No. 827,870. PATENTED AUG. 7, 1906.

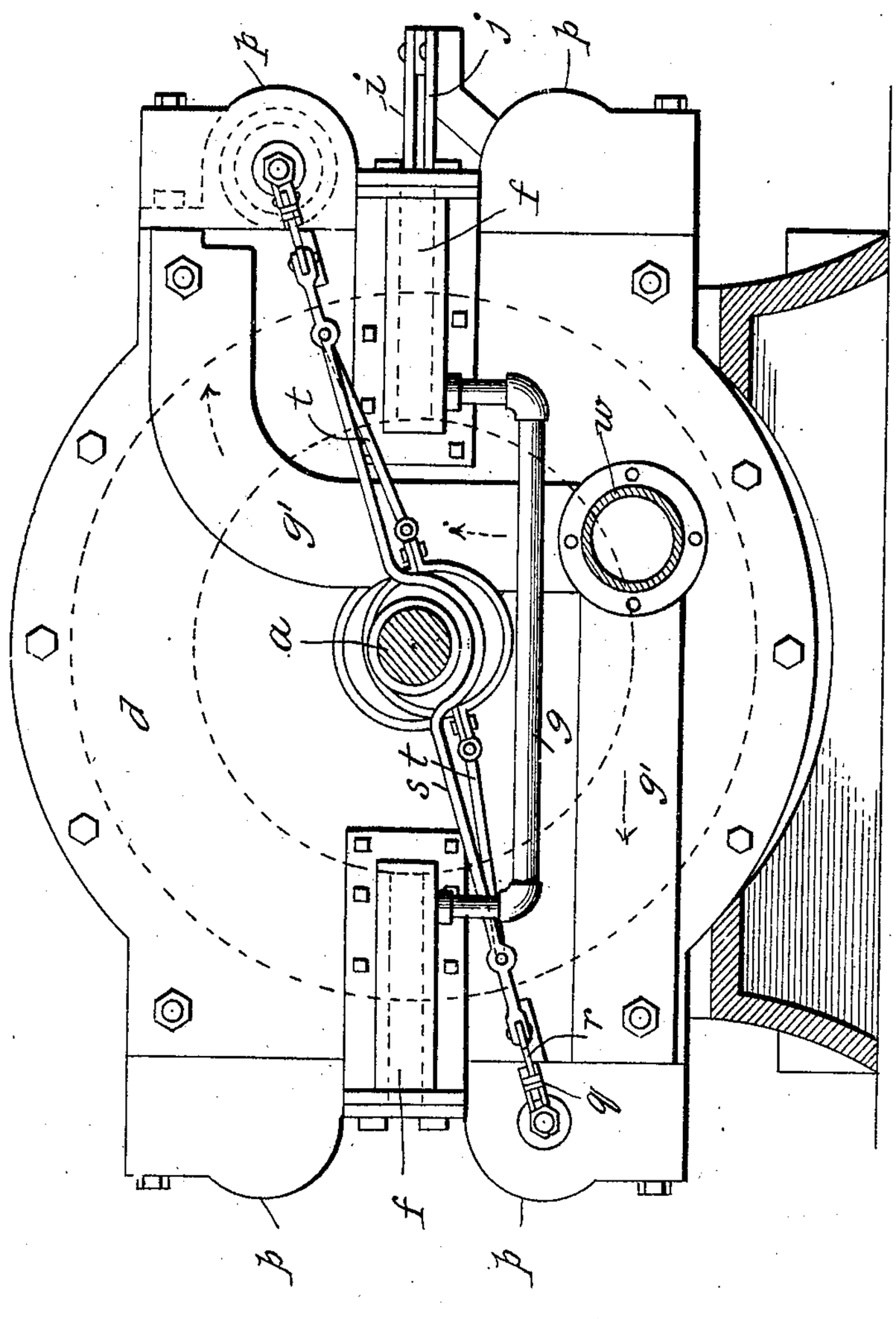
J. C. JARVIS.

