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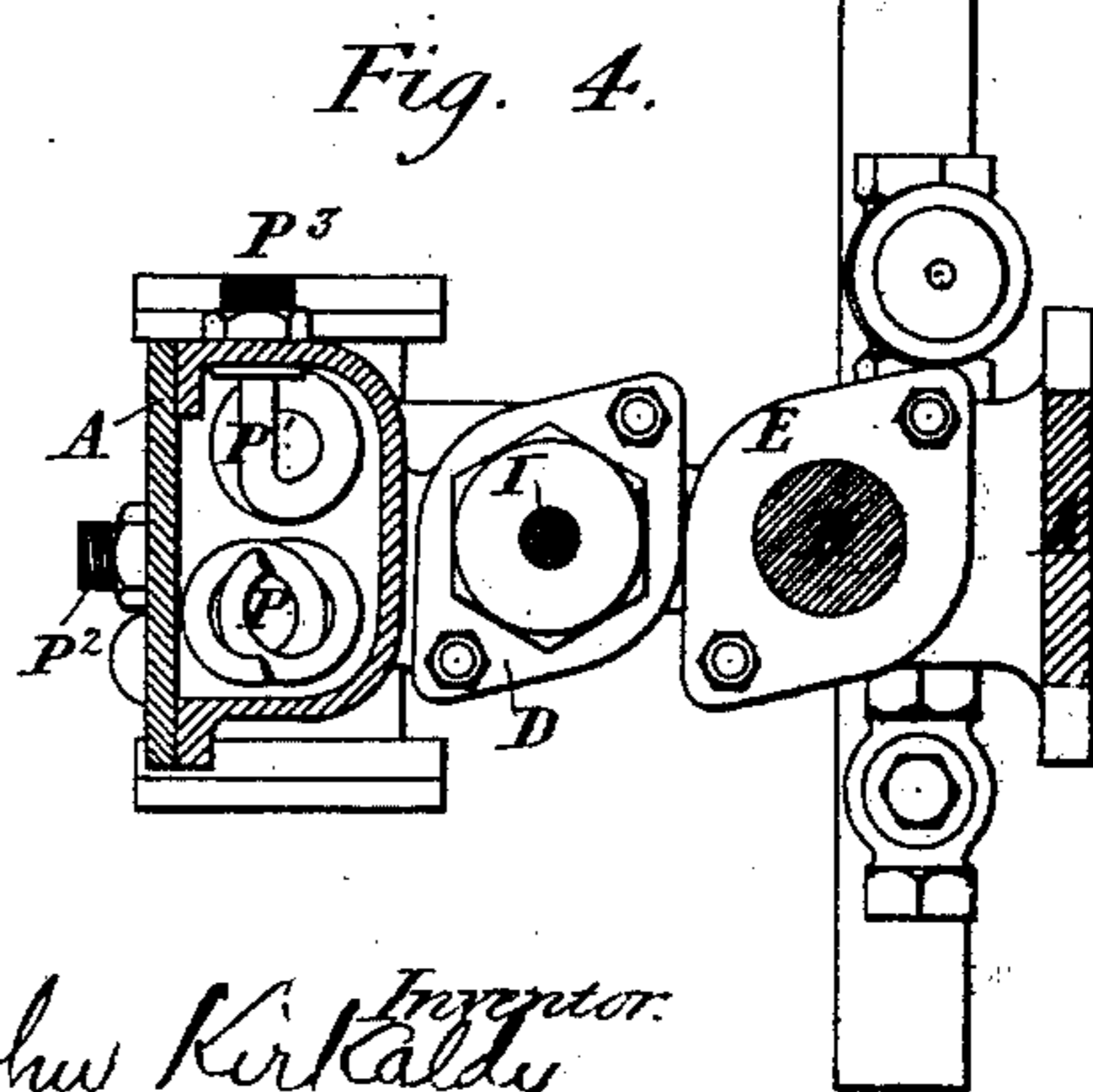
