(No Model.)

4 Sheets—Sheet 1.

H. S. STEWART.

ROTARY APPARATUS FOR FLUIDS.

No. 308,859. Patented Dec. 2, 1884.

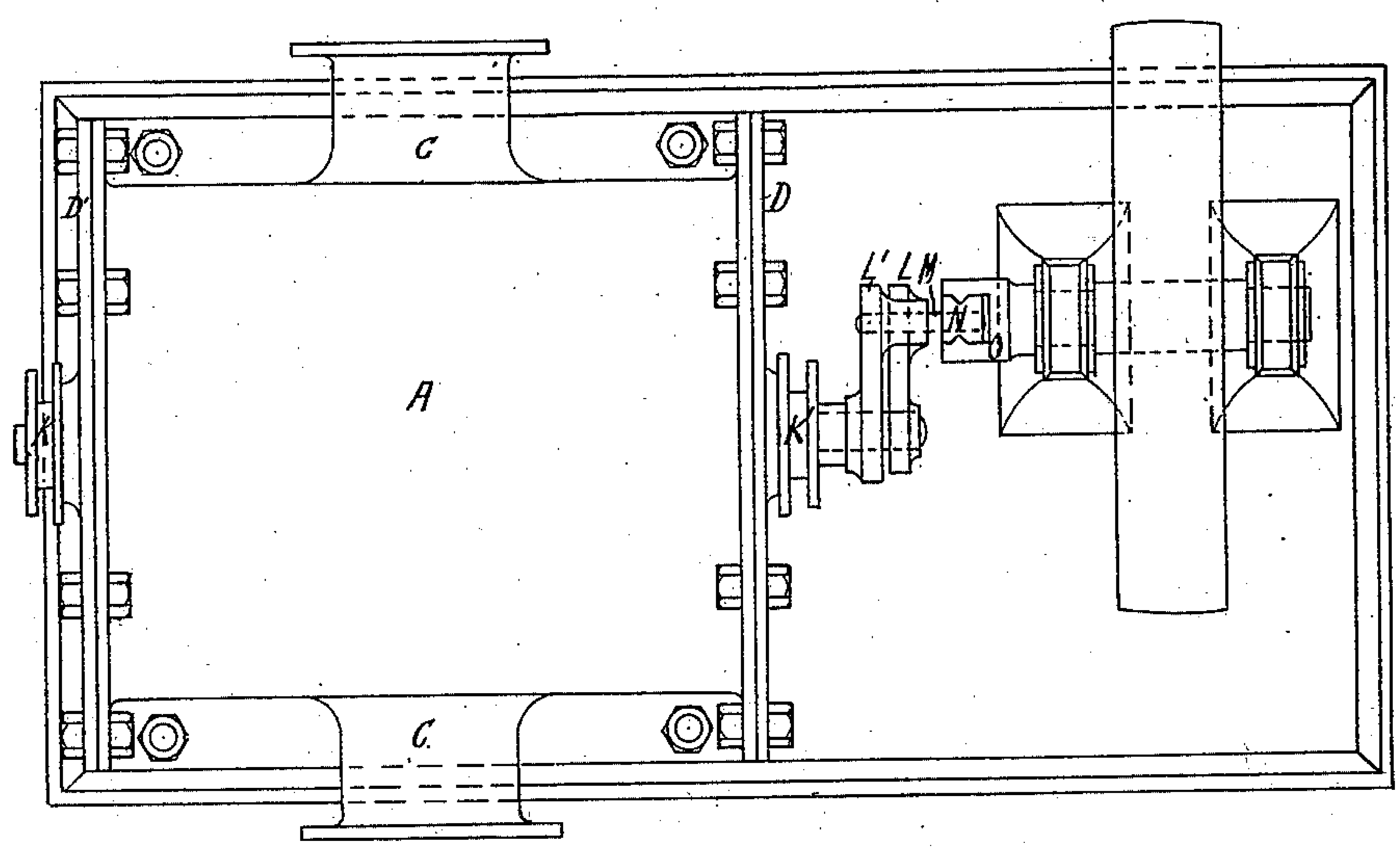
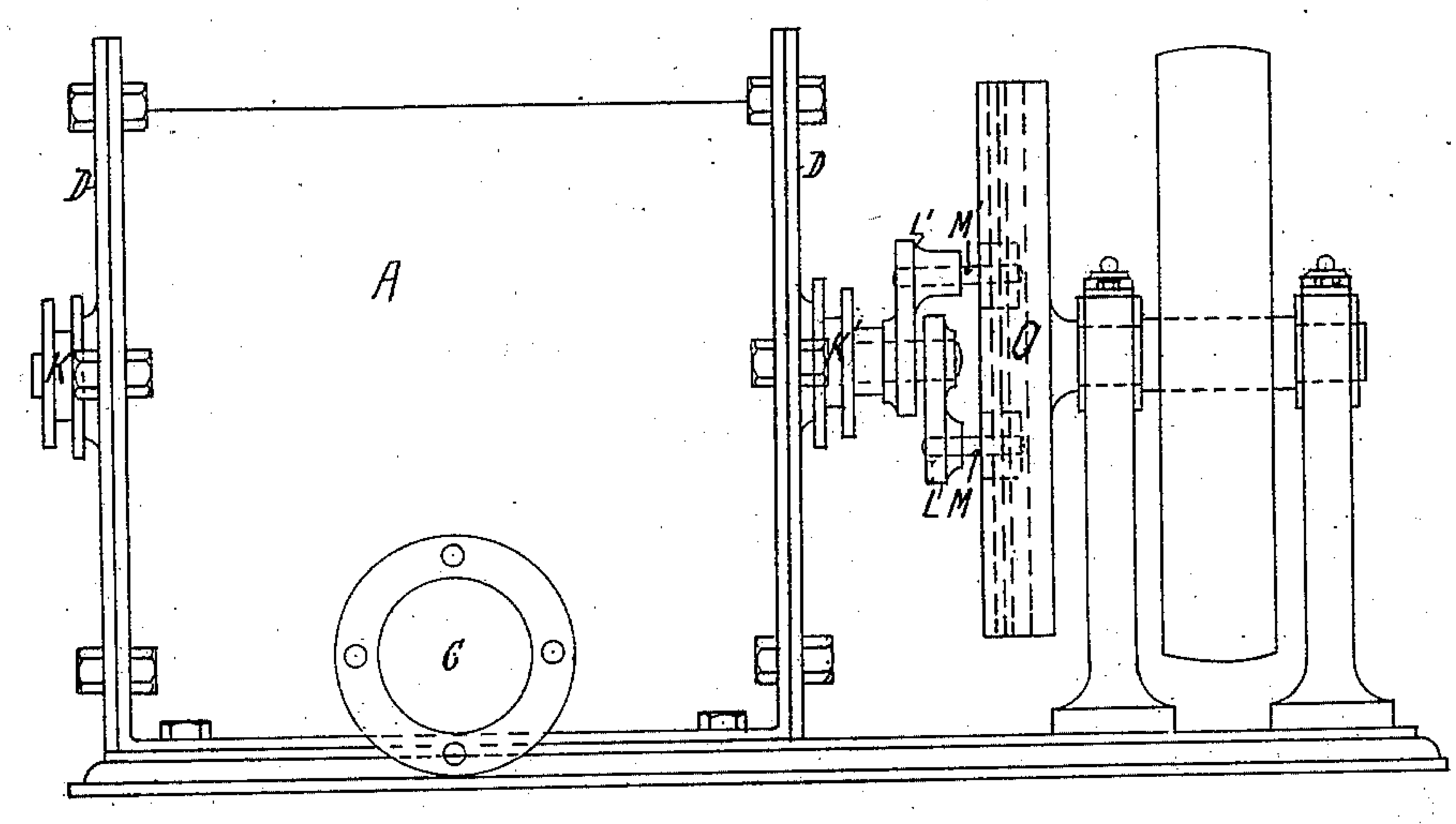