CONTINUOUS PISTON ENGINE.

APPLICATION FILED DEC. 8, 1905.

4 SHEETS—SHEET 1.

Fig. 1.



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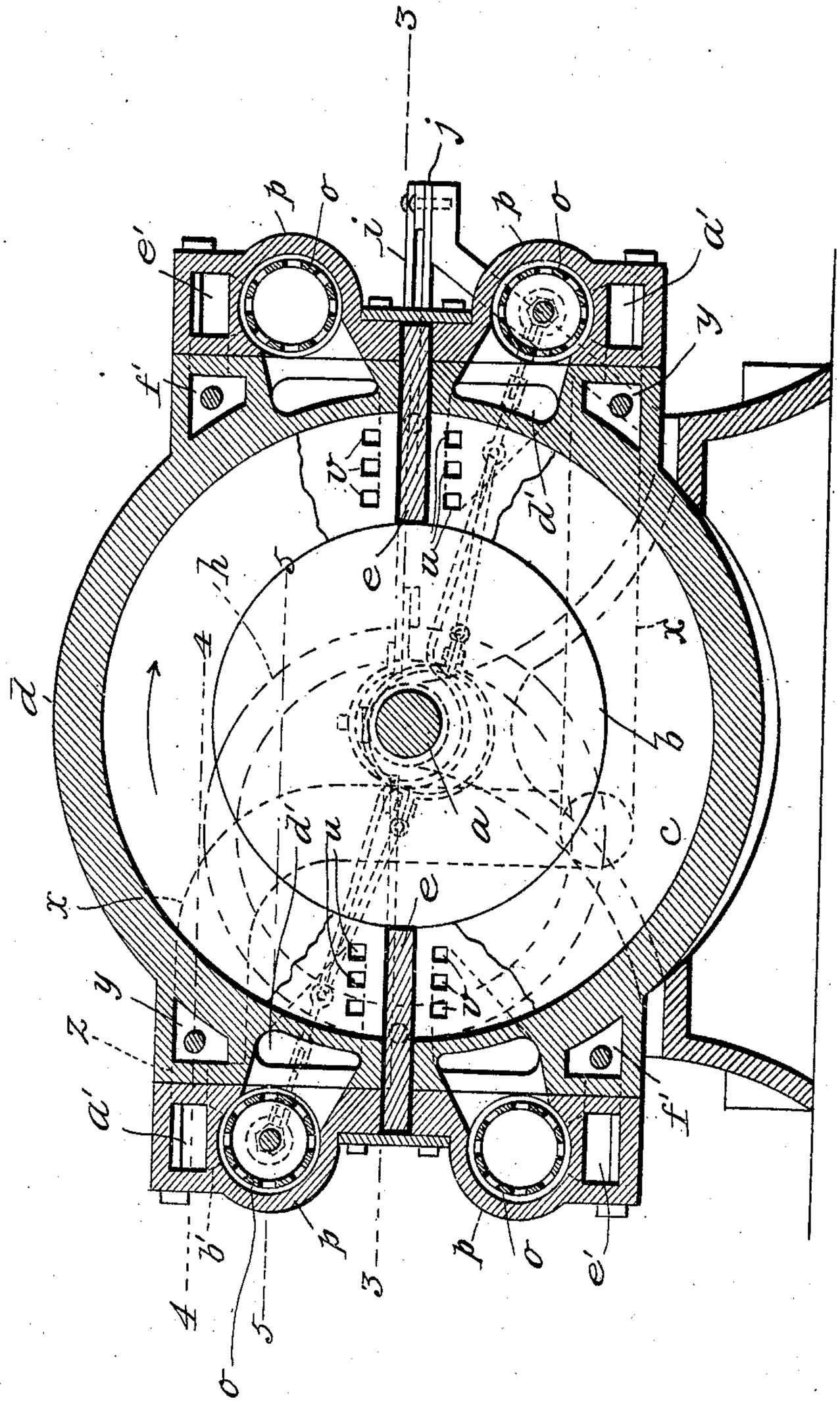
4 SHEETS—SHEET 2.