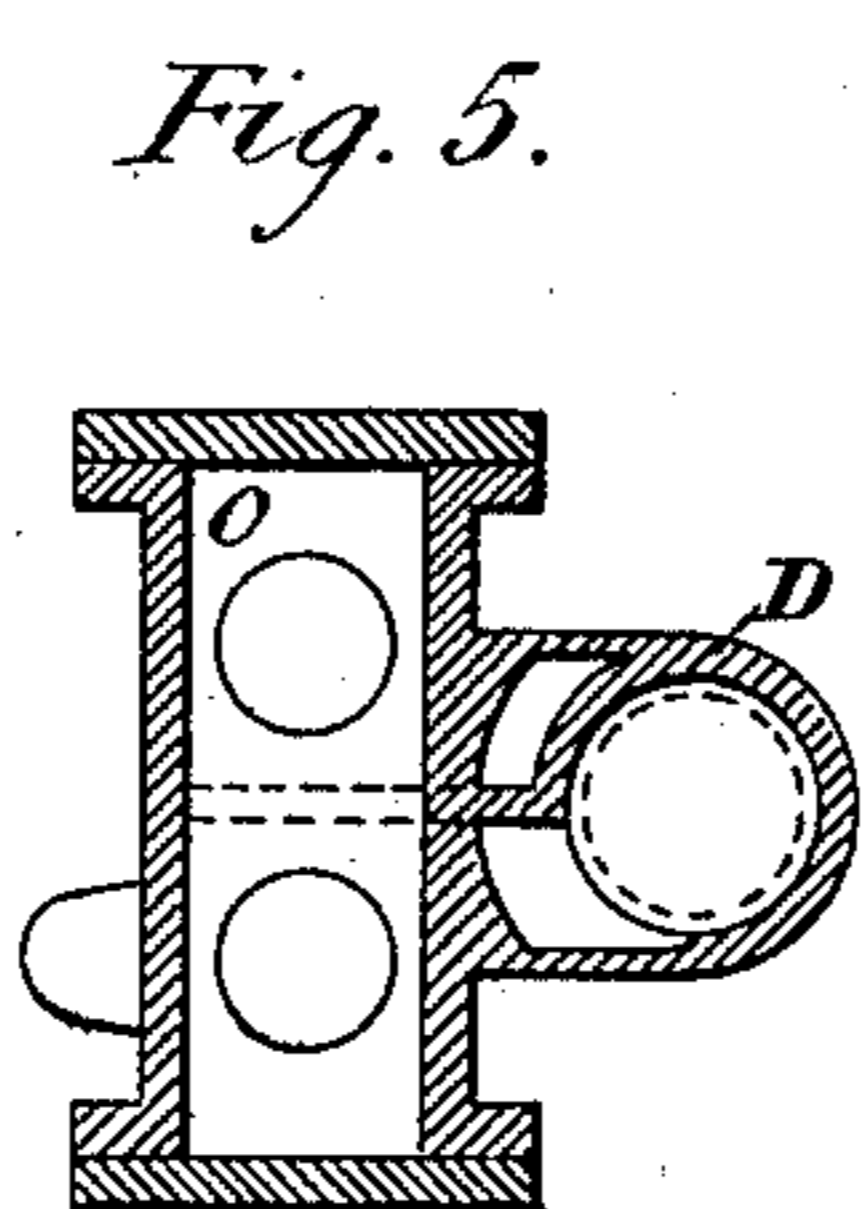
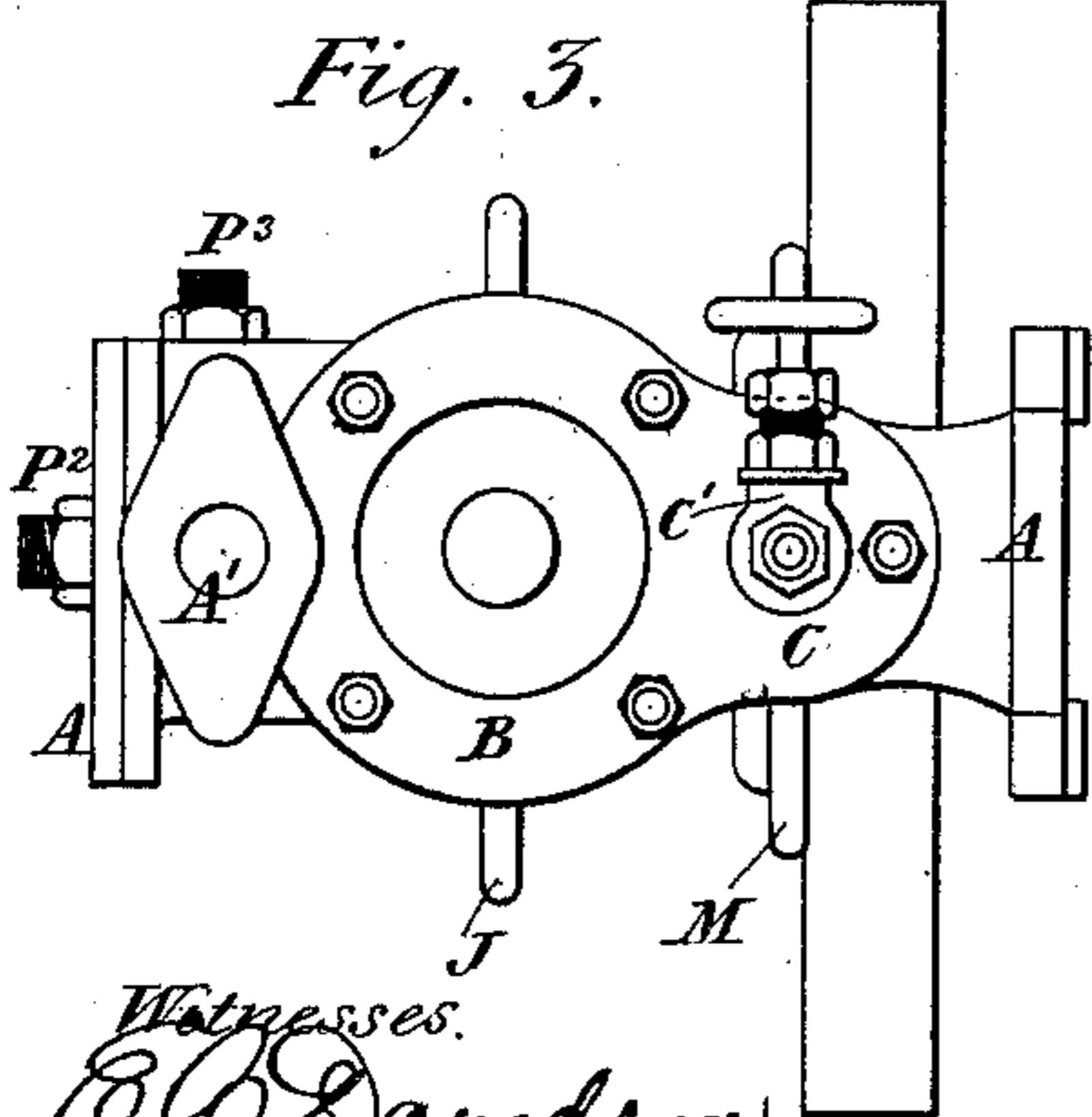
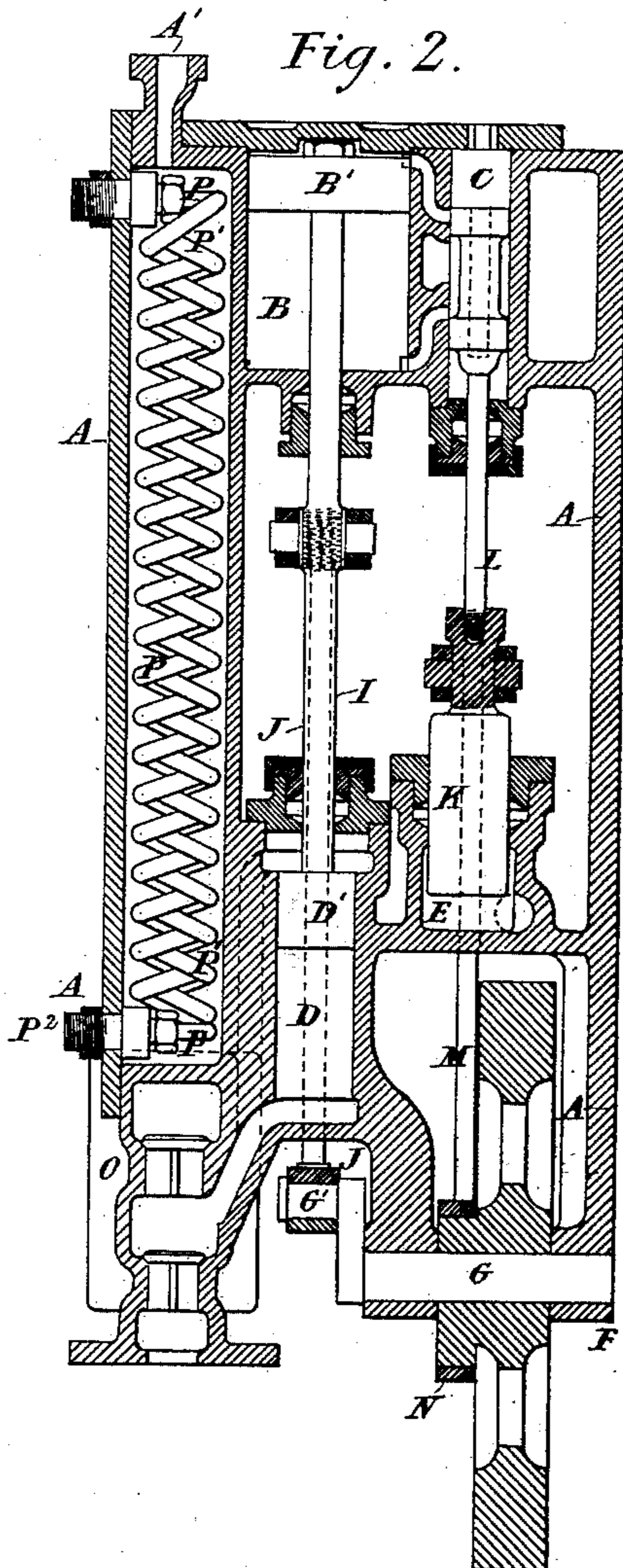