FIG. 1

FIG. 2.



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ROTARY APPARATUS FOR FLUIDS.

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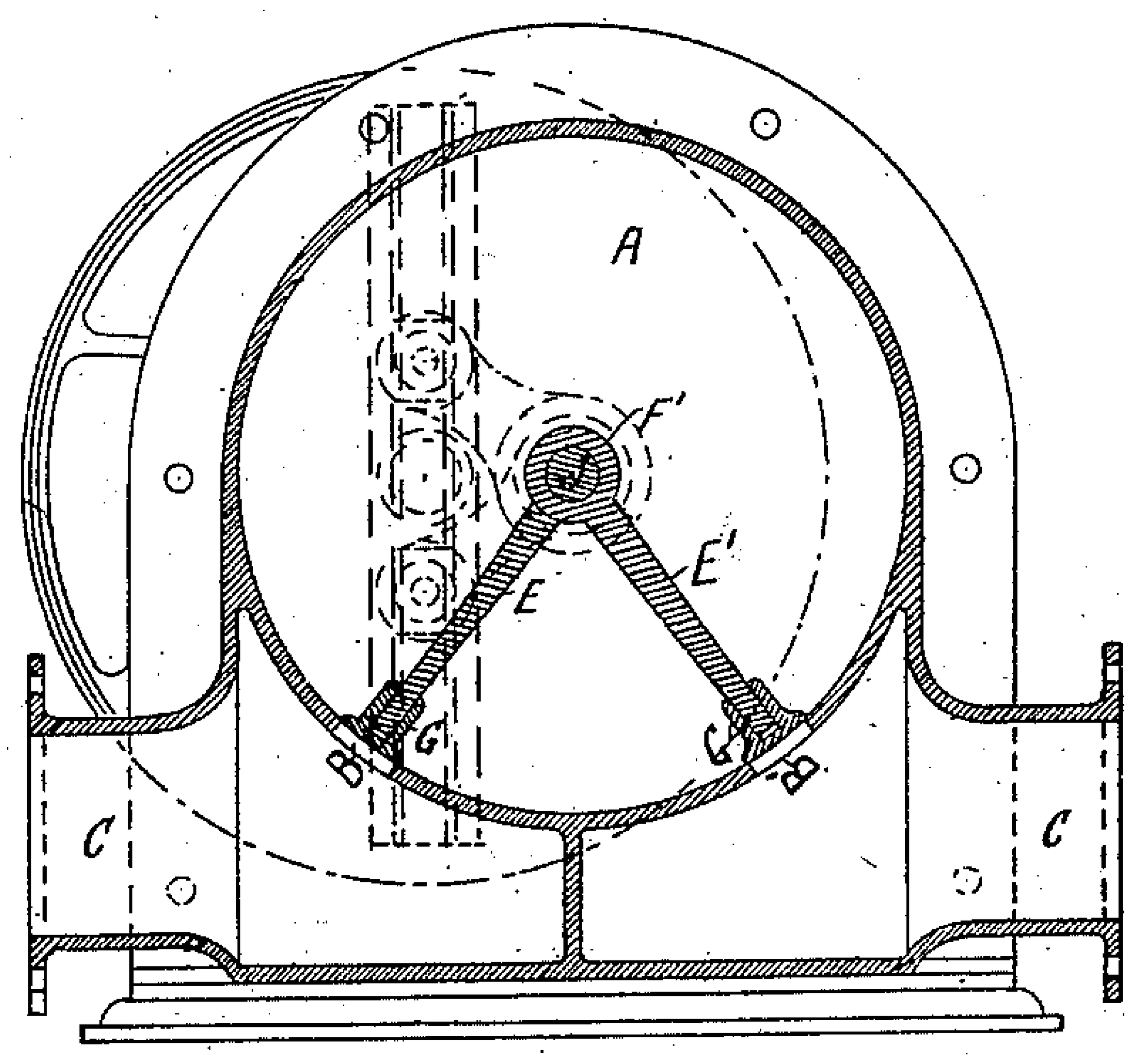

FIG. 3.

