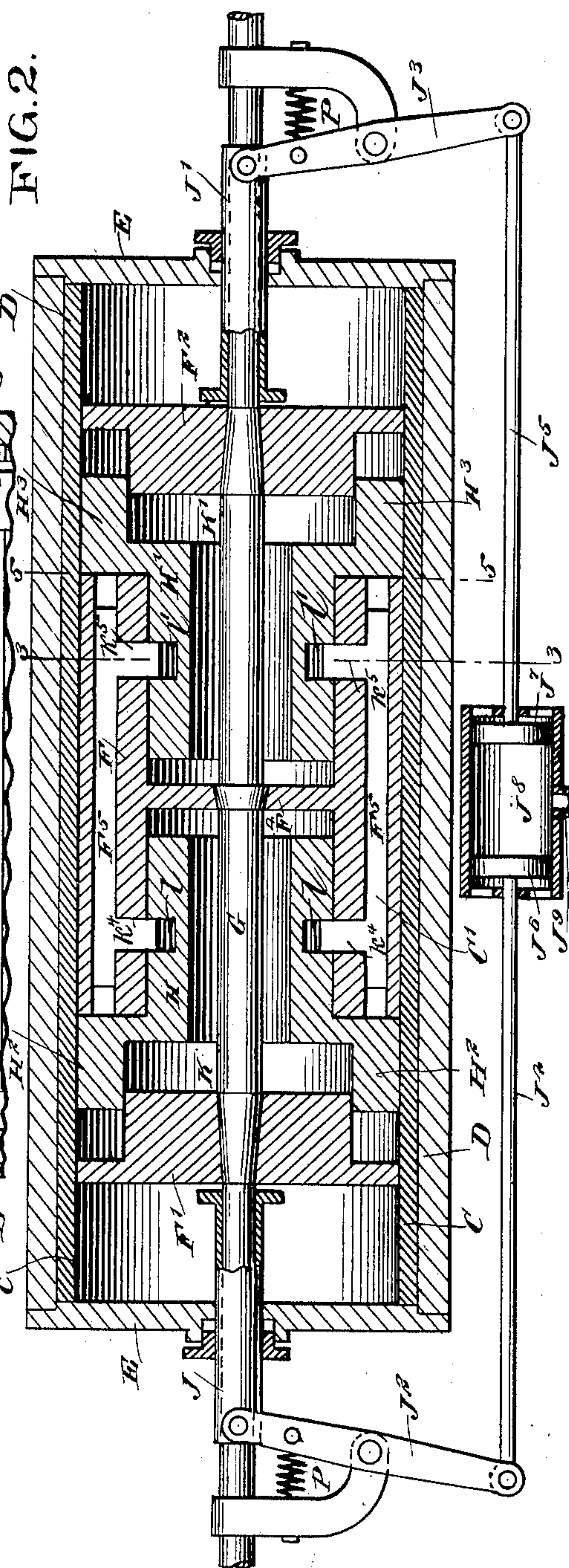
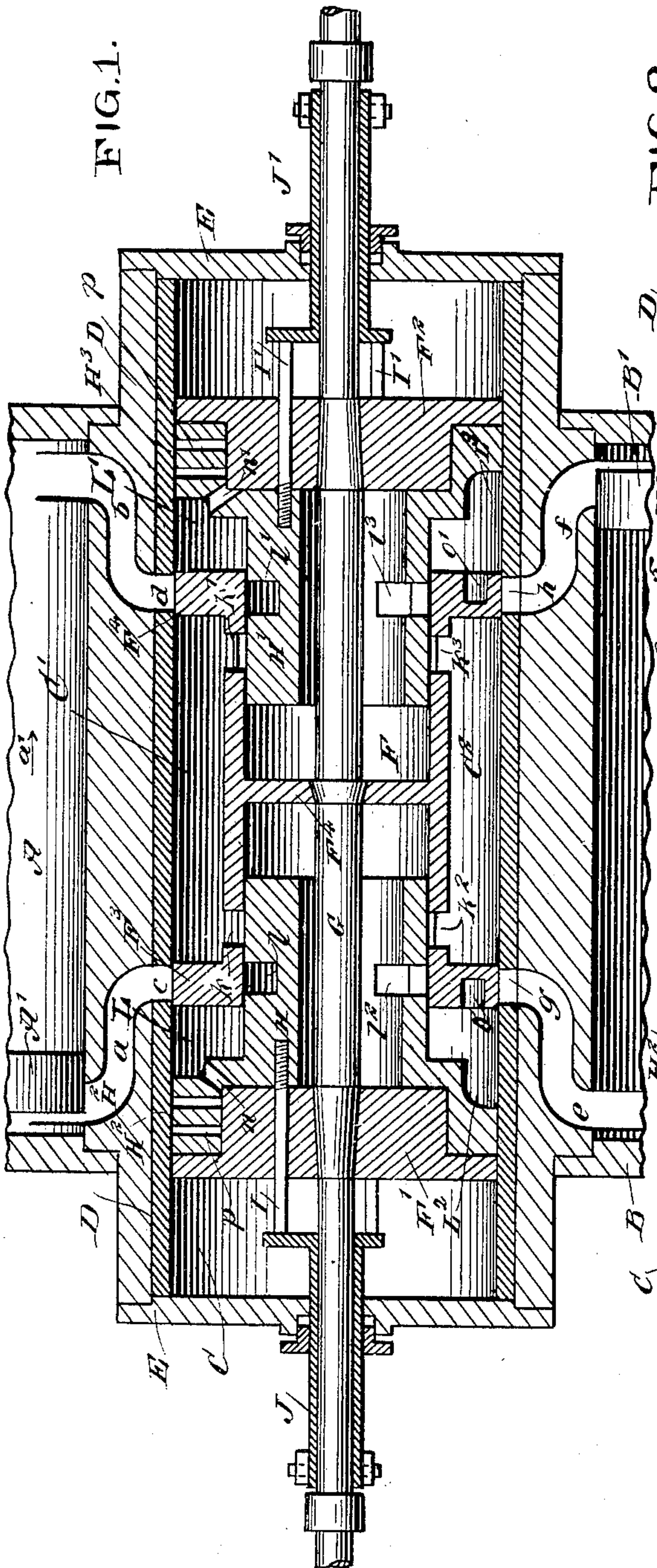
Patented Aug. 28, 1900.