Fig. 2.



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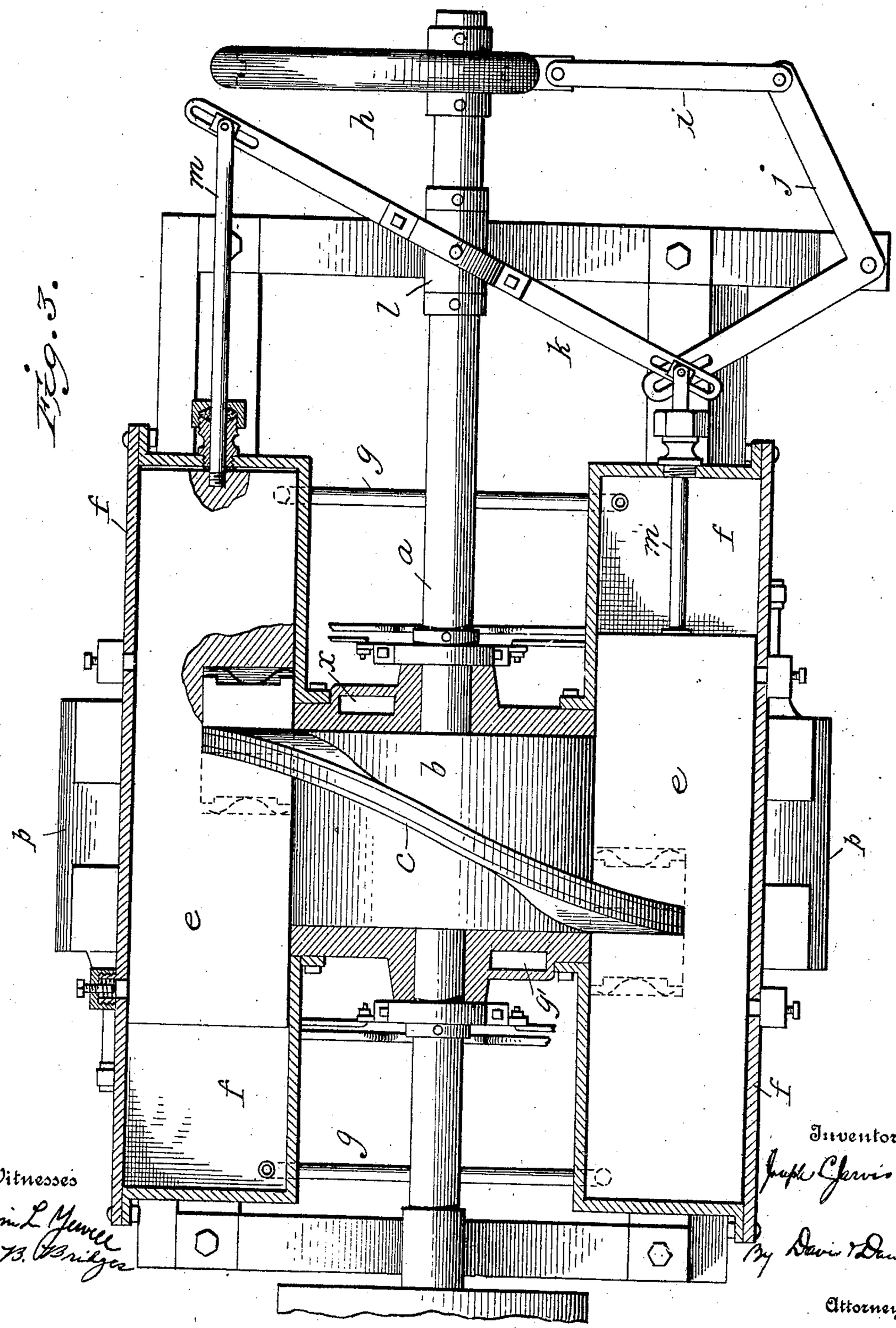
4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 6.

