No. 734,037. PATENTED JULY 21, 1903.

W. T. BENNETT.

COMPOUND STEAM ENGINE.

APPLICATION FILED OCT. 16, 1902.

NO MODEL.

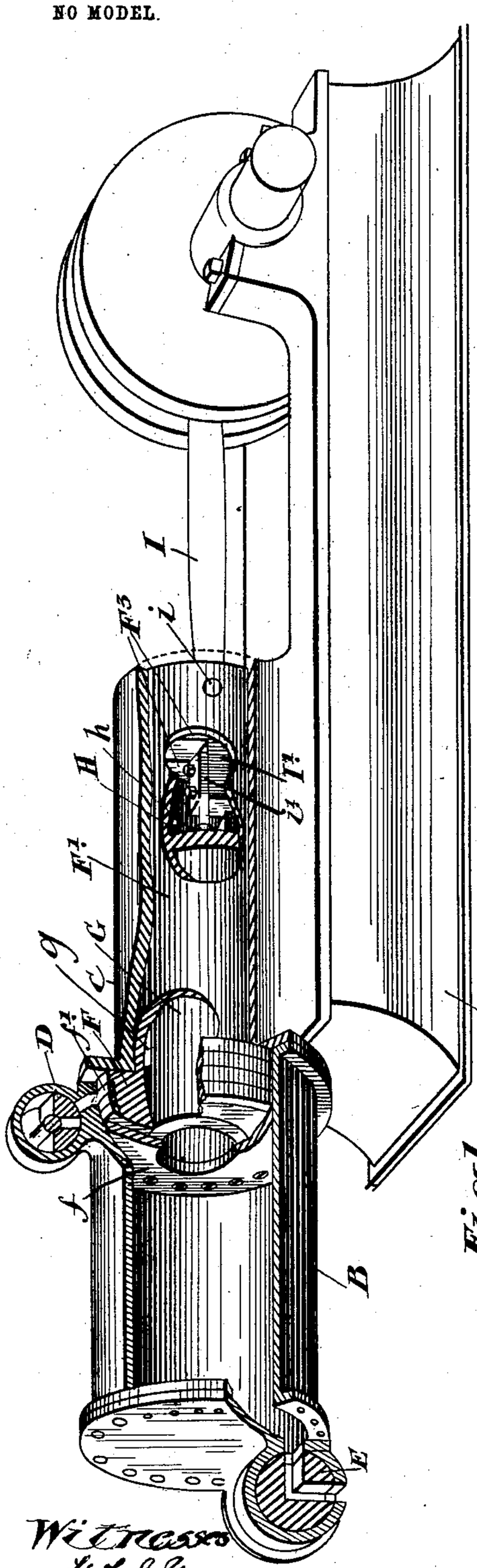

Fig. 1.