D. GILCHRIST.
VALVE.

(Application filed Feb. 15, 1900.)

(No Model.)

2 Sheets—Sheet 1.



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FIG. 3.

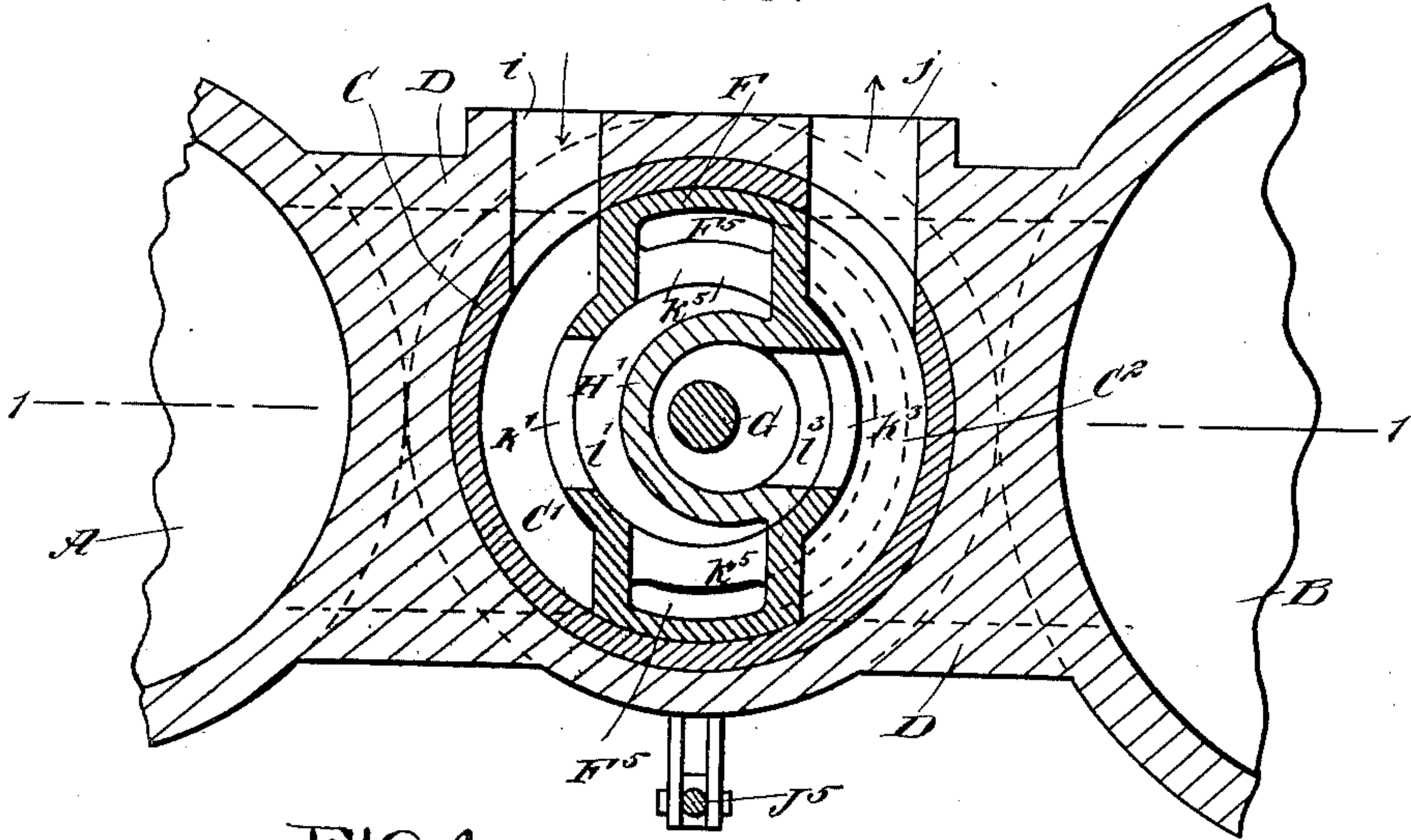


FIG. 4.

