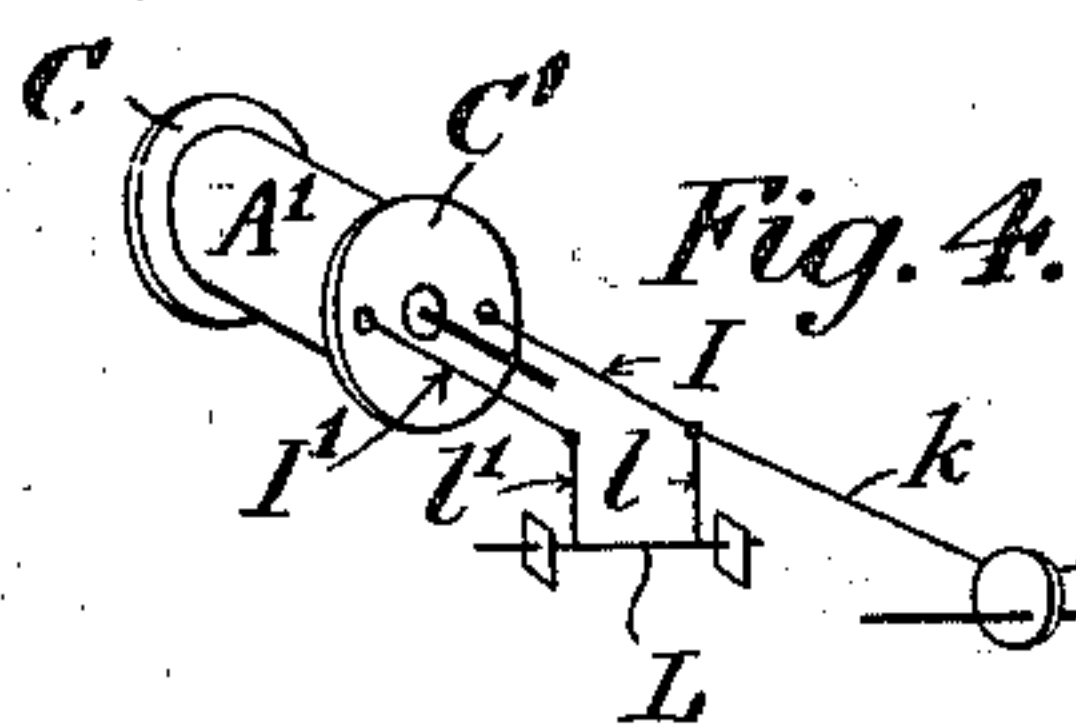