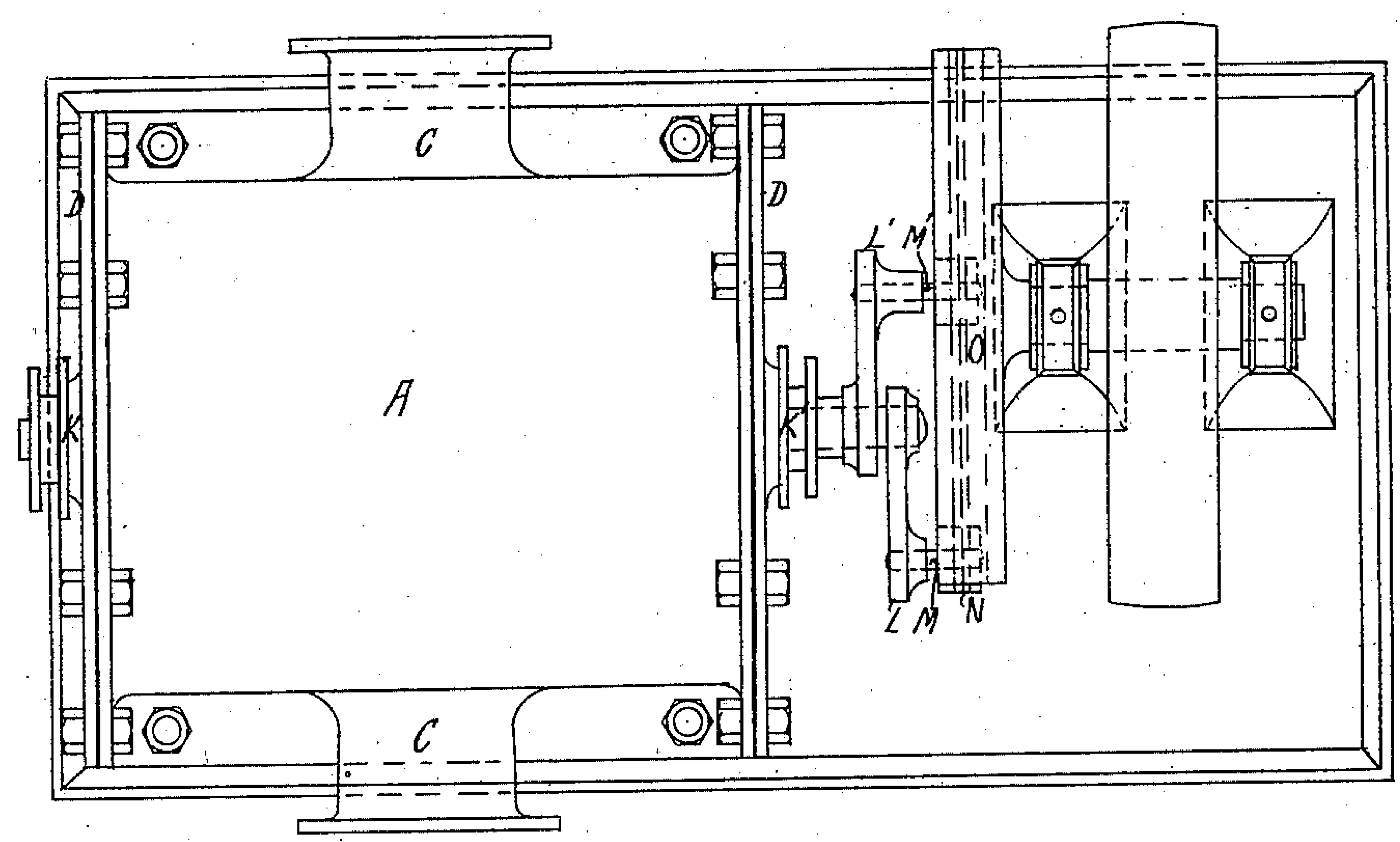

FIG 4.

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(No Model.)