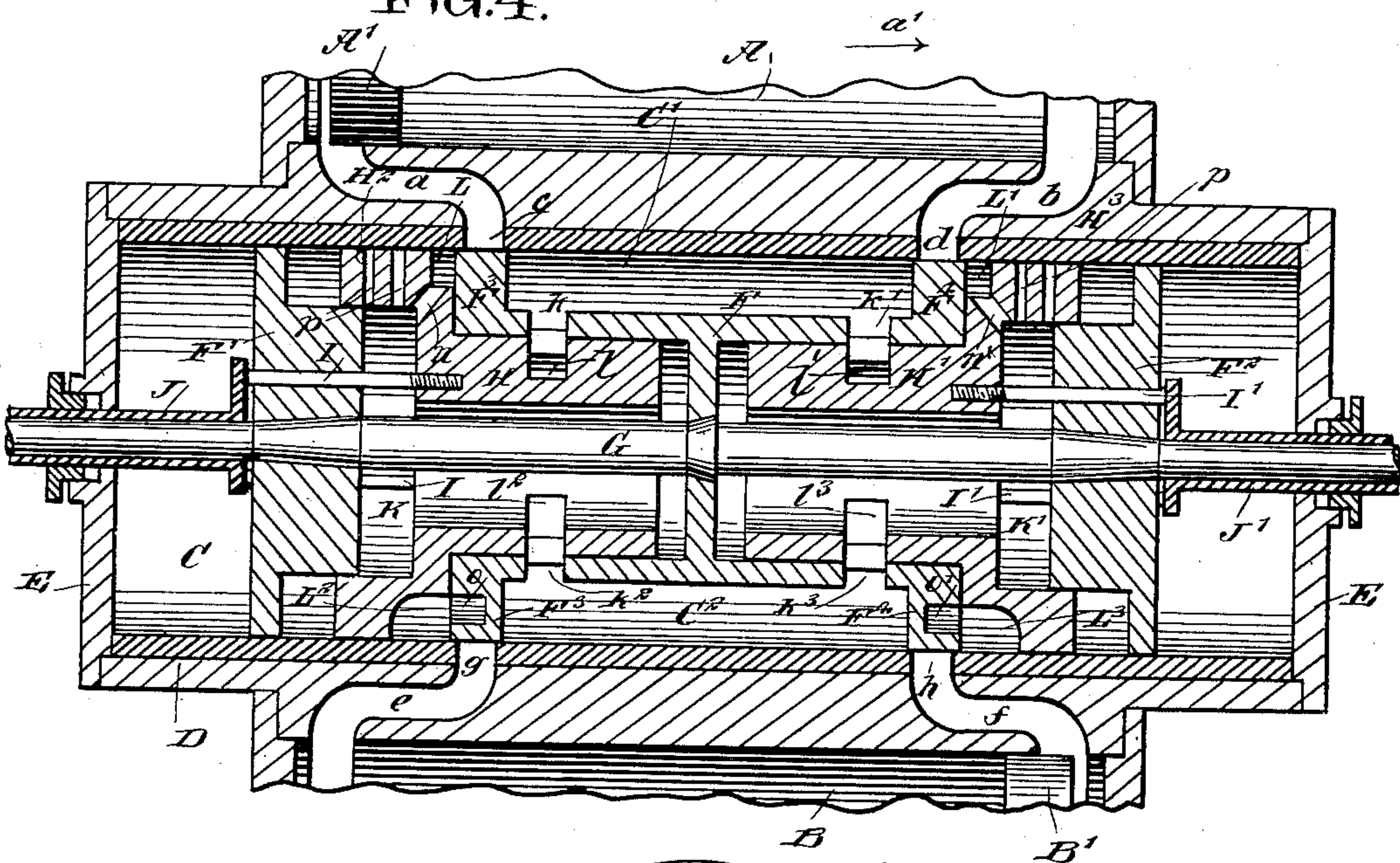
