

(No Model.)

P. F. HOLMGREN.
VIBRATING PISTON STEAM ENGINE.

No. 440,569.

Patented Nov. 11, 1890.

Fig. 2.

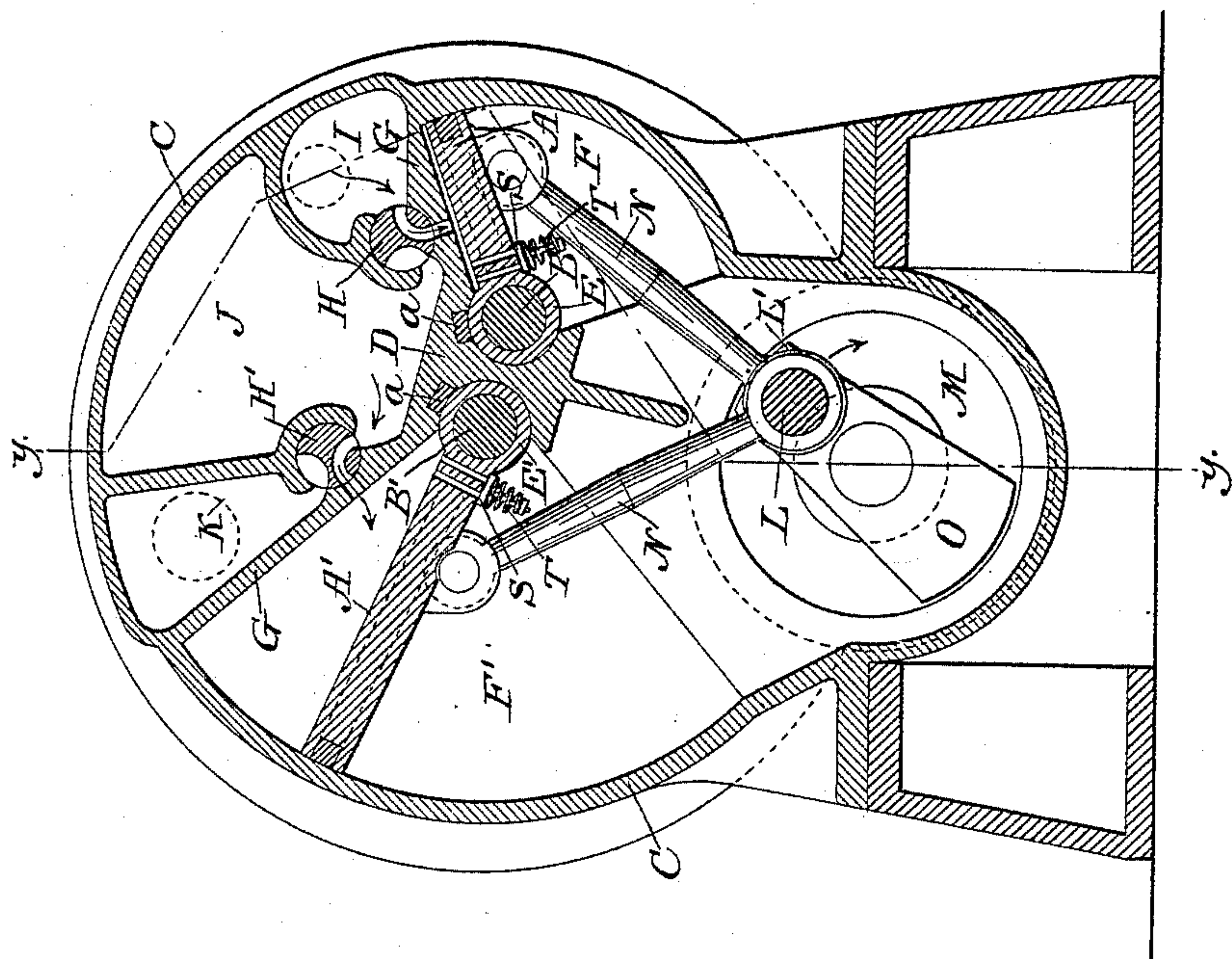