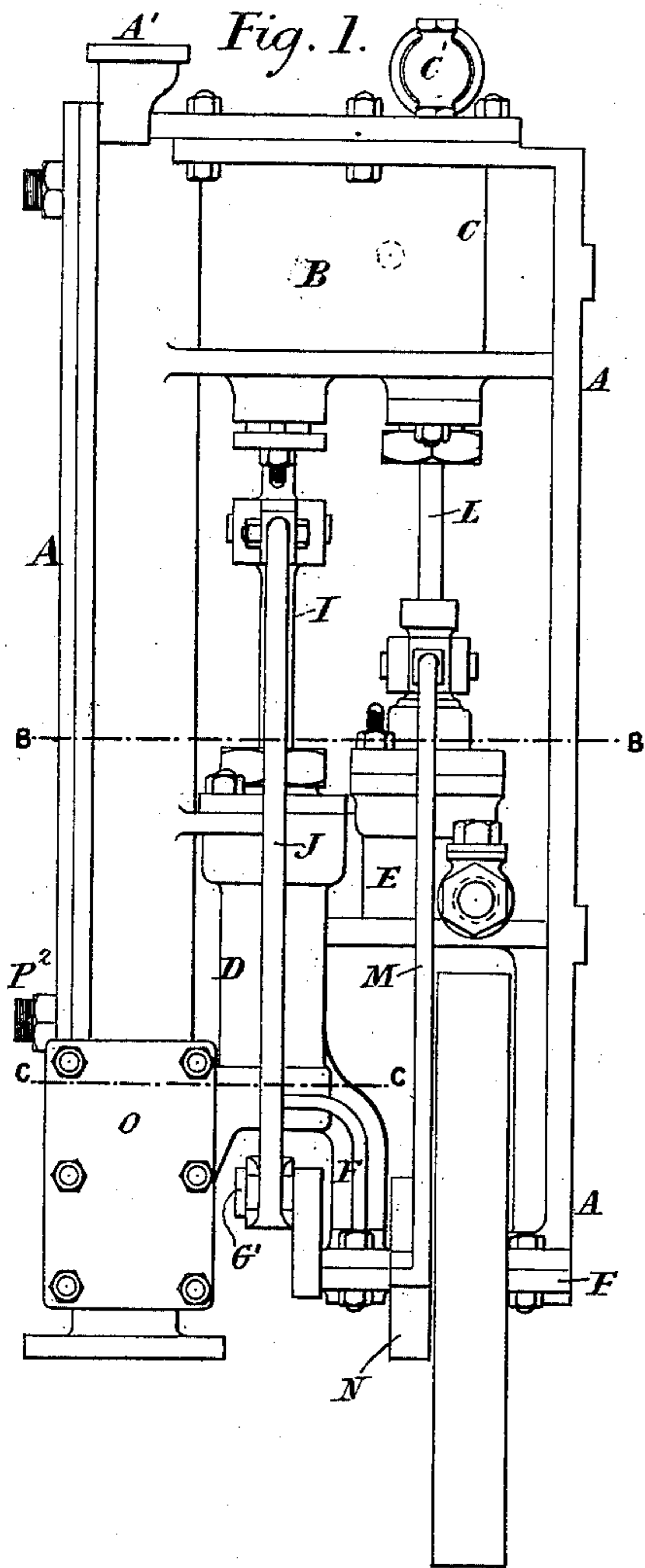
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J. KIRKALDY.