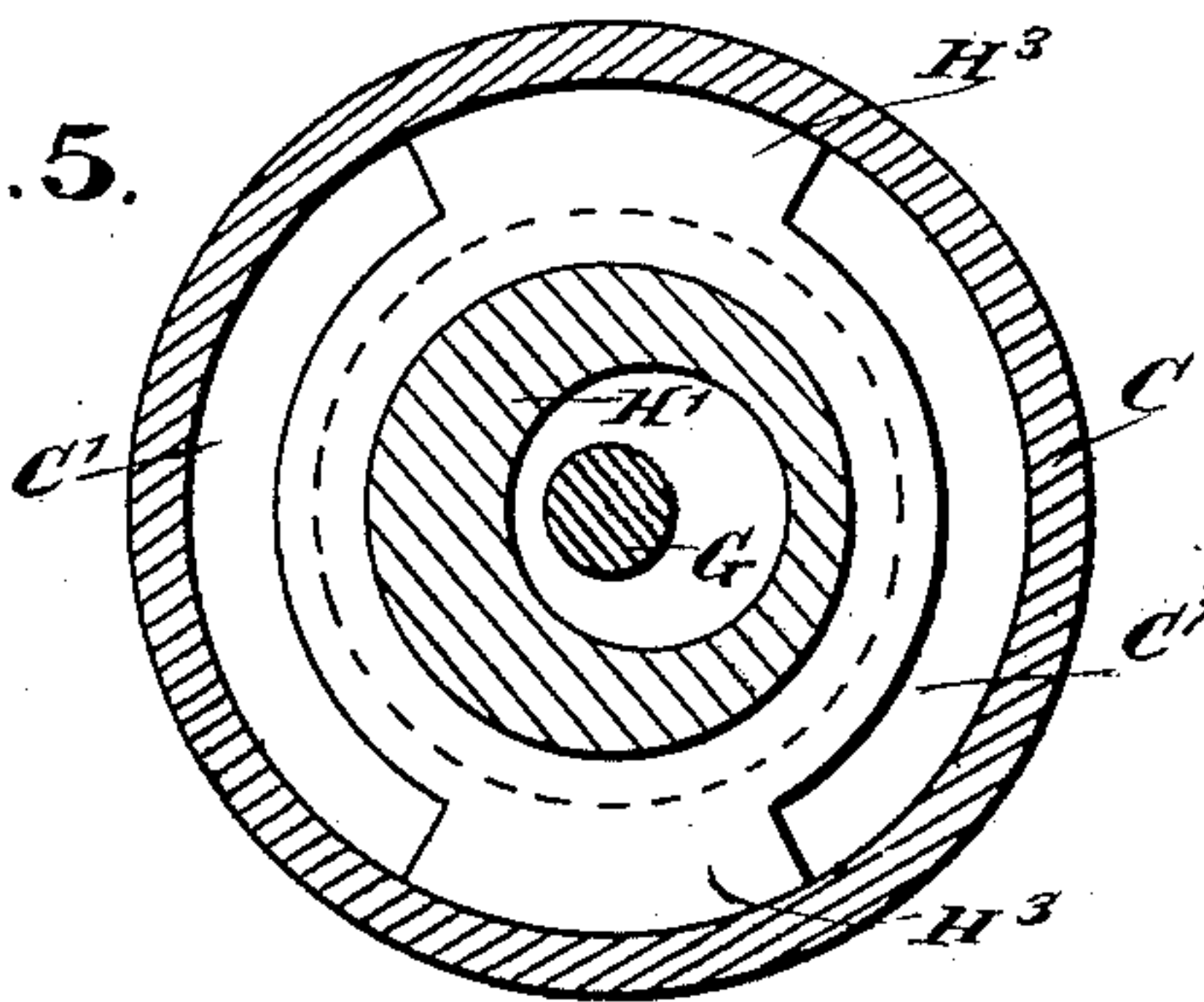


