No. 682,676.

Patented Sept. 17, 1901.

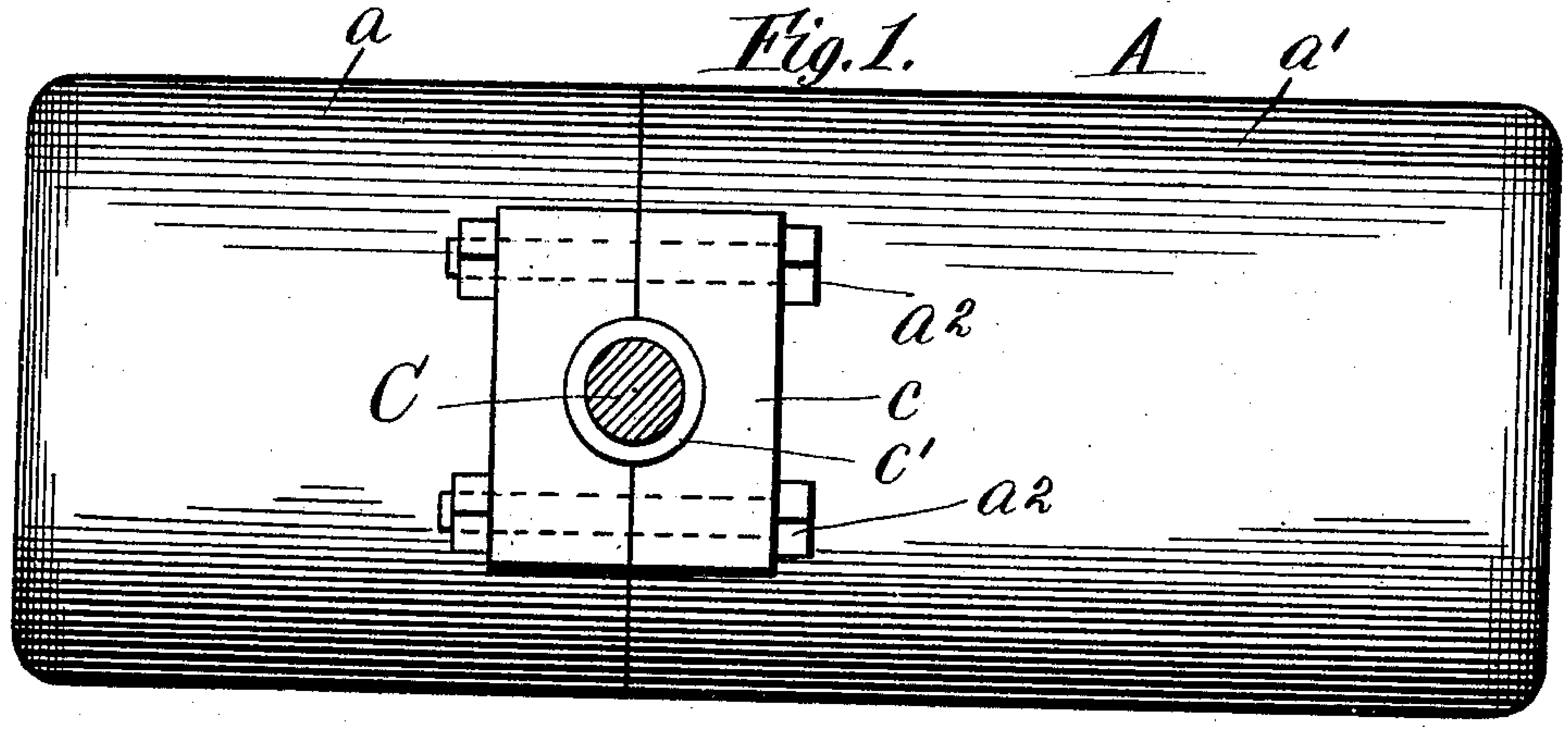
W. E. EWALD.