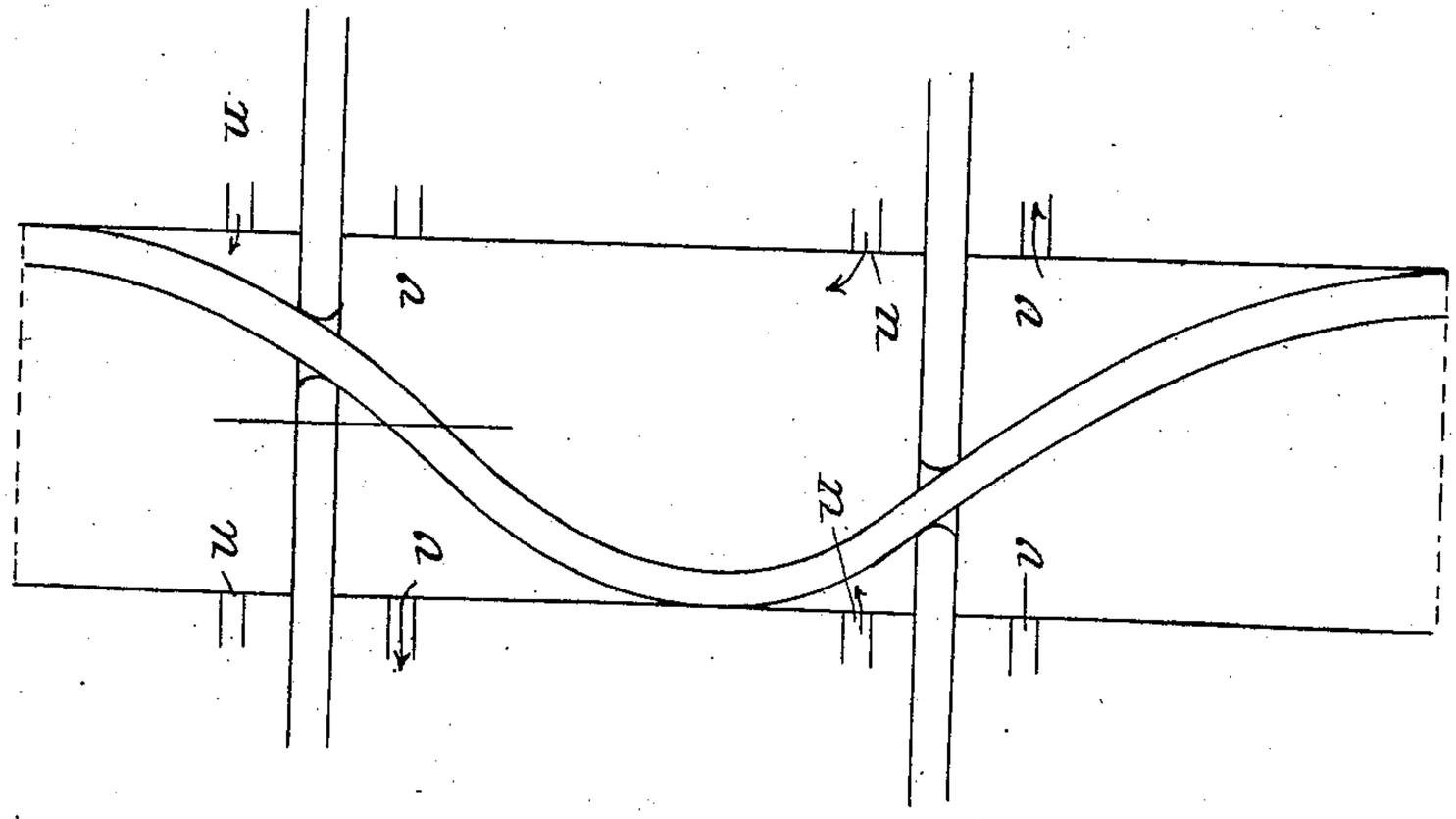


Fig. 4.