FIG. 5.



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UNITED STATES PATENT OFFICE.

DAVID GILCHRIST, OF CONCORD, NEW HAMPSHIRE.

VALVE.

SPECIFICATION forming part of Letters Patent No. 656,963, dated August 28, 1900.

Application filed February 15, 1900. Serial No. 5,347. (No model.)

To all whom it may concern:

Be it known that I, DAVID GILCHRIST, a citizen of the United States, and a resident of Concord, in the county of Merrimac and State of New Hampshire, have invented a new and Improved Valve, of which the following is a full, clear, and exact description.

The invention relates to expansion steam-engines having high and low pressure cylinders, with the cranks standing at one hundred and eighty degrees; and the object of the invention is to provide a new and improved valve designed to control the admission and exhaust to and from the engine-cylinders and arranged to permit of using the exhaust from the high-pressure cylinder either solely as the motive agent for the low-pressure cylinder or to supply live motive agent directly to the low-pressure cylinder.

The invention consists of novel features and parts and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a sectional plan view of the improvement on the line 1 1 in Fig. 3. Fig. 2 is a sectional side elevation of the same with the intercepting-valve in an active position. Fig. 3 is a cross-section of the same on the line 3 3 in Fig. 2. Fig. 4 is a sectional plan view of the same, and Fig. 5 is a cross-section of the improvement on the line 5 5 in Fig. 2.

In the high-pressure cylinder A of the engine reciprocates a piston A', and in the low-pressure cylinder B reciprocates a piston B' in an opposite direction to the reciprocating movement of the piston A', owing to the crank-arms standing at one hundred and eighty degrees. The ends of the cylinder A are connected by ports a and b with ports c and d, respectively, in a cylindrical steam-chest C, fitted into a bore in a saddle D intermediate of the cylinders A and B. The ends of the cylindrical steam-chest C are closed by suitable doors E, as illustrated in the drawings.

The low-pressure cylinder B is provided with ports e and f, connected with ports g

and h in the chest C, preferably located opposite the ports c and d. In the steam-chest C is mounted to reciprocate a main valve having a middle section F and end sections F' F², all secured on a valve-stem G, connected with a suitable mechanism of the engine to give the desired reciprocating motion to the main valve in the steam-chest C. The middle section F of the main valve is provided with flanges F³ F⁴, located a distance from the end sections F' F², and the said flanges F³ F⁴ control the ports c g and d h, respectively.

The middle portion of the steam-chest C is divided by the valve-section F into two compartments C' C², of which the compartment C' is connected with an inlet-port i, connected with a suitable source of steam-supply, and the other compartment C² is connected with an exhaust-port j, as is plainly indicated in Fig. 3.