DONKEY ENGINE PUMP AND CONDENSER.

No. 336,522.

Patented Feb. 16, 1886.



Witnesses.  
Edw Davidson  
Baltus DeLong

Inventor.  
John Kirkaldy  
By his Attorneys  
Baldwin Hopkins & Co

(No Model.)

4 Sheets—Sheet 2

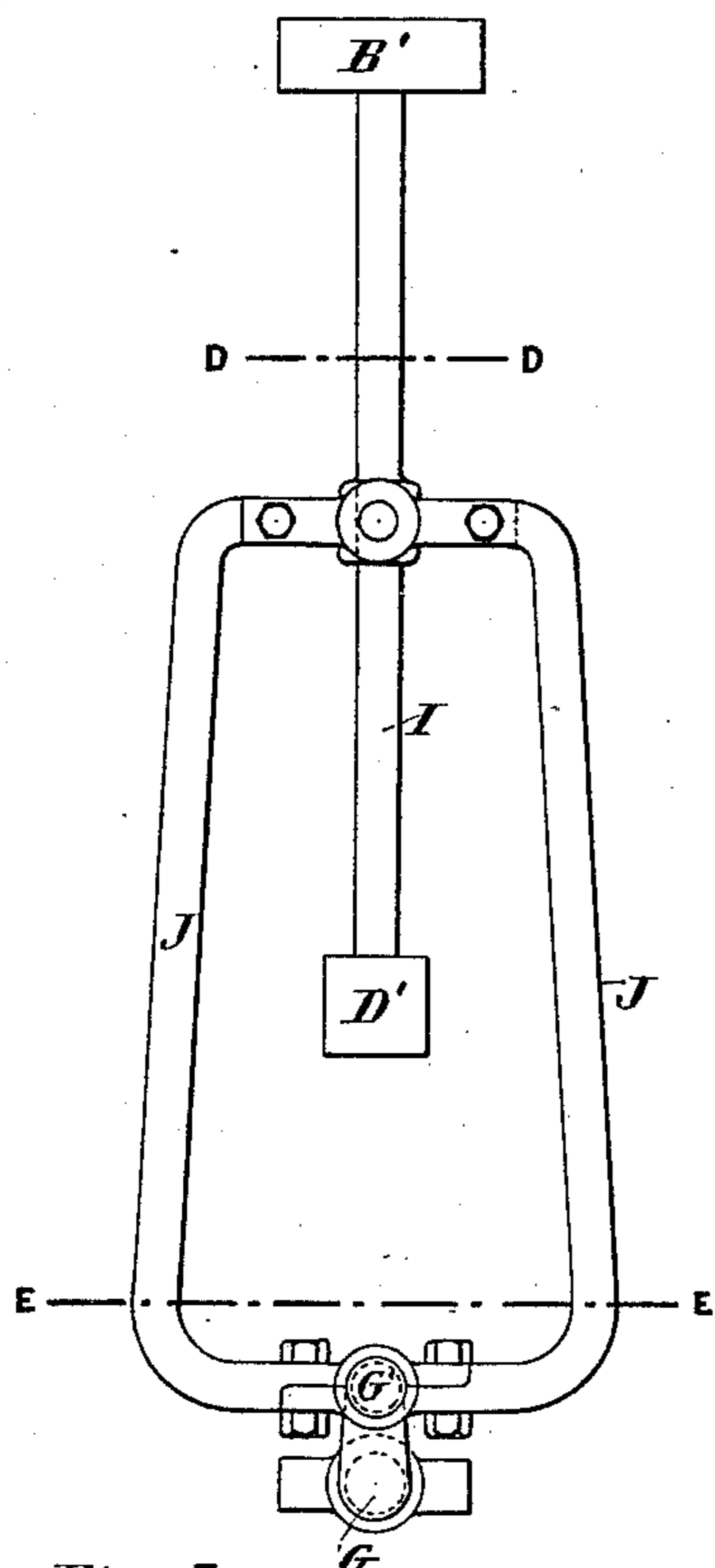
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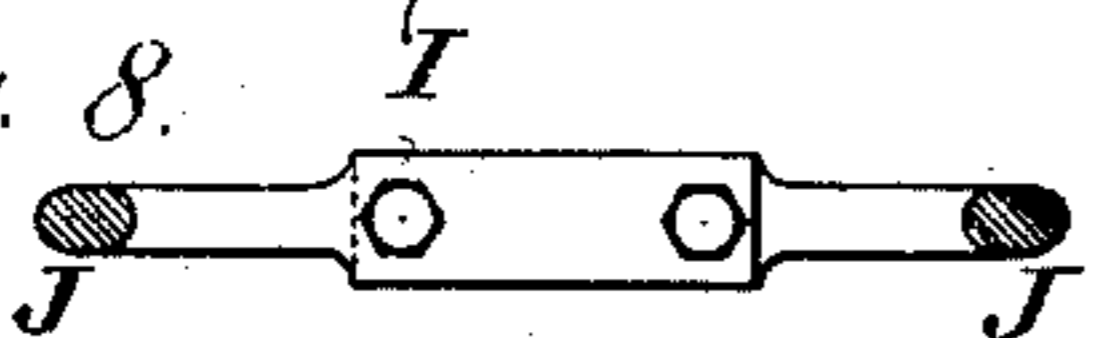
*Fig. 6.*