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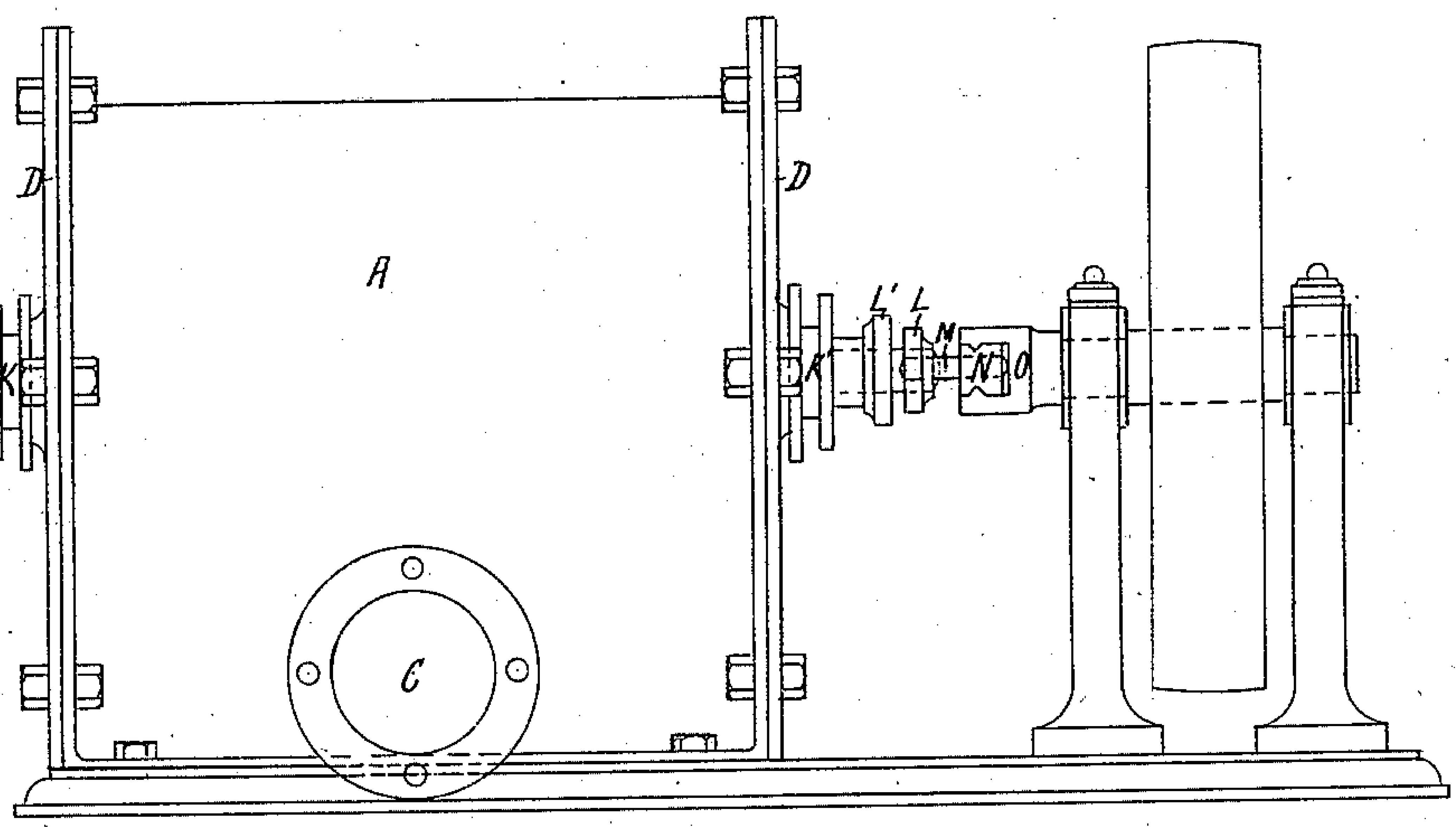