When the several parts are in the position shown in Fig. 1 and the stem G is shifted to the left, then the compartment C' is connected with the port c, so that live motive agent can pass from said compartment through the ports c a into the left-hand end of the cylinder A to push the piston A' therein to the right in the direction of the arrow a', and at the same time the exhaust motive agent in front of the piston A' passes through the ports b d into the compartment C' and from the latter through the ports h f into the right-hand end of the cylinder B to push the piston B' therein in the inverse direction of the arrow a'. As the port g is uncovered during this operation, it is evident that the exhaust motive agent in front of the piston B' passes through the ports e g into the exhaust-compartment C² and from the latter through the exhaust-port j to the open air or to a condenser. When the pistons A' and B' near the ends of their strokes, then the valve-stem G is shifted to the right, so as to connect the compartment C' with the ports d and b to allow the motive agent to pass into the right-hand end of the cylinder A to push the piston A' in the inverse direction of the arrow a', and at the same time the exhaust motive agent in the left-hand end of the cylinder A passes through the ports a and c into the annular compartment C' and through the ports g e into the left-hand end of the cylinder B to push the piston B' therein to the

right in the direction of the arrow a' . While this is taking place the exhaust motive agent in the right-hand end of the cylinder B passes through the ports $f h$ into the compartment C^2 and through the exhaust-port j to the open air or a condenser.

When it is desired to pass live motive agent from the compartment C' directly into both the cylinders A and B and to simultaneously exhaust the motive agent from said cylinders into the compartment C^2 , intercepting-valves H H' are made use of in the manner presently to be described in detail. The intercepting-valves H H' are mounted to simultaneously slide toward or from each other in the main valve, the annular flanges $H^2 H^3$ of said intercepting-valves being disposed between the flanges $F^3 F^4$ and the end sections $F' F^2$, respectively. The intercepting-valves H H' are hollow and are inside of the middle section F, which has a central transverse partition F^4 , as shown in the drawings. The intercepting-valves H H' are secured on rods $I I'$, fitted to slide in the end sections $F' F^2$ and connected with sleeves $J J'$, fitted to slide in the heads E, the valve-stem G passing through said sleeves $J J'$. The outer ends of the said sleeves are pivotally connected with levers $J^2 J^3$, respectively connected with piston-rods $J^4 J^5$, carrying pistons $J^6 J^7$, mounted to reciprocate in a cylinder J^8 , connected at its middle at J^9 with a motive-agent supply under the control of the operator, the ends of said cylinder being open, so that when the motive agent has passed into the cylinder the two pistons $J^6 J^7$ are moved apart in an outward direction to cause the sleeves $J J'$, to move inward and shift the intercepting-valves H H' toward each other to the position shown in Figs. 2 and 4.

In the middle section F of the main valve are arranged ports $k k'$, opening into the steam-supply compartment C' , and ports $k^2 k^3$, opening into the exhaust-compartment C^2 . The ports $k k'$ are adapted to register with channels $l l'$ in the intercepting-valves H H', and the ports $k^2 k^3$ are adapted to register with the ports $l^2 l^3$, opening into the inside of the intercepting-valves H H' to allow the exhaust motive agent to pass to chambers K K', between the sections $F' F^2$ and the intercepting-valves H H', respectively, as is plainly shown in Fig. 4. From the chambers K K' lead ports $n n'$ to chambers L L', arranged between the flanges $F^3 F^4$ and the flanges $H^2 H^3$ of the intercepting-valves H H', so that exhaust-steam from the ends of the cylinder A can pass by ports $a c$ and $b d$ to the said chambers L L' and from the latter by way of ports $n n'$ to the chambers K K' and through the middle of the valves H H' and ports $l^2 k^2$ and $l^3 k^3$ to the exhaust-compartment C^2 . The channels $l l'$, above mentioned, connect by ports $k^4 k^5$, respectively, with chambers F^5 , formed in the middle valve-section F and opening at their ends into channels $o o'$, formed in the outer faces of the flanges $F^3 F^4$,

the said channels opening into chambers $L^2 L^3$, respectively, arranged between the flanges $F^3 F^4$ and the flanges $H^2 H^3$, the said chambers being adapted to register with the ports g and h , respectively, to supply the low-pressure cylinder with live steam when the valve F, and with it the intercepting-valves, is reciprocated. Springs P preferably bear between the levers $J^2 J^3$ and the supports on which said levers are fulcrumed and serve to force the intercepting-valves back into an outermost position when the steam is cut off from the cylinder J^8 .