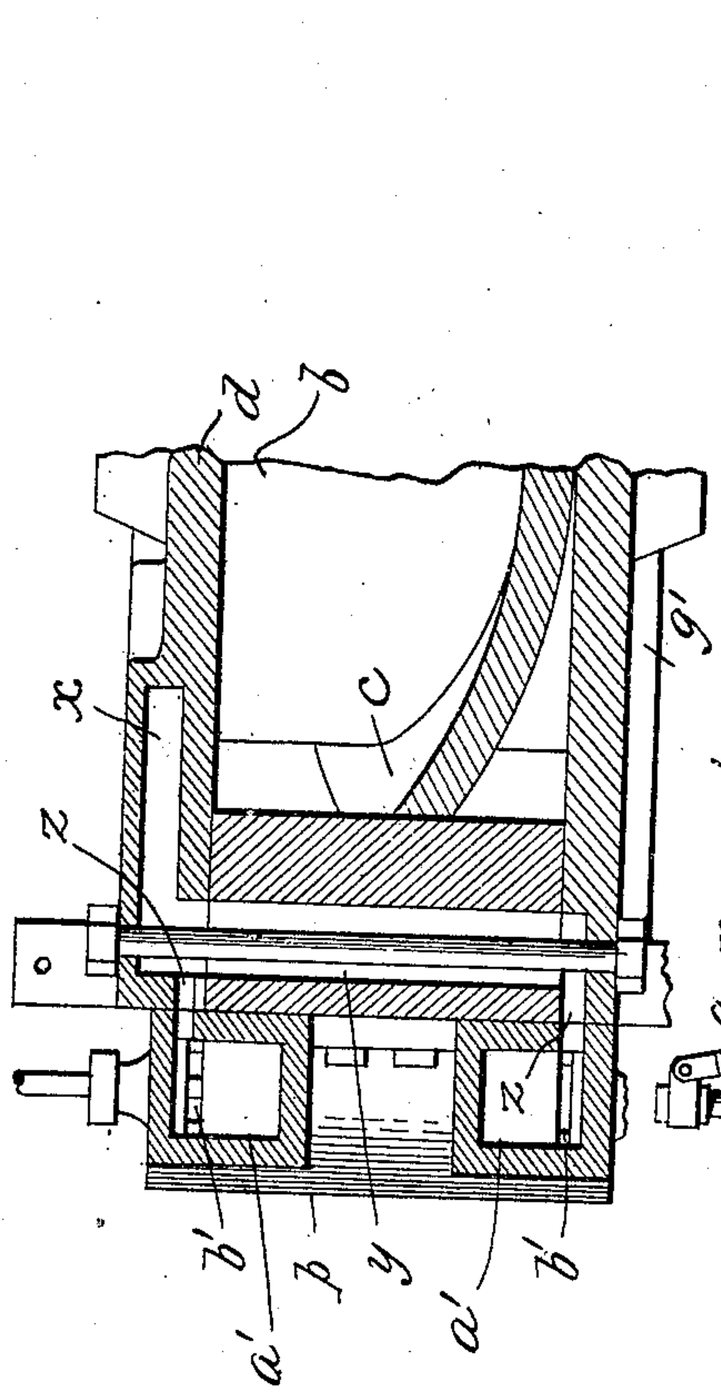