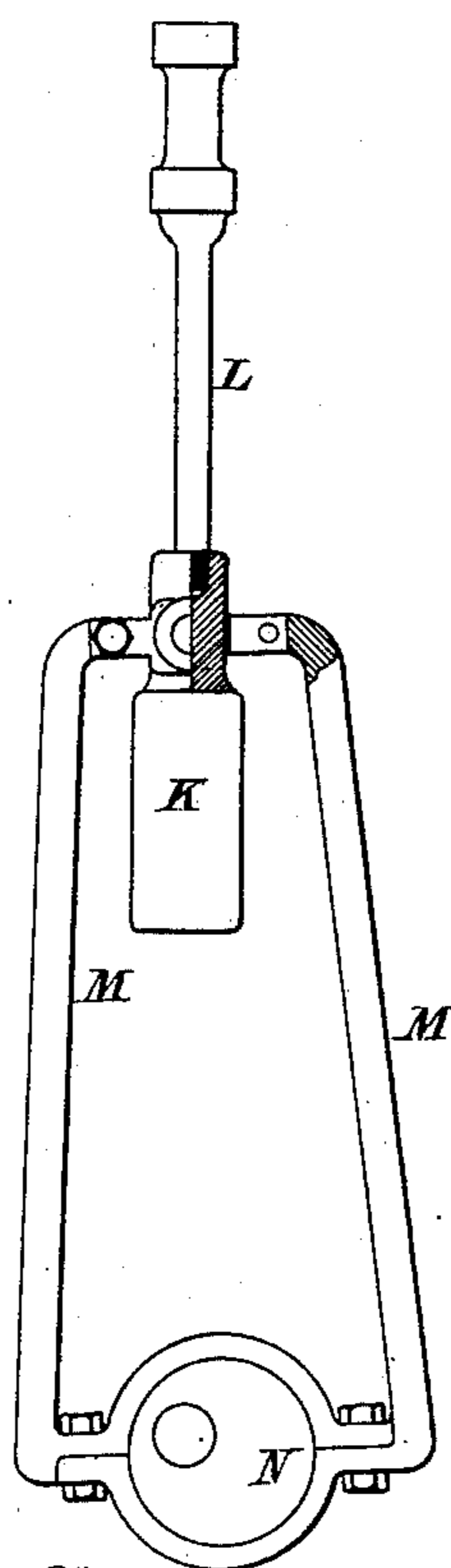
*Fig. 7.*



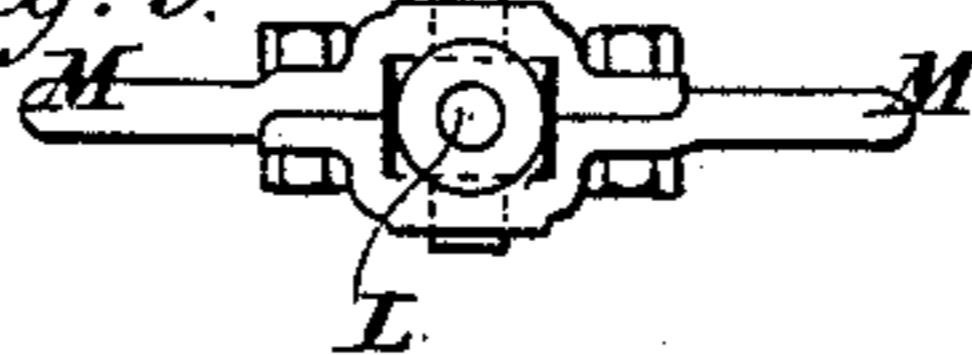
*Fig. 8.*



*Fig. 9.*



*Fig. 9\*.*



*Witnesses.*

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*Inventor.*

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(No Model.)

4 Sheets—Sheet 3.

J. KIRKALDY.

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Fig. 13.

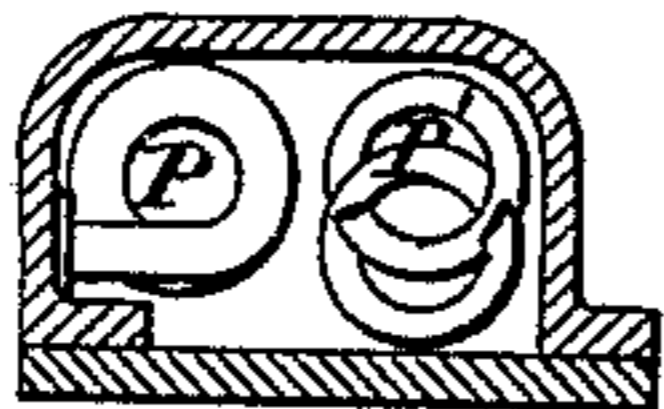


Fig. 10.

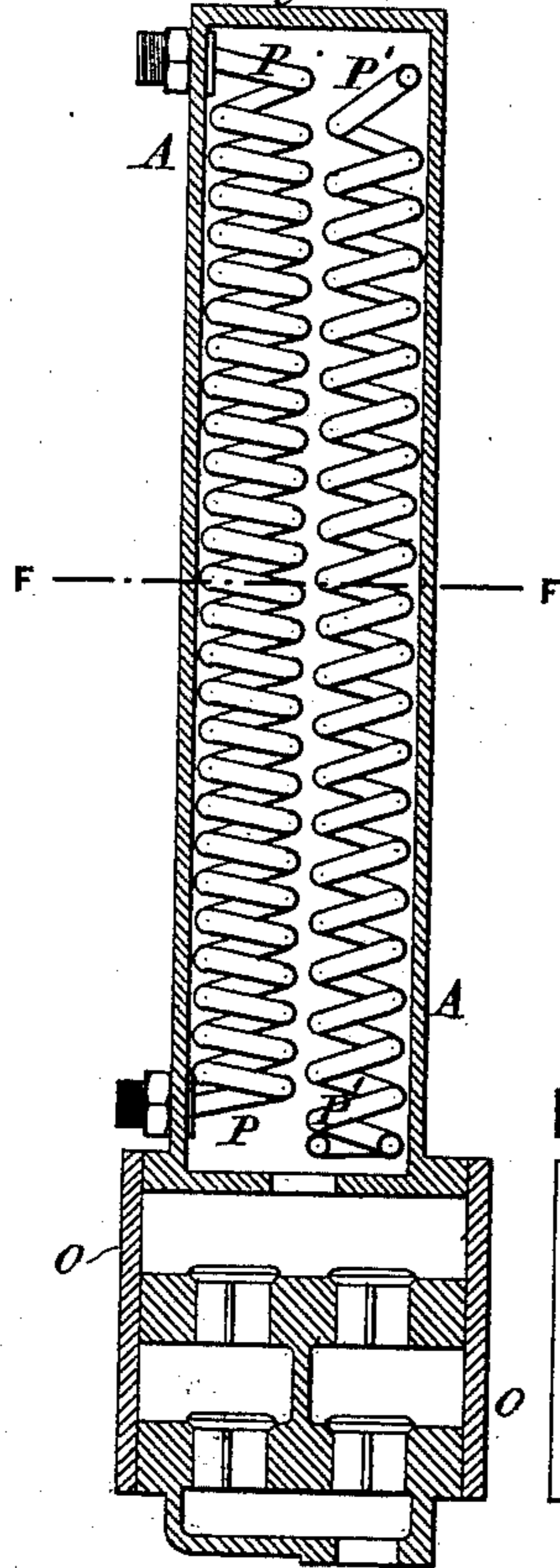


Fig. 11.