When the intercepting-valves have been moved inward toward each other, as illustrated in Figs. 2 and 4, and the stem G is moved to the left, then the live motive agent from the compartment C' passes through the ports c and a into the left-hand end of the cylinder A to push the piston A' in the direction of the arrow a' , the same as previously described, and at the same time the live motive agent passes from the compartment C' , by way of the registering port k' and channel l' , to the chamber F^5 and from the right-hand end of the latter, by way of the channel c' , to the chamber L^3 , and then by the ports $h f$ to the right-hand end of the cylinder B to push the piston B' therein in the inverse direction of the arrow a' at the time the exhaust in front of the piston A' passes through the ports $b d$ into the chamber L' and by way of the port n' into the chamber K', then through the intercepting-valve H' to the ports $l^3 k^3$ to the compartment C^2 , and through the port j to the outside air. The exhaust in front of the piston B' passes, by way of the ports $e g$, directly into the compartment C^2 , and likewise through the port j to the outer air. When the pistons A' and B' near the ends of their strokes, the main and intercepting valves are simultaneously reversed, as it is understood that the intercepting-valves move with the main valve when the valve-stem G is shifted, and the motive agent passes from the chamber C' into the right-hand end of the cylinder A at the same time the live motive agent passes into the left-hand end of the cylinder B to push the pistons $A' B'$ in opposite directions back to their former positions. (Shown in Fig. 4.) The exhaust motive agent passes from the said cylinders into the compartment C^2 —that is, the motive agent from the cylinder A passes, by way of the ports $a c$, into the chamber L, through the port n into the chamber K, and from the latter, through the intercepting-valve H and the registering ports $l^2 k^2$, into the chamber C^2 . The exhaust motive agent in front of the piston B' passes through the ports $f h$ directly into the chamber C^2 to be exhausted by way of the port j .

In the flanges $H^2 H^3$ adjacent to the cylinder A are arranged ports p to assist in passing the exhaust to the chambers K K' for the purpose previously explained, said ports p being additional to the ports $n n'$.

From the foregoing it is evident that the

intercepting-valves can be thrown into or out of action at the will of the operator, so that the motive agent simultaneously passes into the cylinders A and B at opposite ends thereof, or the main valve is used without the intercepting-valves being in active position for carrying the exhaust motive agent of the high-pressure cylinder for expansion purposes into the low-pressure cylinder B and for finally passing the exhaust motive agent from the low-pressure cylinder to the exhaust-chamber C² and the port *j*.

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

1. A valve for expansion-engines, comprising a steam-chest connected with the ports of both the high and low pressure cylinders, a main valve reciprocating in said steam-chest, and arranged to control the admission of the motive agent to the high-pressure cylinder, and an intercepting-valve under the control of the operator and operating in unison with said main valve, to control the exhaust of both the high-pressure and the low-pressure cylinders, and to control the admission of the live motive agent to the low-pressure cylinder, the said intercepting-valve being adjustable on the main valve, as set forth.

2. A valve for expansion-engines, comprising a steam-chest connected with the ports of both the high and low pressure cylinders, a main valve reciprocating in said steam-chest, and arranged to control the admission of the motive agent to the high-pressure cylinder, an intercepting-valve under the control of the operator and operating in unison with said main valve, to control the exhaust of both the high-pressure and the low-pressure cylinders, and to control the admission of the live motive agent to the low-pressure cylinder, the said intercepting-valve being adapted to be shifted on the main valve and means under the control of the operator for shifting the said intercepting-valves into an active or inactive position on said main valve, as set forth.

3. A valve for expansion-engines, comprising a steam-chest connected with the ports of both the high and low pressure cylinders, a main valve reciprocating in said steam-chest, and arranged to control the admission of the motive agent to the high-pressure cylinder, and intercepting-valves moving with said main valve and operating in conjunction therewith, to control the exhaust of both the high and low pressure cylinders and the admission of motive agent to the low-pressure cylinder, the said intercepting-valves being mounted to slide toward and from each other in the main valve and means under the control of the operator, for shifting the said intercepting-valves on the said main valve to an active position, as set forth.