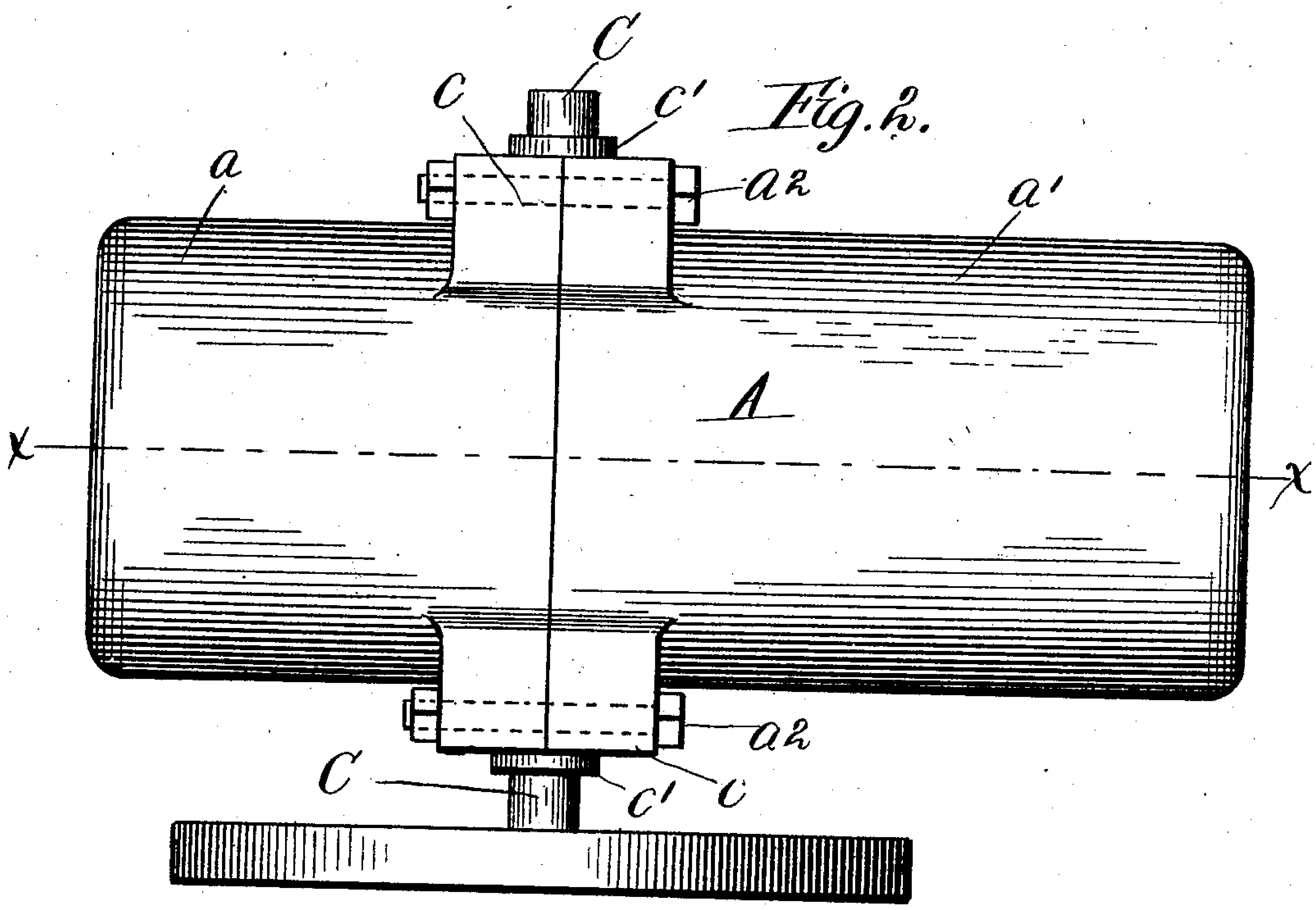
MULTIPLE CYLINDER ENGINE.

(Application filed Oct. 19, 1900.)

(No Model.)