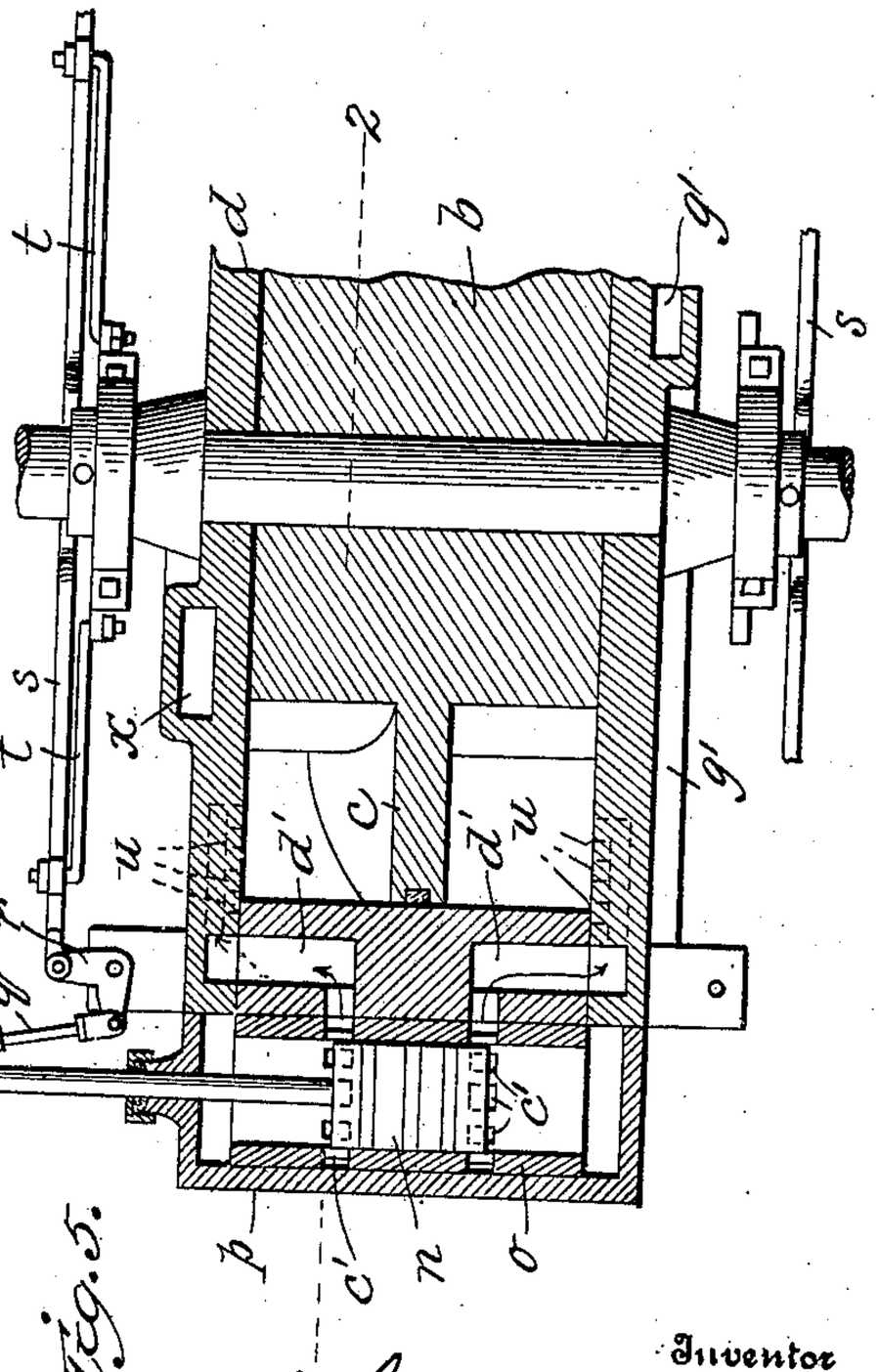