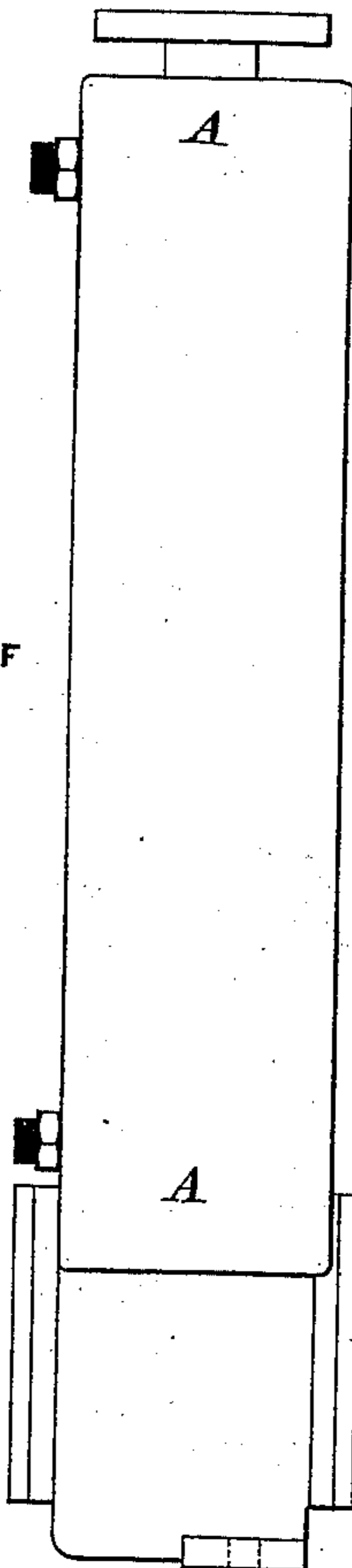
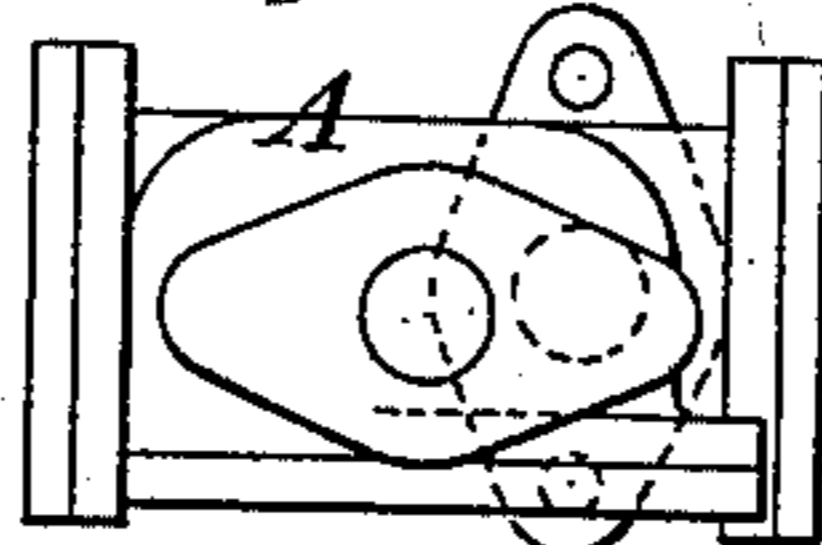


Fig. 12.



Witnesses.

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Inventor.

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(No Model.)

4 Sheets—Sheet 4.

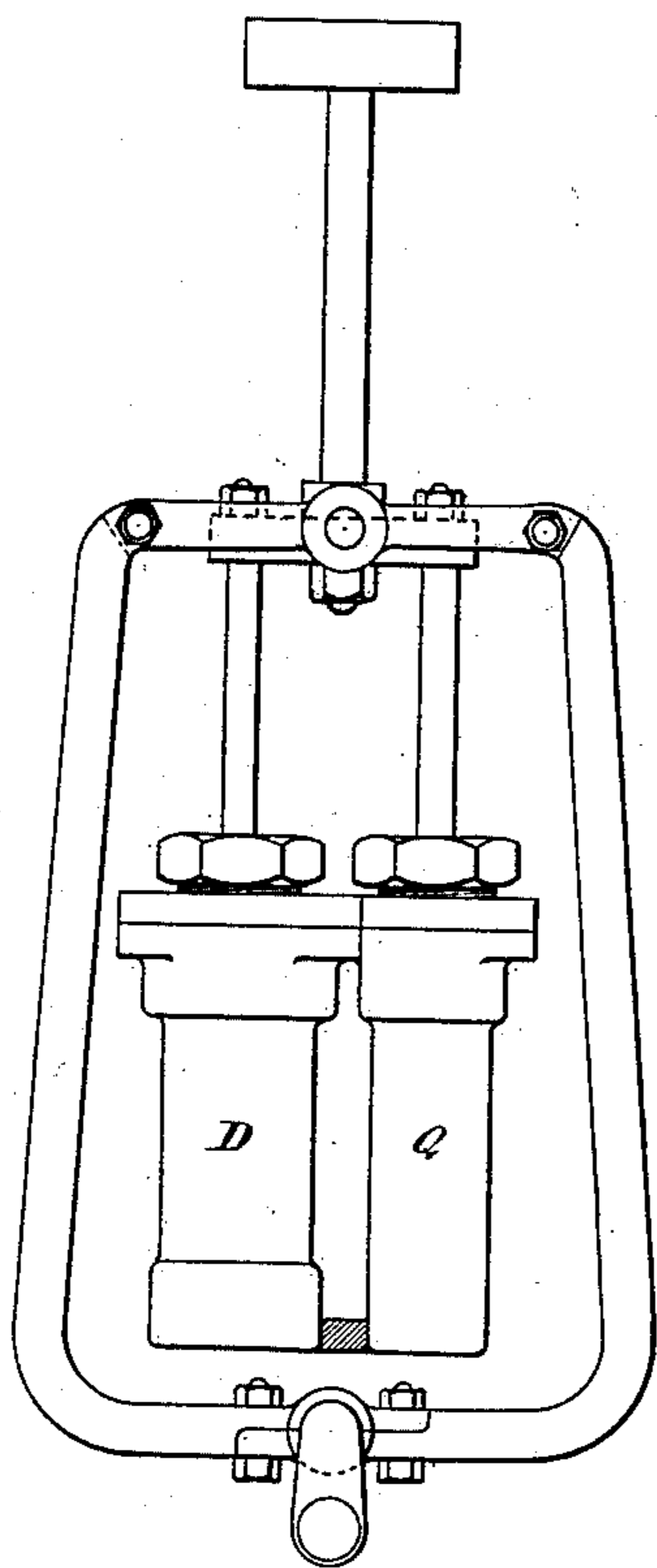
J. KIRKALDY.