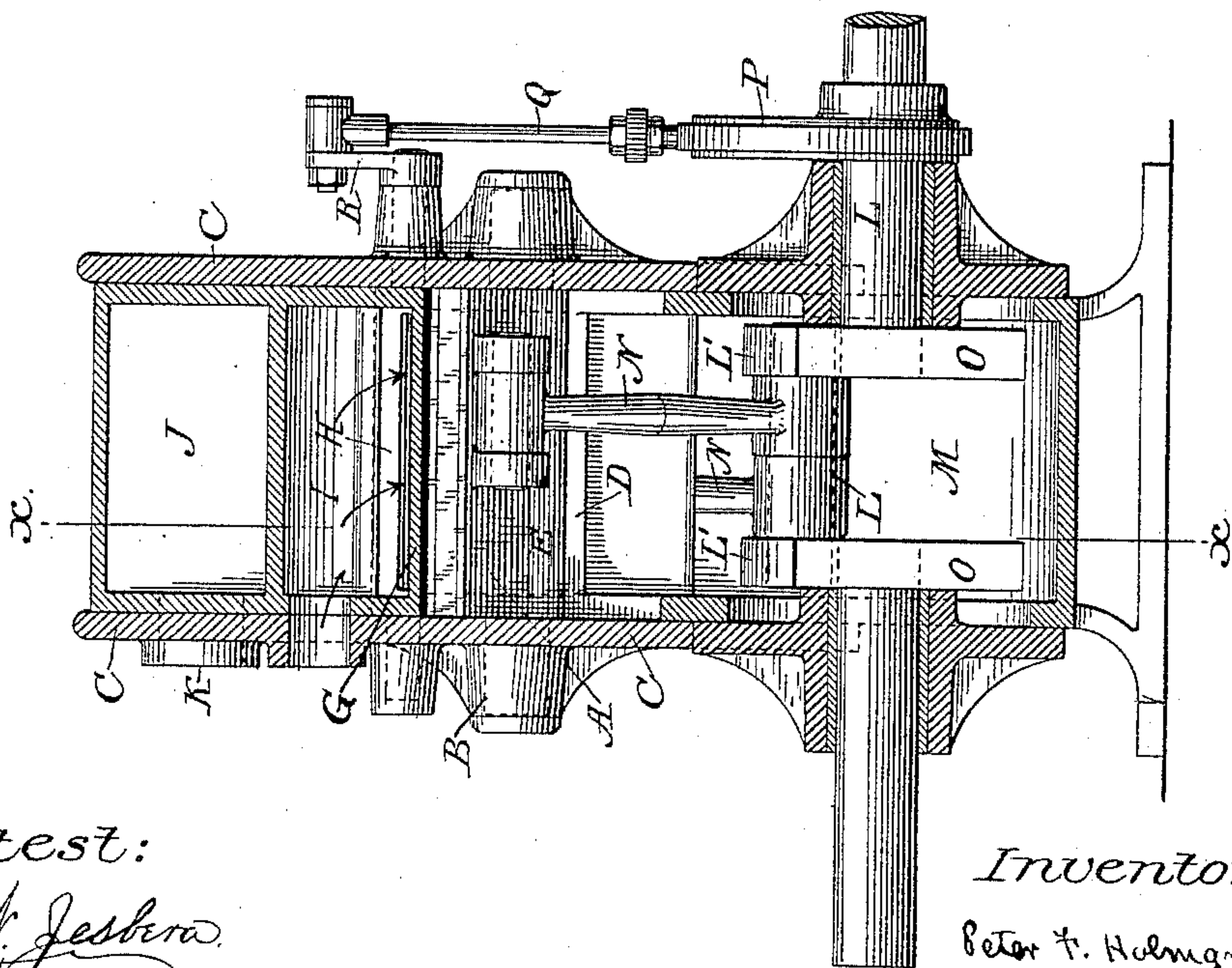


Fig. 1.



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UNITED STATES PATENT OFFICE.