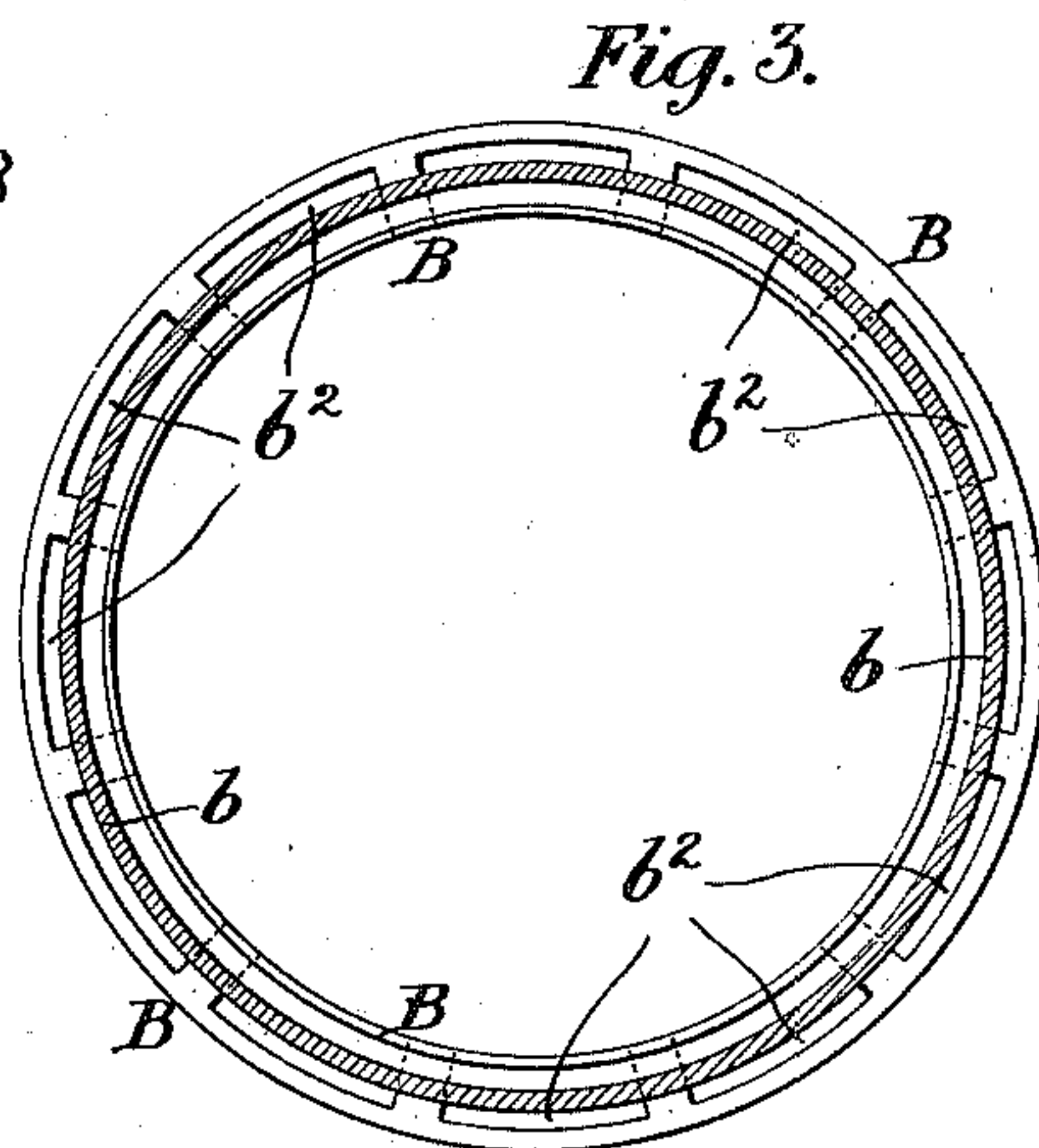
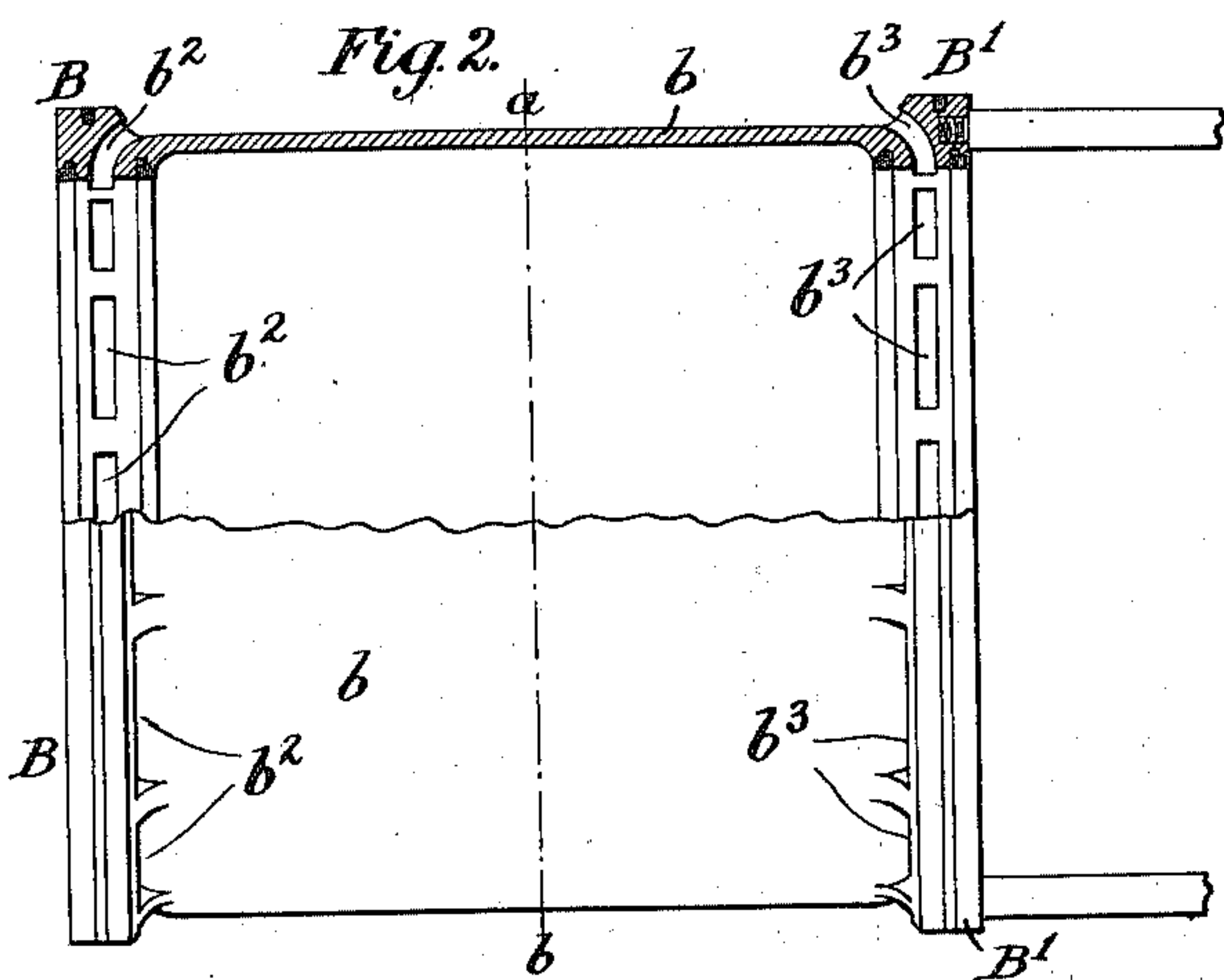
