

No. 695,989.

Patented Mar. 25, 1902.

C. C. WORTHINGTON.

DUPLEX STEAM PUMP OR OTHER DUPLEX STEAM ENGINE.

(Application filed Apr. 4, 1900.)

(No Model.)

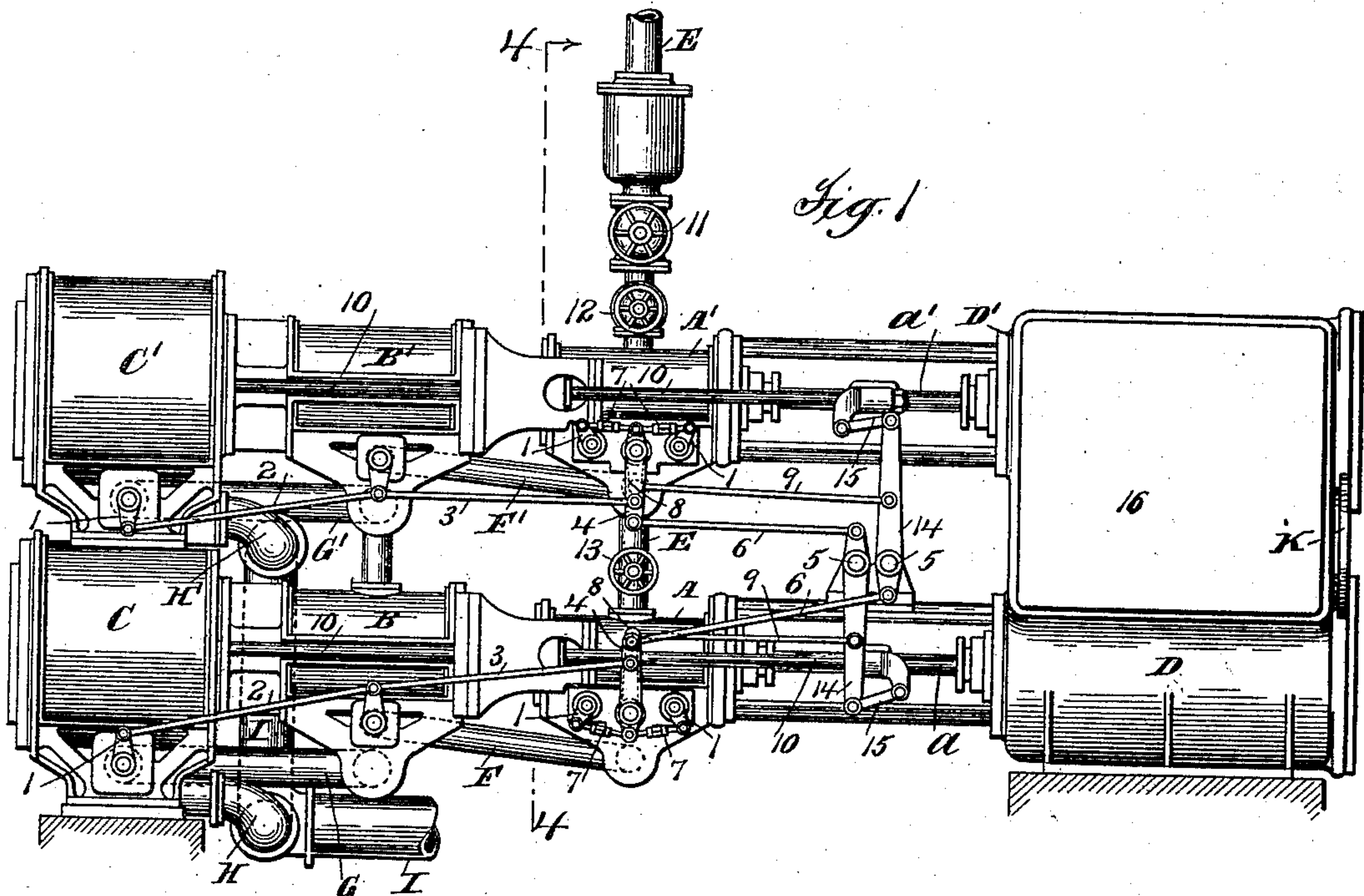
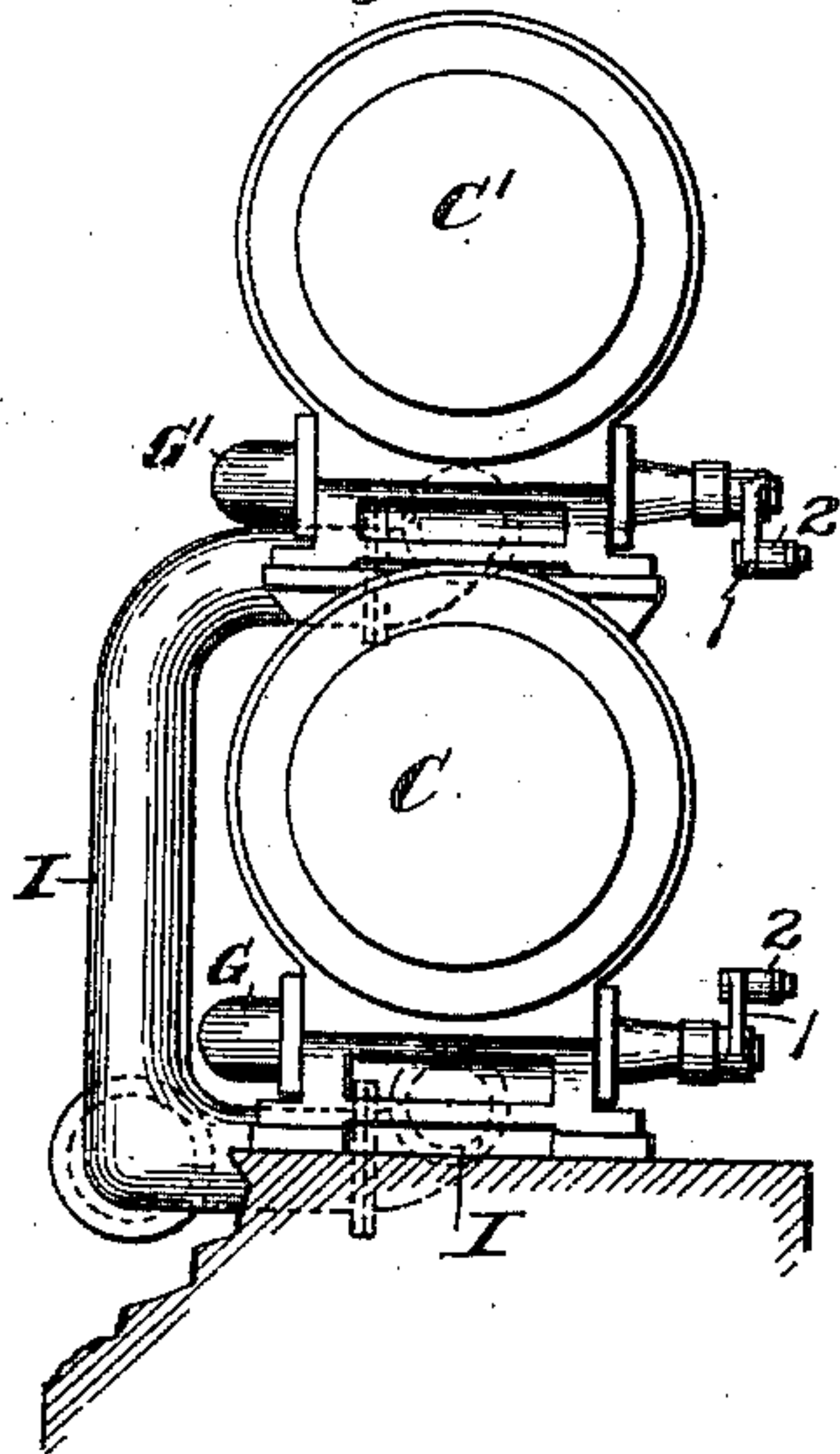


Fig. 2.