PETER F. HOLMGREN, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF
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VIBRATING-PISTON STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 440,569, dated November 11, 1890.

Application filed February 11, 1890. Serial No. 339,976. (No model.)

To all whom it may concern:

Be it known that I, PETER F. HOLMGREN, of the city of Brooklyn, in the county of Kings and State of New York, have invented certain
5 new and useful Improvements in Vibrating-Piston Engines; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference
10 marked thereon, making a part of this specification.

My invention relates to the class of engines having vibrating pistons, and has for its object to provide at a low cost a simple compact single-acting compound engine.

It consists in the novel combination and arrangement, substantially as hereinafter described and claimed, of the two single-acting pistons of unequal area with a single crank-shaft mounted parallel with the axes of the
20 pistons within the same casing, and with sectoral piston-chambers having a connecting-passage controlled by suitable valves, by means whereof the exhaust-steam from the
25 high-pressure piston-chamber is delivered to the low-pressure piston-chamber.

In the accompanying drawings, Figure 1 is an irregular vertical section through the casing of the engine in line *yy* of Fig. 2, showing its working parts in elevation; and Fig.
30 2 is a vertical section in line *xx* of Fig. 1.

Similar letters indicate like parts in both figures.

A A' represent the two vibrating pistons of
35 the engine. These pistons severally radiate from hubs or collars E E', which encircle and are pivoted upon axial shafts B B', mounted and fixed at their ends in the casing C. The hub of each piston is partially embraced longitudinally by a partition D, interposed between the two hubs, and which connects the two end plates of the casing. The joint between each hub or collar and the partition D is made tight by means of a suitable packing-strip *a*, as shown in Fig. 2. Each piston
45 vibrates in a sectoral chamber F F', formed to inclose it in the casing C, and each of said chambers F F' is open at one end, the piston moving therein being made to work up closely
50 against the partition-plate G, which closes its opposite end. The inner or end plate in each piston-chamber is provided with a port formed therein, and which is governed by a rotating

valve through which the steam admitted to the piston is admitted and exhausted. 55

The valve H, which controls the steam-port for the piston-chamber F of least area, is made to establish communication alternately with a steam-passage I in the casing, to which the supply-pipe from the boiler is connected, and with an exhaust-passage leading to the
60 larger piston-chamber F'. This passage is enlarged intermediate the two chambers, so as to form a middle steam-chamber J between them. 65

The valve H', controlling the steam-port in the larger piston-chamber F', is made to communicate alternately with said intermediate steam-chamber J and with an exhaust-passage K, leading out from the engine. 70

The crank-shaft L to be driven by the pistons is mounted beneath them, and the crank L' thereon revolves in a chamber M, formed in the lower part of the casing as an extension of the open ends of the two piston-chambers F F' to communicate freely therewith. Each piston is connected with the one crank L' on the shaft L by means of coupling-rods N N, and the connection is so adjusted that the one piston shall have a slight lead over
80 the other, as shown in Fig. 2, so that they may not be both upon a dead-center at the same time.

To prevent an accumulation of the water in front of the piston in each chamber due
85 to a condensation of steam, I insert in each piston a valve S, opening outward, and which is closed by a spring T of sufficient power to resist the highest steam-pressure which may be exerted upon the piston. The crank L' is
90 preferably counterbalanced by the extension O O of its two radial arms on the opposite side of the shaft.

The steam-valves H H' are actuated from an eccentric P on the main shaft L, each by
95 an independent coupling-rod Q, extending to a rocking arm R, which is in turn coupled to the shaft carrying the valve, the rods being so adjusted that one of the valves H' shall have a lead over the other H. 100

The crank-chamber M may be partially filled with oil, so that the crank will at each revolution dip therein, and thereby insure a thorough and constant lubrication of the pistons and other working parts of the engine. 105