4. A valve for expansion-engines comprising a cylindrical steam-chest connected by ports with the ports of both the high and low

pressure cylinders and a main valve reciprocating in said steam-chest, and having end sections and a middle section all secured on the valve-stem, the said middle section dividing the middle portion of said steam-chest into two compartments one of which is connected with an inlet-port for the steam-supply and the other with an exhaust-port, the said middle section of the main valve being provided with flanges controlling the said ports connecting the steam-chest and cylinders, substantially as described.

5. A valve for expansion-engines, comprising a steam-chest connected with the ports of both the high and low pressure cylinders, a main valve reciprocating in the steam-chest and arranged to control the admission of the motive agent to the high-pressure cylinder, the said valve having a middle section and end sections, the middle section forming two compartments in the steam-chest connected respectively with an inlet-port for the steam-supply and an exhaust-port, and an intercepting-valve under the control of the operator, and mounted to slide in the middle section of the main valve, the said intercepting-valve operating in unison with said main valve, for the purpose set forth.

6. A valve for expansion-engines, comprising a steam-chest connected with the ports of both the high and low pressure cylinders, a main valve reciprocating in said steam-chest and forming two compartments therein connected respectively with an inlet-port for the steam-supply and an exhaust-port, the said valve being arranged to control the admission of the motive agent to the high-pressure cylinder, an intercepting-valve fitted to slide in the main valve and operating in unison therewith to control the exhaust of both the high-pressure and the low-pressure cylinders, and to control the admission of the live motive agent to the low-pressure cylinder, and means under the control of the operator for shifting the said intercepting-valve, substantially as set forth.

7. A valve for expansion-engines, comprising a steam-chest connected with the ports of both the high and low pressure cylinders, a main valve reciprocating in said steam-chest and arranged to control the admission of the motive agent to the high-pressure cylinder, an intercepting-valve mounted to slide in the main valve, and operating in unison therewith to control the exhaust of both the high-pressure and the low-pressure cylinders and to control the admission of the live motive agent to the low-pressure cylinder, rods secured to the intercepting-valve and fitted to slide in the main valve, and means under the control of the operator and connected with said rods for shifting the intercepting-valve, as set forth.

8. A valve for expansion-engines, comprising a steam-chest connected with the ports of both the high and low pressure cylinders, a main valve reciprocating in said steam-chest,

and arranged to control the admission of the motive agent to the high-pressure cylinder, intercepting-valves mounted to slide in the main valve and operating in unison therewith
5 to control the exhaust of both the high-pressure and the low-pressure cylinders, and to control the admission of the live motive agent to the low-pressure cylinder, rods fitted to slide in the ends of the main valve and to
10 which the said intercepting-valves are secured, sleeves fitted to slide in the ends of the steam-chest and connected with the said rods, the main valve-stem passing through the said sleeves, levers pivotally connected
15 with the outer ends of said sleeves, a cylinder, and piston-rods carrying pistons mounted to reciprocate in said cylinder, the said piston-rods being connected with the said levers, the said cylinder being connected with a motive-agent supply under the control of the
20 operator, for the purpose set forth.

9. A valve for expansion-engines comprising a cylindrical steam-chest having ports connected with the ports of both the high and
25 low pressure cylinders, a main valve reciprocating in said steam-chest and having end sections and a middle section, the middle section dividing the middle portion of the

steam-chest into a live-steam compartment and an exhaust-compartment connected respectively with an inlet-port for the steam-supply and an exhaust-port, the middle valve-section being provided with flanges controlling the ports connecting the steam-chest and the cylinders, and the said middle section
35 having a central transverse partition, hollow intercepting-valves extending within the middle section of the main valve and provided with flanges located between the flanges on the middle section and flanges on the end
40 sections of the main valve, the said reciprocating valve moving with the main valve and adapted to be shifted thereon, the middle section of said main valve and the intercepting-valve being provided with ports or passages,
45 and the said intercepting-valve operating in unison with said main valve, for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of
50 two subscribing witnesses.

DAVID GILCHRIST.

Witnesses:

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WM. R. CHEVES.