FIG. 5

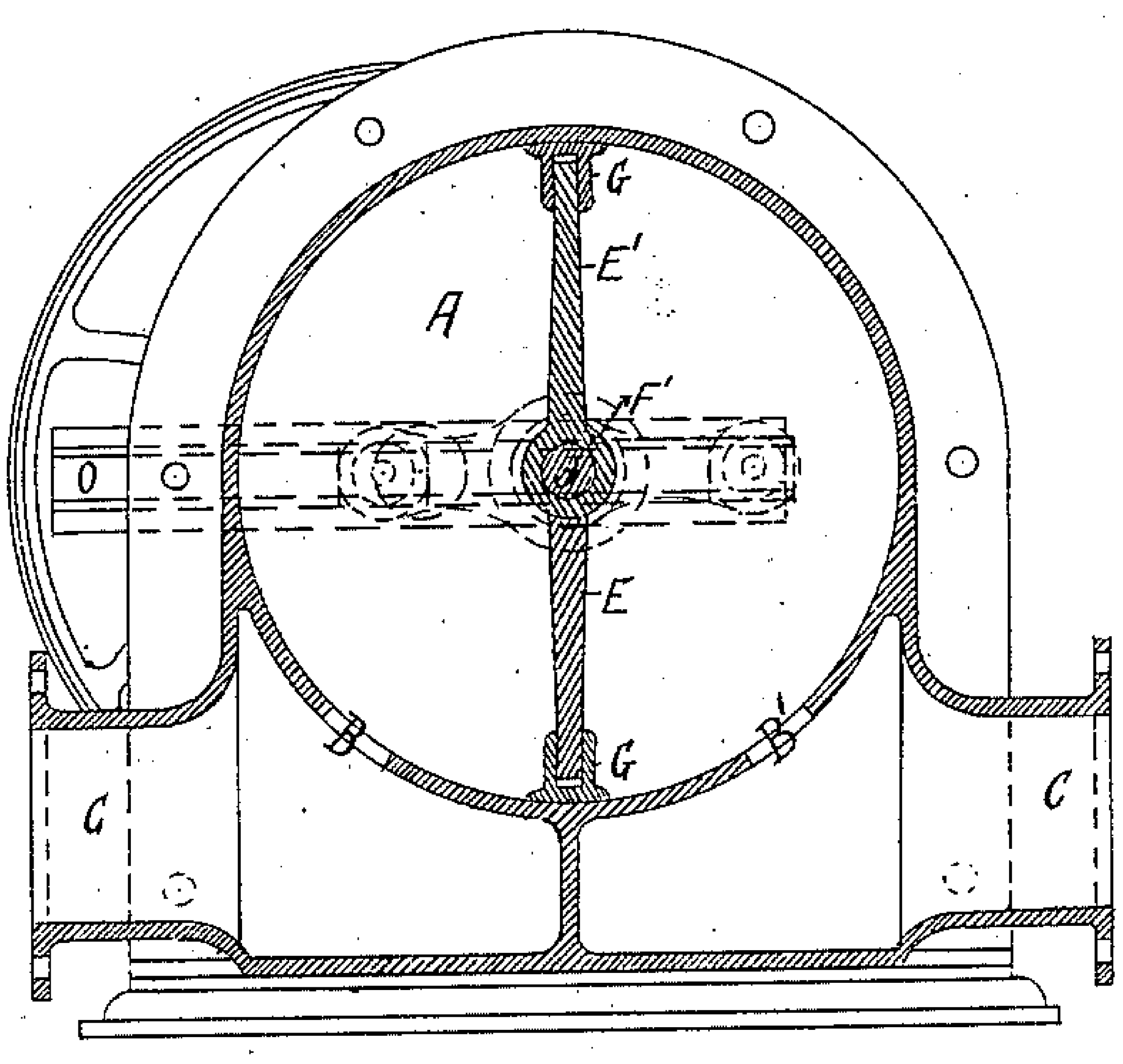

FIG 6

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(No Model.) 4 Sheets—Sheet 4.