In the operation of the engine steam is ad-

mitted at high-pressure through the valve H, against the piston A of least area, and will drive it forward at full pressure to the end of its stroke, whereupon, by the movement of the valve H, produced automatically by the action of the eccentric P on the crank-shaft, the valve will operate to cut off the supply of steam and will open the exhaust-passage from the piston-chamber into the intermediate steam-chamber J, so that as the piston A makes its return-stroke the steam will exhaust from before it into said chamber J. While the high-pressure piston A is making its forward stroke the valve H' will have opened the port between the steam-chamber J and the low-pressure piston-chamber F', so that the steam in said chamber will act expansively upon the piston A' of enlarged area to drive it forward; but owing to the advanced lead of this piston it will reach the end of its forward stroke and pass the dead-center before the forward stroke of the high-pressure piston A is completed. So soon as the low-pressure piston A' has completed its forward stroke its steam-valve H' will move and cut off the connection with the steam-supply chamber J and open the outward exhaust-passage K. Hence as an exhaust takes place from the high-pressure piston-chamber F into the steam-chamber J the exhaust-steam from the low-pressure piston A' is discharged from the engine, while by reason of the relative adjustment of the two pistons the low-pressure exhaust will be closed and the forward movement of the low-pressure piston A' will begin, under the force of steam admitted thereto from the chamber J, before the return-stroke and exhaust of the high-pressure piston A has ceased. It is evident that this adjustment of the two pistons may be varied without departing from my invention, and also that the form of the steam-valves H H' is immaterial, so that any known form of valve suitable for the purpose may be used as an equivalent therefor in opening and closing the communications between the ports opening into the two piston-chambers and their respective steam-supply and exhaust-passages.

All the working parts of the engine are inclosed in the one casing, so that the engine is not only compact in form, but presents a singularly neat appearance, and being automatically lubricated by the oil contained in the crank-chamber M, within the casing, will need no attention in this regard, and will remain outwardly clean and free from oil and grime.

By reason of the delivery of the steam from the high-pressure chamber F for use expansively in the low-pressure chamber F', (which is made in connection with the intermediate steam-chamber J, by means of which its transmission from the one to the other is effected without interference with a proper relative adjustment of the two pistons,) the engine

will work with great economy as well as efficiency.

I claim as my invention—

1. The combination, in a compound single-acting vibrating-piston engine, of pistons of unequal area oscillating in sector-shaped chambers within the same casing upon separate independent parallel axes mounted in the casing between said chambers, a steam-supply pipe connected with the inlet-port of the piston-chamber of least area, a passage connecting the exhaust-port of said chamber of least area with the piston-chamber of larger area, an exhaust-port in said chamber of larger area opening to the atmosphere, valves controlling said inlet and exhaust ports, and a crank-shaft mounted parallel with the axes of the piston and coupled directly to each piston, substantially in the manner and for the purpose herein set forth.

2. A compound vibrating-piston engine having pistons of unequal area oscillating in sector-shaped chambers upon separate independent parallel axes, each chamber being open at its outer end to the atmosphere, in combination with a single crank-shaft mounted parallel with the axes of the pistons between the outer open ends of the piston-chambers and within the same casing, and with coupling-rods connecting said shaft directly with the outer face of each piston, substantially in the manner and for the purpose herein set forth.

3. The combination, in a compound single-acting vibrating-piston engine, of the casing, the high and low pressure sector-shaped piston-chambers formed opposite each other in said casing; the intermediate crank-chamber on the one side opening freely into said piston-chambers, the intermediate steam-chamber on the opposite side into which the steam from the high-pressure chamber exhausts and thence passes to the low-pressure chamber, the steam-valves, the crank-shaft in the crank-chamber, and the pistons severally oscillating in the piston-chambers upon independent parallel axes mounted in the partition between the piston-chambers, both pistons being coupled directly to the one crank-shaft, substantially in the manner and for the purpose herein set forth.

4. The combination, with the piston in a single-acting vibrating-piston engine, of a spring-actuated valve opening outward, whereby the piston is relieved from a pressure exceeding that of the highest normal working-pressure, substantially in the manner and for the purpose herein set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PETER F. HOLMGREN.

Witnesses:

A. N. JESBERA,
E. M. WATSON.