DONKEY ENGINE PUMP AND CONDENSER.

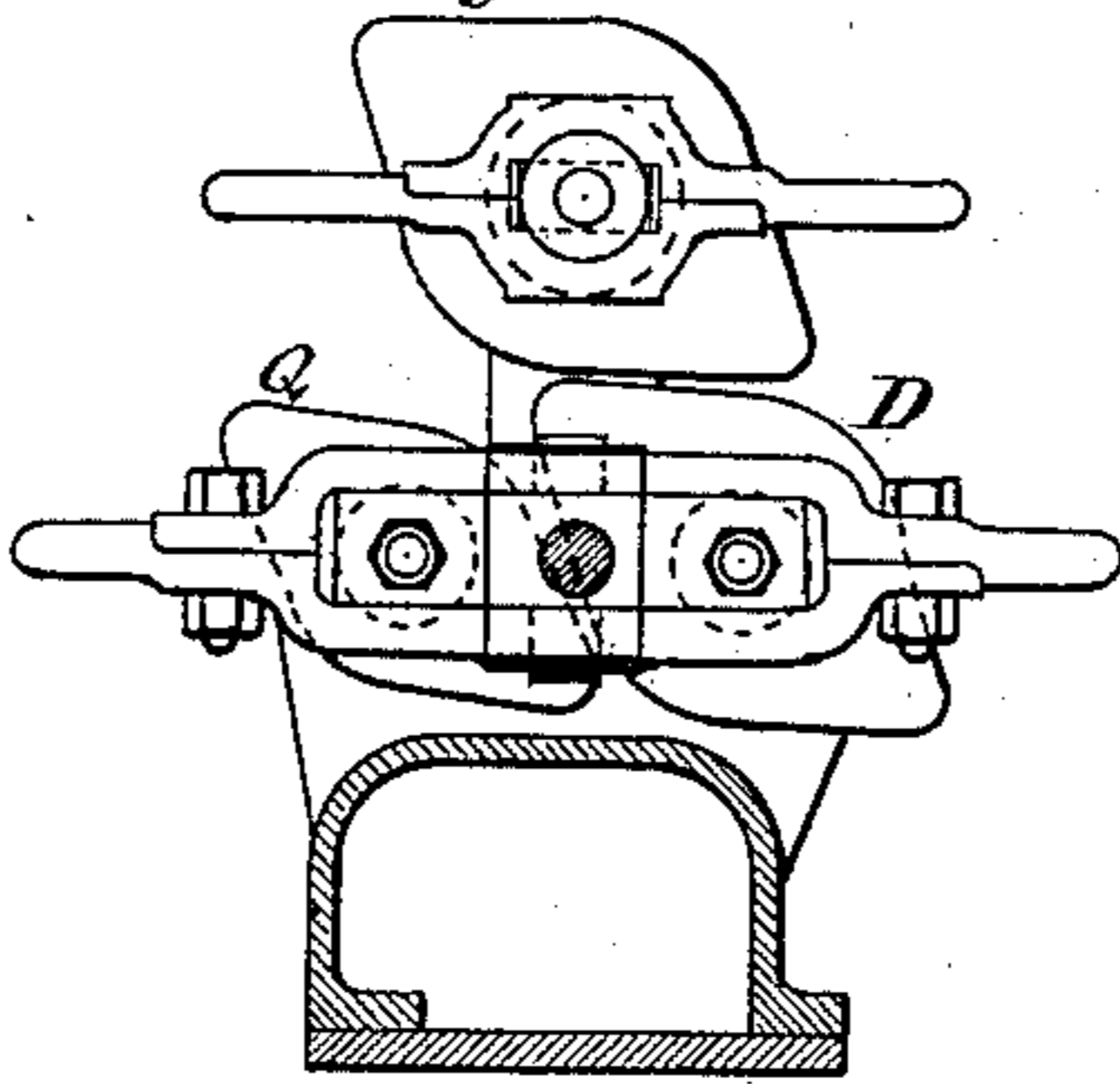
No. 336,522.

Patented Feb. 16, 1886.

*Fig. 14.*



*Fig. 15.*



Witnesses:  
*Ed. Davidson*  
*Battus & Long*

Inventor:  
*John Kirkaldy*  
by his Attorneys  
*Baldwin, Hopkins & Co.*

# UNITED STATES PATENT OFFICE.

JOHN KIRKALDY, OF 40 WEST INDIA DOCK ROAD POPLAR, COUNTY OF MIDDLESEX, ENGLAND.

## DONKEY-ENGINE PUMP AND CONDENSER.

SPECIFICATION forming part of Letters Patent No. 336,522, dated February 16, 1886.

Application filed December 15, 1885. Serial No. 185,732. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN KIRKALDY, a subject of the Queen of Great Britain, residing at 40 West India Dock Road Poplar, in the county of Middlesex, England, engineer, have invented a Combined Donkey-Engine Pump and Condenser, of which the following is a specification.