2 Sheets—Sheet 1.

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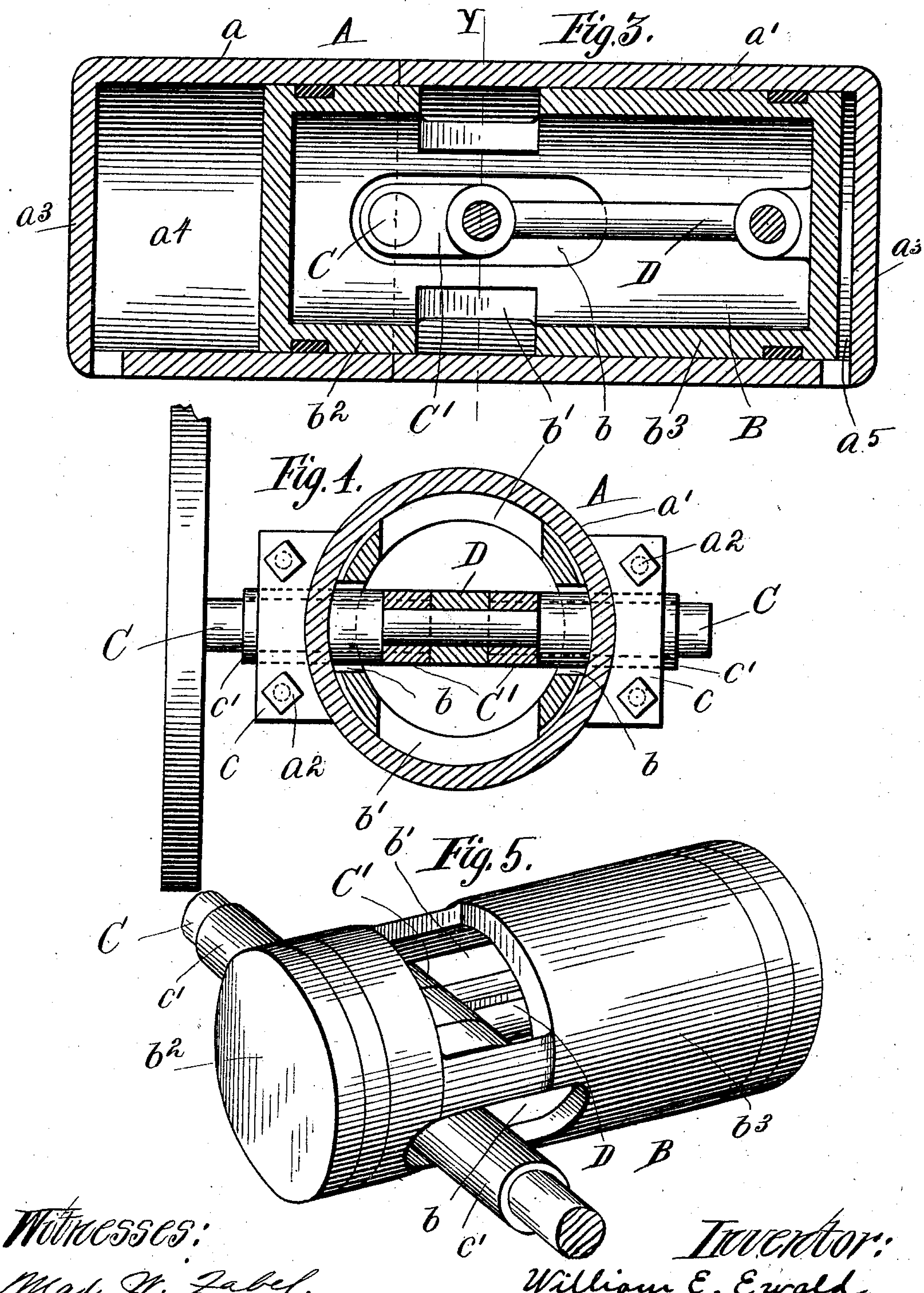


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# UNITED STATES PATENT OFFICE.

WILLIAM E. EWALD, OF CHICAGO, ILLINOIS.

## MULTIPLE-CYLINDER ENGINE.

SPECIFICATION forming part of Letters Patent No. 682,676, dated September 17, 1901.

Application filed October 19, 1900. Serial No. 33,542. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM E. EWALD, a citizen of the United States of America, and a resident of Chicago, county of Cook, State of Illinois, have invented certain new and useful Improvements in Fluid-Motors, of which the following is a specification.

My invention relates to fluid-motors of the reciprocating-piston type, and has for its object the provision of a simple, compact, and comparatively inexpensive engine capable of efficient service in various connections, but more particularly adapted for use in connection with automobiles, to reduce the cost of manufacture, to insure strength and rigidity, to reduce vibration, to prevent leakage, to insure perfect alinement of the piston-heads, and to provide certain details and features of improvement tending to increase the general efficiency and to render a fluid-motor of this character serviceable and reliable in its operation.

To the attainment of the foregoing and other useful ends my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is a side elevation of a fluid-motor embodying the principles of my invention. Fig. 2 is a plan of the same. Fig. 3 is a longitudinal section on line $x$ $x$ in Fig. 2. Fig. 4 is a cross-section on line $y$ $y$ in Fig. 2. Fig. 5 is a perspective of the piston and crank-shaft.

As thus illustrated, my invention comprises a cylinder or casing A, a piston B, and a crank-shaft C. The casing is preferably composed of sections $a$ and $a'$, the two sections being held together by bolts or screws $a^2$ and the line of junction occurring at the point where the shaft C extends transversely through the motor. The cylinder-heads $a^3$ are preferably formed integral with the body of the casing, so as to prevent leakage. With this construction and arrangement it will be seen that the motor involves a plurality of cylinder-sections connected together to provide a plurality of oppositely-arranged pressure-chambers—as, for example, the two chambers $a^4$ and $a^5$—wherein motive fluid is expanded for the purpose of driving the piston. The transversely-arranged crank-shaft C revolves in bearings $c$, arranged at either side of the crank C′, it being observed that the abutting ends of the two cylinder-sections are grooved to accommodate said shaft and that said bearings are of the split or two-part form. In this way it will be seen that the bearings for the shaft are formed at the junction of the cylinder-sections, and that consequently the shaft and piston can be removed intact.