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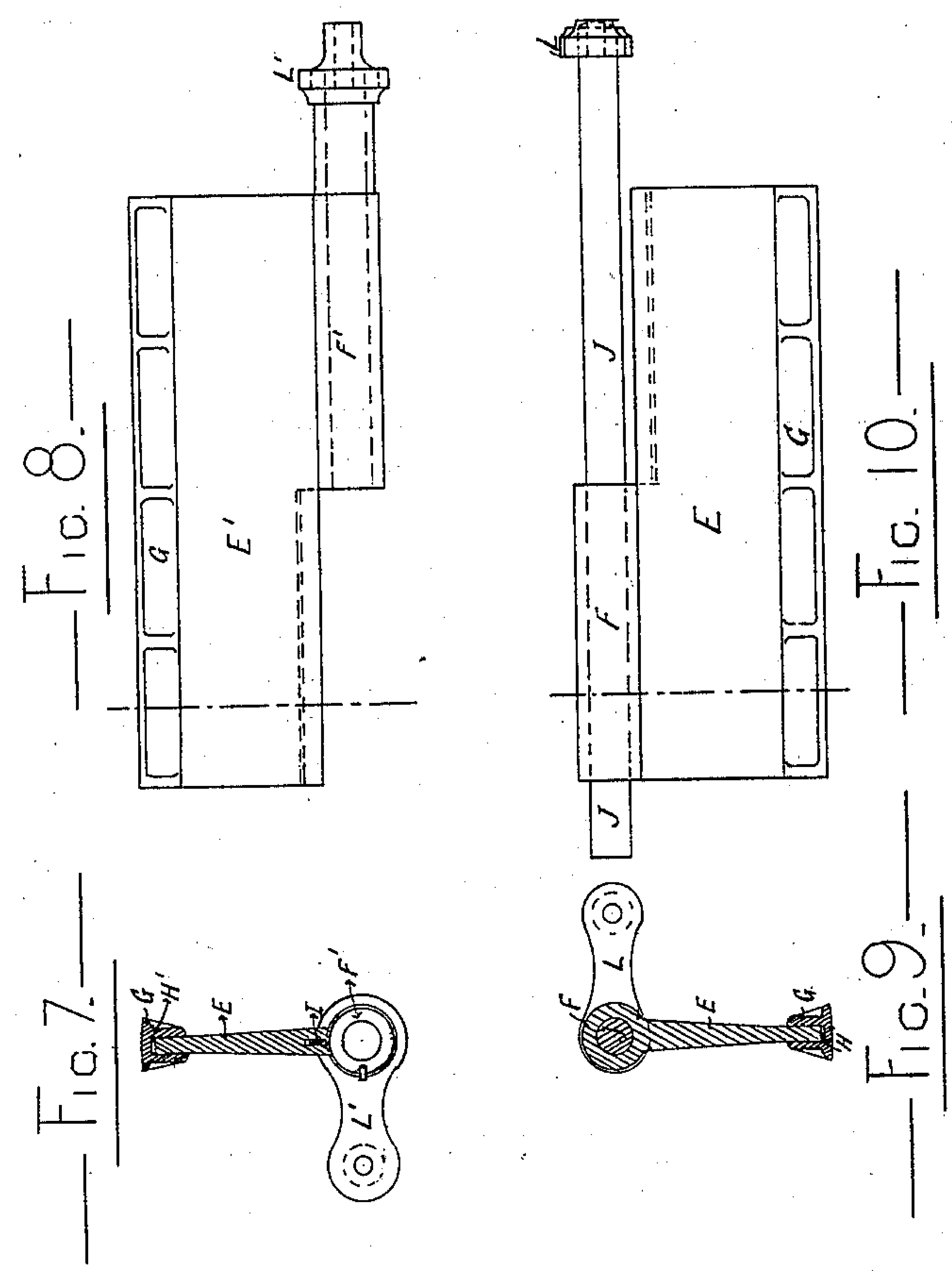

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his Attys

UNITED STATES PATENT OFFICE.

HOUSTON STEWART STEWART, OF LONDON, ENGLAND.

ROTARY APPARATUS FOR FLUIDS.

SPECIFICATION forming part of Letters Patent No. 308,859, dated December 2, 1884.

Application filed March 29, 1883. (No model.) Patented in England November 25, 1882, No. 5,616; in France March 1, 1883, No. 154,014, and in Belgium March 6, 1883, No. 60,653.

To all whom it may concern:

Be it known that I, HOUSTON STEWART STEWART, a subject of the Queen of Great Britain, residing at London, England, have invented new and useful Improvements in Rotary Apparatus for Fluids, of which the following is a specification.

This invention relates to further improvements in apparatus for exhausting, lifting, forcing, or measuring fluids, for which English Letters Patent were granted to me, No. 2,588, dated June 25, 1880, whereby greater efficiency and simplicity of action are obtained than has hitherto usually been the case, the present improvements more particularly relating to improved means of imparting a varying rotary velocity to the vanes revolving within the cylinder round a common center, and which center is concentric with the axis of the cylinder, in such a manner that the velocity of these vanes shall be so varied that each of them alternately travels from the inlet to the outlet port in the same space of time as is occupied by the other vane in traveling from the outlet to the inlet port.

Having thus stated the nature of the invention, I will proceed to describe more particularly in what manner the same is to be performed, by reference to the accompanying drawings.