Attest:  
Geo H. Bots  
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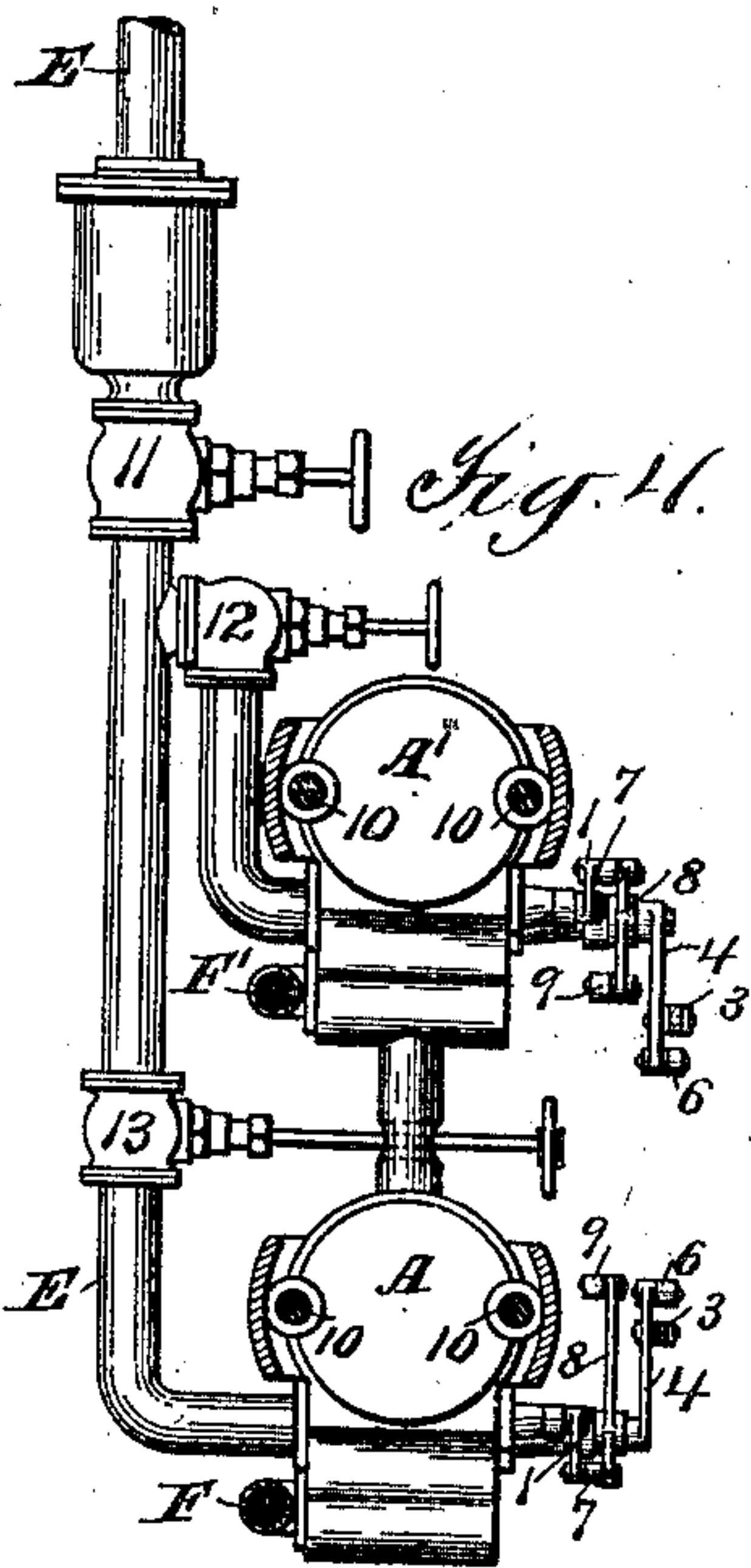
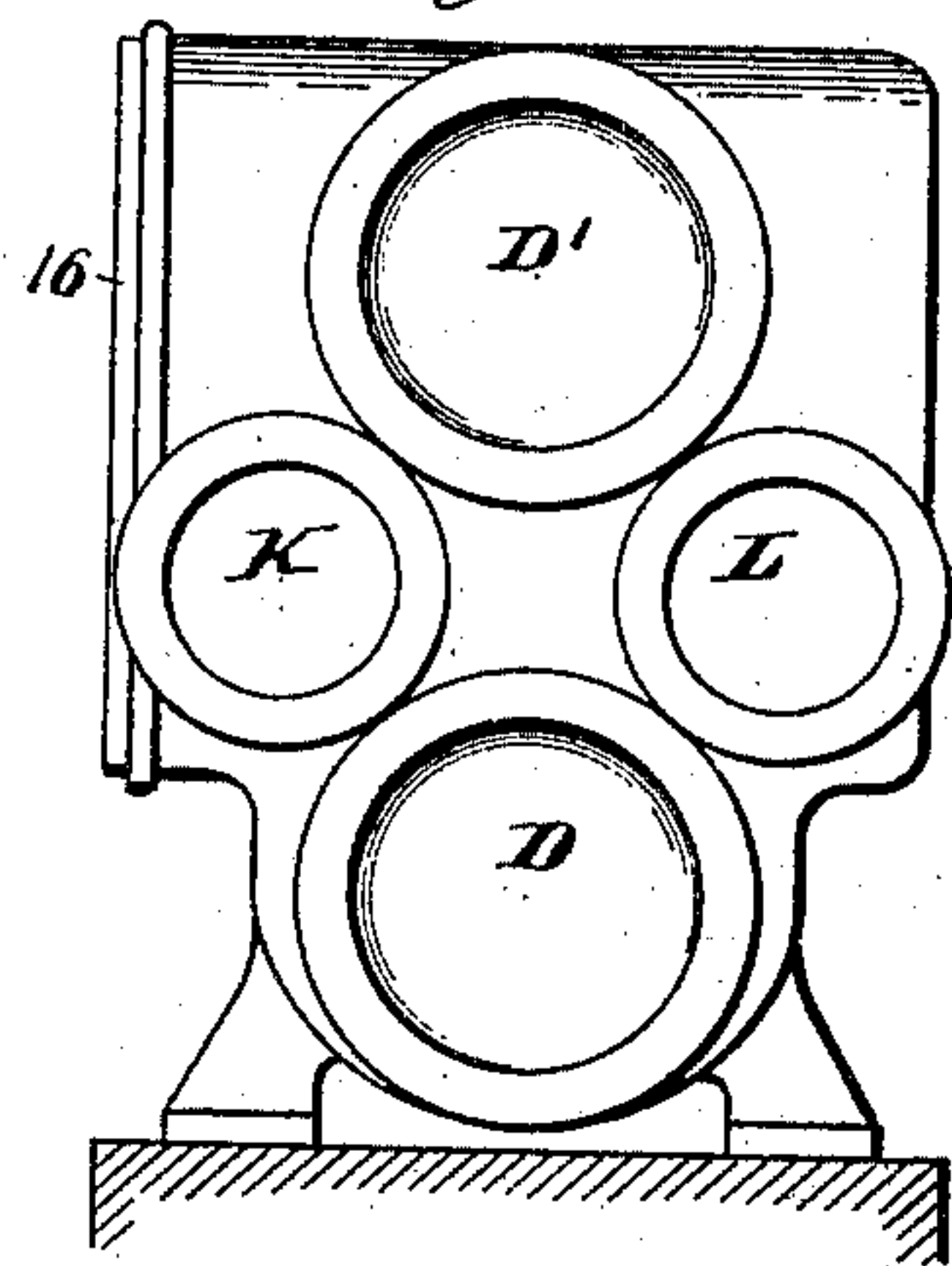