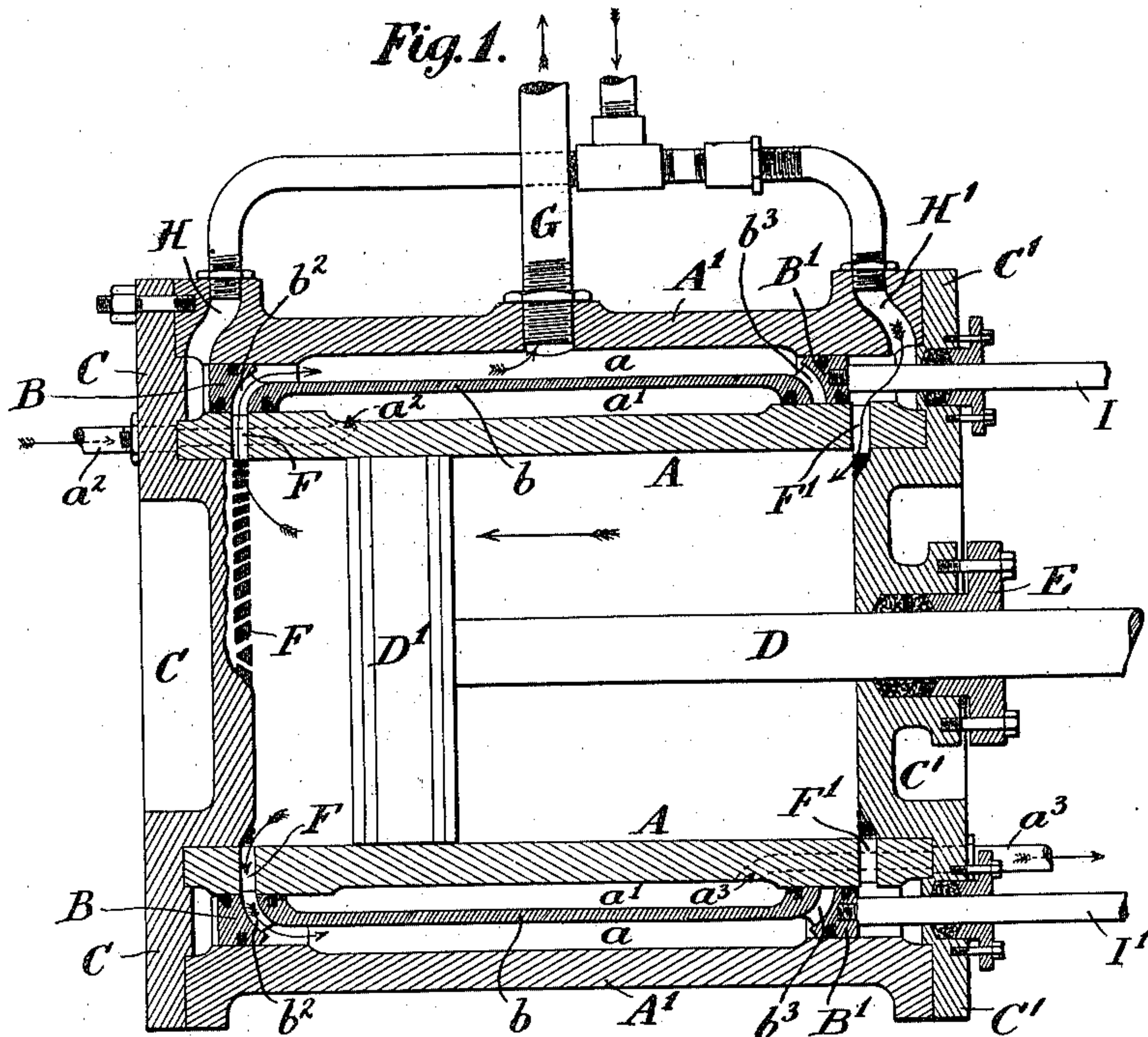