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOSEPH C. JARVIS, OF HUNTINGTON, WEST VIRGINIA.

CONTINUOUS-PISTON ENGINE.

No. 827,870. Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed December 8, 1905. Serial No. 290,972.

To all whom it may concern:

Be it known that I, JOSEPH C. JARVIS, a citizen of the United States of America, and a resident of Huntington, county of Cabell, State of West Virginia, have invented certain new and useful Improvements in Continuous-Piston Engines, of which the following is a full and clear specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the engine, showing the shaft and the base in cross-section; Fig. 2, a vertical section on the line 2 2 of Fig. 5; Fig. 3, a horizontal section on the line 3 3 of Fig. 2; and Figs. 4 and 5, horizontal sections on the lines 4 and 5, respectively, of Fig. 2.

The object of this invention is to improve and simplify the engine covered by my former patent, No. 805,140, dated November 21, 1905; and to the accomplishment of this object and such others as may hereinafter appear the invention consists of the parts and combination of parts hereinafter fully described, and particularly pointed out in the appended claims, reference being had to the accompanying drawings, forming a part of this specification, in which the same reference characters designate like parts throughout the several views.

Referring to the drawings by reference characters, *a* designates the shaft of the engine, which carries the hub *b*, which hub carries the serpentine continuous piston *c*. The hub and the piston rotate within the circular casing *d*, and across the casing at diametrically opposite points are two sliding gates *e*, which work through slots in the sides of the casing and are each notched to engage over the piston-flange, the notched portions being provided with suitable packings, as usual. In the present engine there are but two bends in the piston-flange, so that this flange touches the sides of the casing at but two points. This reduction in the number of bends in the piston necessitates also a reduction in the number of gates, as is obvious, it being necessary to have the same number of gates as there are bends or apexes in the piston-flange.

The outer ends of the gates work in closed chambers *f*, fastened to the respective heads of the casing, and, if desired, suitable packings may be employed to make a steam-tight joint between each one of these chambers or pockets and the steam-space of the casing. The opposite pairs of these chambers or pockets are connected by pipes *g*, so that as the gates reciprocate in opposite directions the air or steam that may collect in the chambers *f* may readily pass back and forth, thereby avoiding the tendency to form vacuums.

In order to relieve the piston of the work of sliding the gates, and thereby materially reduce the wear and noise and friction, I provide means outside of the engine for sliding these gates alternately in opposite directions as the piston rotates. I prefer employing the mechanism shown, which consists, essentially, of an eccentric *h*, mounted on the engine-shaft and connected by a link *i* to one arm of the bell-crank *j*, the other arm of which is slidably connected to one end of lever *k*, oscillatingly mounted on a suitable part of the engine, preferably on a sleeve *l*, mounted loosely on the engine-shaft. The opposite ends of the lever *k* are connected by rods *m* with the adjacent ends of the respective gates, the rods passing through suitable stuffing-boxes on the ends of the chambers *f*. By means of this system of levers it will be observed that the gates will be positively oscillated as the piston rotates, thereby relieving the piston of the entire work of shifting the gates.

Instead of mounting the valves on the side of the casing, as in my former patent, I arrange them on the periphery of the casing, so that the valve-casing shall lie transversely of the casing. The valves in the present engine consists of four double piston-valves *n*, each of which slides in a transverse open-ended cylinder or lining *o*, arranged within a suitable casing *p*, bolted to the exterior of the main casing. To the outer end of each of the rods of the piston is attached a link *q*, whose inner end is connected to a bell-crank *r*, pivotally mounted on an adjacent part of the engine. The opposite bell-cranks *r* are connected by a link *s*, which is connected to an eccentric carried by the engine-shaft by links *t*, whereby the opposite or companion valves will be simultaneously reciprocated in opposite directions by the rotation of the engine-shaft. The inlet and exhaust ports (lettered, respectively, *u* and *v*) are formed in the sides of the casing adjacent to the gates, the inlet-ports just in advance of the gates and the exhaust-ports just behind the gates, as in my former engine. Steam is supplied to the engine through the pipe *w*, (shown in Fig. 1,) this pipe connecting to conduits *x*, cast in

the adjacent head of the casing and leading to the respective inlet-valve chambers. The end of each of the passages *x* is connected to a transverse passage *y*, and this in turn connects by passages *z* to chambers *a'*, just above the valve-chamber and connected thereto, respectively, by vertical ports *b'*, which lead down into the valve-chamber at the opposite ends thereof, so that the steam may pass into the lining-cylinder *o* at both ends. Ports *c'* are formed in the cylinder *o* at the proper distance apart, which connect with ports *d'*, which respectively lead to the aforesaid inlet-ports *u* in the opposite sides of the casing. It will be observed, therefore, that as the inlet-valves reciprocate they alternately admit steam to the chambers on the opposite sides of the piston-flange, these admissions being timed to occur immediately after the apexes of the piston pass the ports.