Fig. 3.



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# UNITED STATES PATENT OFFICE.

CHARLES C. WORTHINGTON, OF DUNNFIELD, NEW JERSEY.

## DUPLEX STEAM-PUMP OR OTHER DUPLEX STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 695,989, dated March 25, 1902.

Application filed April 4, 1900. Serial No. 11,519. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES C. WORTHINGTON, a citizen of the United States, residing at Dunnfield, county of Warren, and State of New Jersey, have invented certain new and useful Improvements in Duplex Steam-Pumps or other Duplex Steam-Engines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of the present invention is to provide an improved duplex steam pumping-engine which shall occupy little floor-space widthwise of the pump and in which the steam-valve movement shall be more convenient of access and more readily observed by the engineer than in such engines as heretofore constructed. I secure these results by arranging the horizontal steam and pumping cylinders of the opposite sides of the engine one above the other, with the steam-valve movement arranged upon one side of the engine and the water-valves also preferably being accessible from the same side of the engine. The steam admission and exhaust pipes are also preferably arranged in planes parallel with the planes of the cylinders, so as to reduce the floor-space required for these connections and so as to bring the controlling devices on the induction-pipe into convenient position for access at the valve-movement side of the engine, and the suction and force main connections are preferably arranged at the end of the pump and in such a manner as to reduce the widthwise dimension of the pump end.

The especial object of the invention is to provide a duplex steam pumping-engine such as described, and such a pumping-engine forms a specific part of the invention; but the steam and pump ends may be used independently of each other; and the invention, broadly considered, includes certain constructions and arrangements in duplex steam-engines, whether used in connection with a pump end or otherwise.

For a full understanding of the invention a detailed description of a duplex steam pumping-engine embodying all the features of the invention in their preferred form will now be given in connection with the accompanying drawings, forming a part of this specification, and the features forming the invention will then be specifically pointed out in the claims.

In the drawings, Figure 1 is a front elevation of the pumping-engine. Fig. 2 is an end view looking toward the steam end. Fig. 3 is an end view looking toward the water end. Fig. 4 is a cross-section on the line 4 of Fig. 1.

Referring to said drawings, the engine shown is of the general class now well known as "duplex pumping-engines," in which the valves on each side are operated by the piston-rod on the opposite side. The general construction and operation of the valve-movement and other parts of such engines are well known, so that only such description is required as is necessary to understand the present invention, which consists in the arrangement of the cylinders and other parts of the engine.

The engine shown is a triple-expansion engine having the high, intermediate, and low pressure cylinders A B C and A' B' C', forming the opposite sides of the steam end and the corresponding pump-cylinders D D' at the pump end, the steam-pistons and pump-plungers being connected by the piston or plunger rods *a a'* between the high-pressure cylinders A A' and the pump-cylinders D D' and the intermediate and low-pressure pistons being connected to the cross-heads on the rods *a a'* by the rods 10. Steam is admitted to the high-pressure cylinders through the induction-pipe E, shown as provided with the usual cock 11 for adjusting the common supply of the steam and cocks 12 13 for adjusting independently the supply to the opposite sides of the engine, and the high-pressure cylinders exhaust to the intermediate cylinders through exhaust-pipes F F' and the intermediate cylinders to the low-pressure cylinders through the pipes G G' and the low-pressure cylinders through pipes H H' to the common exhaust-pipe I. The steam-admission valves are actuated by crank-arms 1 on the valve-stems of the intermediate and low-pressure cylinders, links 2 3 connecting the crank-arms 1 of the intermediate and low-pressure cylinders with the levers 4, which form the crank-arms of the high-pressure-cylinder admission-valves, and links 6 connecting the levers 4 to the valve-motion levers 14, mounted on studs 5, supported on the cradle between cylinders A D and connected, respectively, to the cross-heads on piston-rods *a a'* by links 15, so that these admission-valves on one side of the engine are actuated by the