(No Model.)

A. HOLMGREN.  
CYLINDER AND VALVE FOR STEAM MOTORS.

No. 528,227.

Patented Oct. 30, 1894.



Witnesses:  
J. M. Fowler  
S. M. Dorsett

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# UNITED STATES PATENT OFFICE.

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## CYLINDER AND VALVE FOR STEAM-MOTORS.

SPECIFICATION forming part of Letters Patent No. 528,227, dated October 30, 1894.

Application filed October 3, 1893. Serial No. 487,096. (No model.) Patented in England December 19, 1892, No. 23,383.

*To all whom it may concern:*

Be it known that I, ALFRED HOLMGREN, a citizen of the United States of America, residing at New York, in the State of New York, have invented new Improvements in Cylinders and Valves of Steam, Compressed-Air, and other Reciprocating Motors, (for which I have obtained a patent in Great Britain, No. 23,383, bearing date December 19, 1892,) of which the following is a specification.

The object of this invention is to simplify the construction of the cylinders of steam and other reciprocating engines in such a way that while the ports for the induction and education of the motive fluid are reduced to a minimum, and at the same time the valve for governing the supply and exhaust is also considerably simplified, and its action rendered much more efficient, such valve shall be perfectly balanced and its construction and arrangement be such that a steam jacket will be provided for the motor cylinder, which jacket will always be independent of the exhaust and supply of the motive fluid, so that the cylinder will be continuously heated and maintained at a uniform temperature, thus avoiding condensation. For this purpose I construct each of the cylinders of the motor so that same are double, that is to say that each consists of two cylinders one within the other, and it is in the annular space between these two cylinders that the valve for controlling the ports at the opposite ends of the cylinder works. The two cylinders have a head common to both at each end, and at or near each end of the inner cylinder a port is formed by simply cutting the wall of the cylinder away all round, simply leaving sufficient metal at suitable intervals to connect the two parts of the inner cylinder together. The part of the space between the inner and outer cylinders over the port at each end is turned to form a valve cylinder, and in this cylinder the valve (which is of annular form) reciprocates. The two valves for governing the opposite ports are connected by an annular shell, so as to separate the annular space between the two cylinders into two parts, the inner one serving as a steam jacket for the inside cylinder (for which purpose suitable steam inlet and