The exhaust valves and ports are constructed like the inlet valves and ports. The cylinder-ports *v* connect, by means of passages similar to those described for the inlet-valves, with the casing of each exhaust-valve, and these valve-casings are each in constant communication with chambers *e'*, similar to chambers *a'*. Chambers *e'* connect with transverse passages *f'*, and these transverse passages each connect at its end to a conduit *g'*, formed in the casing opposite to and similar to the conduits *x*.

By the above arrangement of valves and ports it will be observed that I do away with much piping and valve-operating mechanism. In the present engine each valve is a double valve, in that it controls two independent sets of ports, whereby each valve is adapted to be operated by a simple mechanism connected to the engine-shaft. My present improvements render the engine much more compact and enable it to run smoother and with a minimum waste of steam. I prefer that the inlet-valves shall be of such length that they will at no time entirely cut off the steam from the engine, as I have found it desirable to admit steam through at least one of the inlet-ports at all times, so as to thereby maintain the momentum of the piston and relieve it of shock.

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

1. In an engine of the type described, the combination of a casing, a shaft carrying a serpentine piston, a plurality of gates engaging the piston and having their ends working in chambers at the sides of the casing, and pipes connecting opposite pairs of these chambers, for the purpose set forth.

2. In an engine of the type described, the combination of a casing, a shaft carrying a continuous serpentine piston, gates engaging this piston and adapted to slide endwise across the casing, and means independent of the piston for endwisely sliding said gates as the piston rotates.

3. In an engine of the type described, the combination of a casing, a shaft carrying a continuous serpentine piston, gates engaging this piston and adapted to slide endwise across the casing, and means independent of the piston for endwisely sliding said gates as the piston rotates, said means consisting of a rod connected to each of the gates and a connecting-lever arrangement.

4. In an engine of the type set forth, the combination of a circular casing, a shaft extending centrally therethrough and carrying a serpentine piston, transversely-working gates connected to said piston, inlet-ports at each side of the casing in advance of each gate and exhaust-ports at opposite sides of the casing behind each gate, a single valve controlling each pair of inlet-ports and each pair of exhaust-ports, and means connected to the shaft for operating said valve.

5. In an engine of the type set forth, the combination of a circular casing, a shaft extending therethrough and carrying a serpentine piston, transversely-working gates engaging said piston, inlet-ports at each side of the casing in advance of each gate and exhaust-ports at opposite sides of the casing behind each gate, a valve-casing for each pair of inlet-ports and a valve-casing for each pair of exhaust-ports each of said valve-casings being connected to its ports by independent steam-passages, a single valve in each valve-casing adapted to alternately open and close said steam-passages, means for alternately actuating the inlet-valves, and means for alternately actuating the exhaust-valves, substantially as set forth.

6. In an engine of the type set forth, the combination of a circular casing, a shaft extending therethrough and carrying a serpentine piston, transversely-working gates engaging said piston, inlet-ports at each side of the casing in advance of each gate and exhaust-ports at opposite sides of the casing behind each gate, these ports being connected to independent steam-passages leading to the periphery of the casing, an inlet-valve casing for each pair of inlet-ports and a valve-casing for each pair of exhaust-ports, these valve-casings extending across the periphery of the casing, a reciprocating piston-valve in each casing, and means for operating these valves from the shaft of the engine, substantially as set forth.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 5th day of December, 1905.

JOSEPH C. JARVIS.

Witnesses:

RUFUS SWITZER,

THOS. J. HIGGINS.