The piston B is preferably cylindric in form and is preferably cast integral or all in one piece. It will also be observed that the piston is hollow and that it is provided with lateral slots $b$ $b$ and upper and lower openings $b'$ $b'$. Thus constructed the piston presents a relatively short head $b^2$ at one end and a relatively long head $b^3$ at the other end. The relatively long head is connected with the crank by a rod or pitman D. In this way it will be seen that the formation of the piston provides extensive bearing-surface and that being cast integrally its two heads cannot get out of alinement. Furthermore, it will be seen that the piston while having the desired amount of bearing-surface is also light and of a character to reduce weight and vibration. The end wall of piston-head $b^2$ preferably comes close to the shaft, while the opposite end of the piston is some distance away, depending on the length of the pitman D. In other words, one end of the piston reciprocates close to the shaft, while the other end, owing to the interposition of the pitman, reciprocates farther away. In this way, and with one end of the piston quite close to the shaft, the difference in the length of the two piston-heads and also of the two cylinder-sections will depend upon and be determined almost entirely by the length of the pitman.

It will be understood that any suitable mechanism or devices can be employed for controlling the admission and exhaust.

While any suitable formation or construction can be adopted for the shaft-bearings, it is preferable to mount the shaft in bushings $c'$. These bushings can be of any suitable metal and are clamped between the abutting or opposite ends of the two cylinder-sections. Thus constructed the cylinder presents a bore of uniform diameter from end to end. In operation the strokes of the piston-heads lap—that is to say, each head slides past the shaft—and in this way increased bearing-surface is secured without lengthening the motor. A motor of this character is simple and comparatively inexpensive of manufacture; also, it is capable of high speed without straining or loosening the parts.

What I claim as my invention is—

1. A fluid-motor comprising a cylinder-casing composed of two sections, a shaft extending transversely through said casing at the junction of said sections, the abutting ends of said cylinder-sections being grooved to accommodate the shaft and so formed as to practically provide the latter with a pair of two-part bearings, piston-heads fitting the bore of the cylinder at opposite sides of said shaft, means for connecting said piston-heads with said shaft, and means for connecting the two sections of the cylinder, substantially as described.

2. A fluid-motor comprising a cylinder-casing composed of two sections, a shaft extending through the casing at the junction of said sections, said shaft being journaled in bushings seated in grooves formed in the abutting ends of said sections, piston-heads fitting the cylinder at opposite sides of said shaft, means for connecting said piston-heads with said shaft, and means for connecting the two cylinder-sections, substantially as described.

3. A fluid-motor comprising a cylinder-casing composed of two sections, the abutting end portions of the sections being provided externally with projections or flange-like portions, bushings seated in grooves formed in the abutting ends of said cylinder-sections, bolts or screws extending through said projections or flange-like portions and serving to hold the two sections together and to clamp the bushings in place, a crank-shaft journaled in said bushings, the cylinder-casing having expansion-chambers arranged at opposite sides of said shaft, and reciprocating piston mechanism for communicating motion to said shaft, substantially as described.

4. A fluid-motor comprising a cylinder-casing, a crank-shaft extending transversely through said casing, a hollow piston cast or made in one piece and having heads or ends reciprocating in unison at opposite sides of said shaft, and a pitman inclosed within said piston and connecting one end of the latter with the crank on said shaft, substantially as described.

5. A fluid-motor comprising a cylinder-casing composed of relatively long and short sections, a crank-shaft extending transversely through the casing at the junction of said sections, a piston having relatively long and short heads or end portions inclosed respectively within the relatively long and short cylinder-sections, and a pitman connecting the long end portion of the piston with the crank on said shaft, the end of the short end portion of the piston reciprocating close to the shaft, and the length of the long head or end portion of the piston, as well as the long cylinder-section, depending practically upon the length of the said pitman, substantially as described.

6. A fluid-motor comprising a cylinder-casing, a piston inclosed therein, and provided with opposite ends or heads, a crank-shaft extending transversely through the cylinder and piston at a point much nearer one end than the other, so as to permit one end of the piston to reciprocate close to the shaft, and a pitman for connecting the other end of the piston with the crank on said shaft, the position of the latter relatively to the opposite ends of the cylinder and piston being determined substantially by the length of the said pitman, substantially as described.

7. A fluid-motor comprising a suitable cylinder, a crank-shaft extending transversely through the cylinder, a hollow piston cast or made in one piece and having relatively long and short portions fitting the cylinder at opposite sides of the shaft, the shaft extending through slots in the piston, the end of the short portion of the piston reciprocating close to the shaft, and a pitman connecting the long end of the piston with the crank on said shaft, the difference in the length of the two portions of the piston depending practically upon the length of the said pitman, substantially as described.

Signed by me at Chicago, Illinois, this 17th day of October, 1900.

WILLIAM E. EWALD.

Witnesses:
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