outlet openings will be formed through the heads of the cylinders and leading into such annular space), while the outer space will serve either as the steam chest or as the exhaust common to both cylinder ports. Passages are formed through each valve into the outer annular space, so as to connect the cylinder ports with the latter at the required times. From one end of the valve, spindles work through glands at diametrically opposite points of the cylinder head, and are actuated simultaneously by any suitable means, such as a forked lever engaging both spindles and caused to rock in any suitable manner so as to actuate the valves at the required times. Any form of expansion gear may be fitted to the valve so as to regulate the cut off as desired.

By the construction of cylinder and valve described the valve will be relieved of all pressure, and will be perfectly balanced, and further, the admission and exhaust of the motive fluid will be perfectly free and unobstructed.

In the accompanying drawings:—Figure 1 is a longitudinal section of a cylinder and valves constructed according to my invention. Fig. 2 is a side elevation (partly in section) of the valves. Fig. 3 is a transverse section through the valves on the line *a, b*, Fig. 2, and Fig. 4 is a diagrammatic view showing how the valves may be actuated.

In the drawings *A* is the inner motor cylinder, and *A'* the outer motor cylinder, these cylinders being provided with heads *C, C'*, common to both, and the piston rod of piston *D'*, which reciprocates in the inner cylinder *A*, works through a gland or stuffing box *E* in the head *C'*, in the usual manner.

The inner cylinder *A* is provided with ports *F, F'*, at each end, which are formed through such cylinder all round, and which are controlled by the valves *B, B'*. These valves *B, B'*, are connected together by an annular shell *b*, so that such shell divides the space between the cylinders *A, A'*, into two parts *a, a'*, the former of which serves either for supply or exhaust, while the latter forms a jacket through which steam can be caused to circulate by means of passages *a<sup>2</sup>, a<sup>3</sup>*, pro-



vided in the cylinder heads C, C', and the inner cylinder A, the metal left between the ports F, F', respectively, of which, must at one point be sufficient to permit of the formation of such passages  $a^2$ ,  $a^3$ , through such metal.

The valves B, B', are provided with passages  $b^2$ ,  $b^3$ , through same all round, so as to place the ports F, F', alternately in connection with the space  $a$ , serving for supply or exhaust (as the case may be), when such valves are in the requisite position. This annular space  $a$  is permanently open to exhaust or supply (as the case may be) through the pipe G, while passages H, H', formed through the outer cylinder A', open into the space in which the valves B, B', reciprocate, and are controlled by such valves, so as to alternately connect the ports F, F', respectively, with the annular space  $a$ , and with the passages H, H', the action being such that when port F is in connection with space  $a$ , the port F' is in connection with passage H', and when port F is in connection with passage H, port F' is in connection with space  $a$ . If space  $a$  serves as an exhaust space, the passages H, H', will serve for the supply, and vice versa.

From opposite sides of the valve B', spindles I, I', project, and work through stuffing boxes or glands in the cylinder head C', and same are caused to reciprocate by any suitable means, such as by an eccentric K (as

shown diagrammatically in Fig. 4), the rod  $k$  of which actuates a rocking lever L, with arms  $l$ ,  $l'$ , connected respectively to one of the valve spindles I, I'.

It will be seen that the action of live steam entering by passage  $a^2$  and passing through the space  $a'$  between the shell  $b$  of the valve and the inner motor cylinder A, and then leaving by passage  $a^3$ , will have the effect of heating such cylinder and avoiding condensation.

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

The combination with motor cylinders formed with double walls and an annular space between such walls, of ports formed through the inner wall of such cylinders and controlled by annular valves which are caused to reciprocate in the space between such walls, the valves at the opposite ends of the cylinder being connected together by an annular shell dividing the space between the walls of the cylinder into two parts, the inner one of which serves as a steam jacket, while the outer one is by means of passages through each valve placed alternately into communication with the opposite ends of the inside of the cylinder.

ALFRED HOLMGREN.

Witnesses:

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