piston-rod on the opposite side. The cut-off valves of the high-pressure cylinder are actuated through crank-arms 1, adjustable links 7, and levers 8, connected by links 9 to the valve-motion levers 14 on the same side of the engine, so that the cut-off valves on each side are operated by the piston-rod of their own side. The pump end has force and suction mains K L, and the pump-valves are accessible through the removable plate 16, which may be a single plate, as shown, or two or more hand-holes may be provided, with suitable covers. It will be understood that all of these parts may be of any suitable construction other than that shown and that the invention may be embodied in duplex engines differing widely in construction of cylinders, valve movements, and pipe connections and that the invention is equally applicable to single-expansion engines or to other multiple-expansion engines as well as to the triple-expansion engine shown.

Referring now to the general arrangement of the engine, in which the present invention resides, it will be seen that the horizontal steam and pump cylinders forming the opposite sides of the duplex engine shown are arranged in line vertically one above the other, so that the lower side of the engine is supported on the foundation and in turn supports the upper side of the engine, the floor-space occupied by the cylinders widthwise of the engine being thus reduced to the width of a single side of the engine and the size of the foundations being correspondingly reduced instead of being of the width of the two cylinders and the space between them, as in previous constructions, in which the two sides are arranged horizontally side by side. The valve-movement also is arranged with the parts moving in vertical planes and upon one side of the engine, so that they are all in full view of the engineer as he stands in front of the engine and most convenient of access. The induction-pipe preferably enters in a plane parallel with the plane of the cylinders, being shown as arranged vertically, as is preferable, and the controlling-cocks of the induction-pipe are placed on the valve-movement side of the pipe, so as to be operated from the same side of the engine as the valve-movement. No access to the opposite or rear side of the engine is necessary, therefore, in running the engine, so that the engine may be placed with its rear side close to a wall or to other machinery, producing a further economy of floor-space by the necessity of providing for access only on one side, the pump-cylinders also being accessible from the same side through the opening covered by the plate 16. The steam admission and exhaust pipes and the force and suction mains are preferably arranged, as shown, so as to lie approximately within the floor dimension required for the steam-cylinders and valve-movement; but it will be understood

that these pipe connections may be formed otherwise, if such a reduction of floor-space is not required.

The size of the pump end is preferably reduced, as shown, by arranging the force and suction main connections in line horizontally and between the upper and lower cylinder-heads, as shown in Fig. 3, the same compactness horizontally being thus secured as heretofore secured vertically by the same arrangement with the cylinder-heads in line horizontally and the suction and force main connections in line vertically between the cylinder-heads.

What I claim is—

1. A duplex steam pumping-engine having horizontal steam-cylinders arranged in line one above the other and horizontal pump-cylinders arranged in line one above the other, and having a steam-valve movement for operating the steam-valves of each side of the engine by the piston of the opposite side provided with valve-levers actuated by the pistons and arranged to swing in vertical planes on one side of the engine, substantially as described.
2. A duplex steam pumping-engine having horizontal steam and pump cylinders arranged in line one above the other and having the steam-valves for each side of the engine operated by the piston of the opposite side with the steam-valve movement arranged on one side of the engine and a removable cover for access to the pump-valves on the same side of the engine as the valve-movement, substantially as described.
3. A duplex steam pumping-engine having horizontal steam and pump cylinders arranged in line one above the other and having the steam-valves for each side of the engine operated by the piston of the opposite side and having its steam-valve movement arranged on one side of the engine and its steam and pumping connection-pipes extending in planes parallel with the cylinders, substantially as described.
4. A duplex steam pumping-engine having horizontal steam and pump cylinders arranged in line one above the other, and force and suction main connections at the end of the pump in line horizontally and on opposite sides of a plane central to the pump-cylinders, and having the steam-valves for each side of the engine operated by the piston of the opposite side and its steam-valve movement arranged on one side of the engine and its steam connection-pipes extending in planes parallel with the cylinders, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES C. WORTHINGTON.

Witnesses:

C. J. SAWYER,  
T. F. KEHOE.