According to this invention I combine a surface-condenser on one bed-plate with a donkey-engine pump, adapted for performing the various services requisite on board ship, making the outer casing of the condenser form part of the frame-work of the engine, and I cause the discharge from the pump to enter the one end of the casing of the condenser and to pass away from it at the other end, so that whenever the engine is set to work the water discharged by the pump serves as a cooling medium for cooling the several pipes or passages of the surface-condenser, within which not only may the steam from the donkey-engine pump be condensed, but also steam passed direct to the condenser from a steam-boiler. When fresh water is required for drinking purposes, the steam, passing direct to the condenser from a steam-boiler, may be made to pass through pipes or passages in the condenser separate from those through which the steam from the donkey-engine is passed to be condensed, and may be separately collected and stored. The condenser will also serve as a medium for obtaining heated water for any purposes which may be required. The surface-condenser may also be utilized for condensing steam from the winches, cranes, and other small engines used on board ship; and if it is desired to maintain a vacuum to assist in working such engines, then I form the engine with an air-pump and hot-well, from which the water condensed in the condenser is pumped off; or the feed-pump might be made to act as an air-pump as well as feed.

If desired, winches, windlasses, steam steering-gear, and such like mechanism may be combined on one bed and frame with the engine and pump gear.

By making the condenser in one piece with the donkey-engine considerable saving is effected in pipe-connections, in addition to making the whole occupy less space.

Figures 1 to 15 of the drawings hereunto annexed show various views of a compound donkey-engine pump and condenser constructed in the manner I prefer for carrying out my invention.

Fig. 1 is a side elevation; Fig. 2, a vertical section; Fig. 3, a plan view; Fig. 4, a section on the line B B, Fig. 1; Fig. 5, a section on the line C C, Fig. 1. Fig. 6 shows an elevation of the piston-rod which carries the piston of the steam-engine cylinder, and also the piston of the pump, and also shows the connecting-rod and crank for giving motion from this piston-rod to the crank-shaft. Fig. 7 is a section on the line D D, Fig. 6; and Fig. 8, a section on the line E E. Fig. 9 is an elevation, and Fig. 9<sup>x</sup> a plan view of the slide-valve and the feed-pump plunger, both fast on one rod, and of the eccentric and connecting-rod which gives motion to them. Fig. 10 is a vertical section of the bed or column which forms the main portion of the frame. Fig. 11 is an elevation, and Fig. 12 a plan view, of the same; and Fig. 13 is a section on the line F F, Fig. 10. Figs. 14 and 15 show the way in which I modify the construction when an air-pump as well as a circulating or general pump is used.

In these figures, A is a hollow bed or column, having cast with it at one end a steam-cylinder, B, and valve-box C, and at the opposite end pump-cylinders D and E, and the bearings F for the crank-shaft of the engine. The cylinders B and D are in a line with one another, and their pistons B' and D' are both fixed on one piston-rod, I. This rod, at its center, is jointed to a connecting-rod, J, which is also coupled to the crank-pin G' on the crank-shaft G. The slide-valve box C and feed-pump E are also in a line with one another, and the slide-valve and the plunger K of the feed-pump are both fixed on one rod, L, to which movement is given by a connecting-rod, M, from an eccentric, N, on the crank-shaft. In the drawings the slide-valve is shown as being formed as a piston-valve, but it might be an ordinary D slide-valve; or other ordinary form of valve might be used.

C' is a stop-valve on the steam-inlet to the valve-box.

O is a valve box at the end of the hollow

bed or column A, in which are the suction and delivery valves for the double-acting pump D. The delivery-chamber of the valve-box opens into the end of the bed or column A, as shown in Fig. 10, and at the opposite end of the column is a delivery-outlet, A', so that all water pumped by the pump D has to pass through the bed or column A.

P P' are coils of pipe contained within the bed or column A. The ends of each coil are led out from the bed or column. The coil marked P may be coupled at P<sup>2</sup> to a pipe leading from the steam-space of a steam-boiler, so that steam from the boiler may be passed through the coil and condensed into water for drinking purposes. The other (marked P') is at P<sup>3</sup> connected to the exhaust-outlet from the valve-box by a pipe not shown in the drawings, and at the other led to a hot-well, so that steam exhausting from the steam-cylinder is condensed in the coil and flows into the hot-well, from which it is again pumped back to the boiler by the feed-pump E.

When it is desired to obtain a vacuum to aid in working the engine, the coil of pipe P' may be made to discharge into a closed hot-well, and the condensed water and air be pumped therefrom by an air-pump, Q, added to the engine in the manner shown at Figs. 14 and 15. The pump-cylinders D and Q are in this case placed side by side, and their piston-rods are both fixed to the piston-rod of the steam-cylinder B. As before stated, the surface-condenser might also be utilized for condensing steam from the winches, cranes, and other small engines on board ship, either to maintain a vacuum to assist in working such engines or simply to avoid the blowing off of steam and to obtain a supply of hot water. When so used, the bed or column A might be of larger dimensions, so as to be able to contain within it a greater number of coils of tube.

The tubes used for the coils in the surface-condenser may be either plain or corrugated, solid drawn or brazed, and the coils may be side by side or interlaced with one another, and may be connected either to the door or

cover of the condenser or to trunk-pipes. The engine also might be made with its frame adapted to be bolted down to a foundation and used for driving machinery, propelling boats or vessels, or for other purposes for which steam-engines are used. The engine also might be made as a compound engine, if desired.

When it is necessary to heat the feed-water pumped into steam-boilers by the feed-pump herein described, I arrange the delivery-pipe from this pump so that it passes the water through the condenser-case, or so that it passes through one set of the coiled tubes, the steam being in this arrangement passed into the condenser-case instead of into the tubes.

When it is necessary to heat the water raised by the water-pump on its way through the condenser-case, I pass not only the exhaust-steam from the donkey-engine through its coiled tubes, but also steam from a boiler through the other coiled tubes, and if necessary reduce the quantity of water raised by the pump, so that it may pass sufficiently slowly through the condenser-case to be raised to a high temperature.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

The combination of bed or column A with condenser-tubes led through it, the valve-box C, for pump-valves at one of its ends, the outlet A' at the opposite end, the steam-cylinder B, parallel with the bed or column A at its outlet end, the pump-cylinder D, parallel therewith at its opposite ends, their piston-rods in one piece or secured together and giving motion by a connecting-rod, J, to a crank-shaft, G, and an eccentric, N, on the crank-shaft giving motion to slide-valve rod L, which also serves as pump-rod for the feed-pump E, substantially as hereinbefore described, and illustrated in the drawings annexed.

JOHN KIRKALDY.

Witnesses:

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