Figures 1, 2, and 3 are respectively a plan, a part elevation, and a section of a machine constructed according to my invention, the parts being in the position they would occupy at the moment when the vanes are in closest proximity to one another, and when their velocity is alike. Figs. 4, 5, and 6 are similar views at the moment when the vanes are at their greatest distance apart and when the difference in their velocity is greatest. Figs. 7, 8, 9, and 10 are details of the vanes and the crank-arms by which they are actuated.

In these figures the same letters of reference indicate corresponding parts throughout.

A is the cylinder of the machine. B B′ are the inlet and outlet ports. C C are the inlet and outlet pipes. D D′ are the cylinder ends or covers. E E′ are the blades of the vanes. F F′ are the barrels of the vanes. G G are adjustable shoes of iron, gun-metal, or other suitable metal or alloy. H H′ are spaces for the insertion of springs of india-rubber or other suitable means of obtaining adjustment, if required. I is a packing of any suitable metal or alloy. J is a spindle passing through the axis of the cylinder. This spindle may be either solid or hollow, and in the latter case may be used as a channel of lubrication. K K′ are stuffing-boxes, all the said parts being similar to my said former invention, except that I now place the inlet and outlet ports farther apart. L L′ are crank-arms. M M′ are crank-pins. N N are slide-blocks. O is a cross-head attached to the shaft from which the motion is to be imparted, and in (or on) which the slide-blocks N N are free to slide. The spindle J passes through the barrel of each of the vanes. The barrel F is securely fixed to the spindle, while the barrel F′ is free to revolve upon it. The barrel F′ is extended and passes through the stuffing-box K. The crank-arms L L′ being securely fixed, respectively, to the spindle J and to the barrel F′, it will be seen that motion may be imparted to one of the vanes by means of the crank-arm L and to the other by means of the crank-arm L′. The axis of the shaft from which motion is to be imparted is eccentric to the axis of the cylinder, and the crank-arms L L′ are propelled at constantly-changing velocities, according as the slide-blocks N N are brought nearer to or farther from the axis of the shaft and cross-head. The differential movement thus produced may be varied according to the eccentricity of the cross-head, the position of the ports being correspondingly varied.

Instead of slide-blocks N N, rollers may be employed, or a combination of blocks and rollers. Suppose the eccentricity of the belt-pulley spindle to be four-fifths of the radius of the crank-arms. If this proportion be increased, the vanes will be brought nearer together at the moment when their velocity is equal, and the machine will thus deliver a larger volume per revolution, but with a resulting decrease of pressure; and conversely, if a high pressure is required, the proportion of eccentricity to crank radius may be reduced and the necessary differential power obtained. By means of the cross-head driven directly from the belt-pulley spindle the velocity of these crank-arms, and consequently of the vanes within the cylinder, is constantly being varied, the maximum velocity of one being simultaneous with the minimum velocity of the other. Thus, referring to Fig. 4, it will be seen that the sliding block M′ of the arm L′ is near the axis of the cross-head Q, while the other arm, L, is near the extremity of the cross-head. The arm L will then have a very high velocity as compared with L′, and while the blade E′, Fig. 3, moves a distance from B′ to B the blade E only moves from B to B′. The movements of the vanes are, it will be seen, such that one or the other of them is always between the ports and acting as an abutment. Thus the variation of the velocities of the blades is such that during half a revolution of the belt-pulley one of the vanes travels from the outlet to the inlet port, or, say, one-fifth of a revolution, in the same space of time as is required by the other vane in traveling from the inlet to the outlet port, or, say, four-fifths of a revolution. It will thus be seen that a volume of air or gas equal to the difference between these two is delivered alternately by each vane, and as each performs a complete revolution for every revolution of the belt-pulley this volume is delivered twice. By varying the eccentricity of the slide which actuates the crank-arms the differential movement of the vanes can be regulated to suit the conditions of volume of pressure which may be required in any particular machine.

I claim—

As a means for imparting a varying velocity to the vanes of a rotary apparatus for the purposes described, the combination, with the vanes and with their respective crank-arms, of a cross-head on the motor-shaft, and in which cross-head the ends of these arms shift, all substantially as set forth.

HOUSTON STEWART STEWART.

Witnesses:

G. F. REDFERN,

F. PRICE.