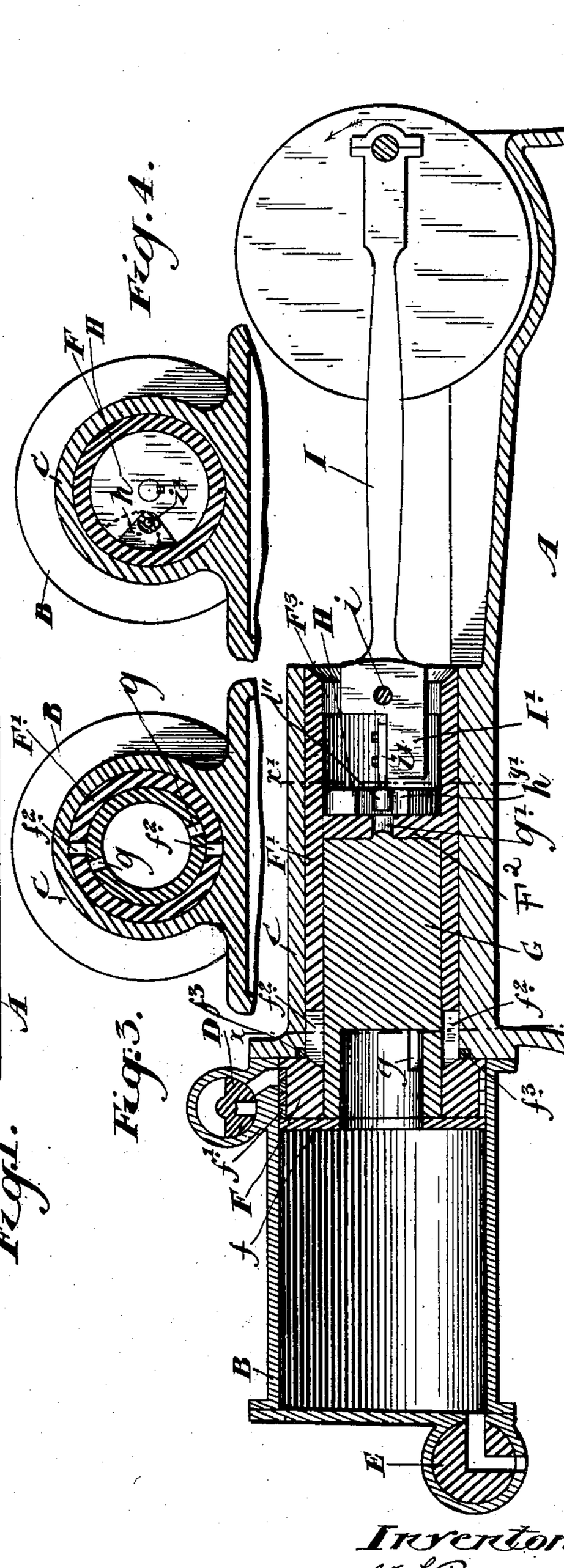

Fig. 3.

Fig. 4.

Fig. 2.

Witnesses:
H. L. S. Gourley
G. S. Bate

Inventor:
W. T. Bennett
by Fetherstonhaugh & Co. Atty's.

No. 734,037. Patented July 21, 1903.

UNITED STATES PATENT OFFICE.

WILLIAM THOMAS BENNETT, OF SUNDERLAND, CANADA.

COMPOUND STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 734,037, dated July 21, 1903.

Application filed October 16, 1902. Serial No. 127,589. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM THOMAS BENNETT, manufacturer, of the village of Sunderland, in the county of Ontario, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Compound Steam-Engines, of which the following is a specification.

My invention relates to improvements in compound steam-engines; and the object of the invention is to produce an economical noiseless compound engine in which there will be no liability of condensation of steam, in which the full benefit of the steam will be employed in compounding, in which all passage-ways to utilize high and low pressure are dispensed with, in which the piston-rod and stuffing-box are eliminated and the number of working parts materially reduced, and in which gas, gasolene, or other expansive fluid may be employed with but slight change; and it consists, essentially, of a cylinder supported on a suitable bed and having an extension-sleeve and suitable inlet and exhaust ports, a hollow piston having a reduced outer end and ports in the same located in proximity to the piston-head, a balance-valve plug, and a connecting-rod connected at one end to the crank-shaft and at the opposite end pivotally connected to the piston and having the inner end of the rod designed to coact with the end of the valve-plug, so as to impart an oscillating movement to same and bring the ports in the valve to register periodically with the ports in the piston at the end of the high-pressure stroke, and thereby expand into the cylinder to the opposite side of the piston, as hereinafter more particularly explained.

Figure 1 is a perspective view, partially in section, showing a compound engine constructed in accordance with my invention. Fig. 2 is a longitudinal section through the engine. Fig. 3 is a cross-section on the line $x\,y$, Fig. 2. Fig. 4 is a cross-section on the line $x'\,y'$, Fig. 2.

In the drawings like letters of reference indicate corresponding parts in each figure.

A is the bed of the engine, B the cylinder, and C a reduced extension thereof, which is attached to or forms part of the bed-plate, the cylinder being preferably bolted to such extension.

D is a rotary inlet-valve, and E is a rotary exhaust-valve, which are connected together in the usual manner by eccentrics and are so timed that when the inlet-valve is opened the exhaust-valve is closed, and vice versa.

F is the piston, which is hollow, as indicated, and is provided with an end plate f and the usual packing-rings f', located to the inside of such end plate. The piston F has a reduced portion F′, such portion being provided with ports f^2, diametrically opposite each other.

f^3 is a packing-ring on the inner end of the extension-sleeve C.

G is the valve-plug, having the diametrically opposite ports g, extending into the recessed end of the valve-plug, as indicated. The piston has an intermediate cross-wall F^2, through which the end stem g' of the valve-plug extends.

H is a disk which is securely keyed on the end of the stem g' and is provided with a right-angular notch or recess h.

I is a connecting-rod which is suitably connected at one end to the crank-shaft of the engine. The opposite rectangular end is pivotally connected by the pin i to the parallel end bars F^3, which are attached to or form part of the piston.

The end of the connecting-rod I is provided with an extension I′, to which is secured a pin i', having a roller i'', which fits in the right-angular notch h in the disk H.

When the steam is admitted to the inlet-port, it passes behind the ring-face of the piston peripherally outside the recessed portion and forces the piston to the opposite end. In so doing as the connecting-rod is brought by the crank in the direction indicated by arrow the valve is held closed. As soon as the piston reaches the opposite end the end of the connecting-rod oscillating throws, by means of the roller, the notch in the disk around to the position shown in dotted lines in Fig. 4 and as the disk is connected to the plug-valve the ports f^2 and g opposite each other, near the end of the stroke, thereby allowing the steam, which is at high pressure, to pass and expand into the low-pressure end of the

cylinder and exert such pressure upon the much larger surface of the piston and drive the piston backwardly to the opposite end.

It will be understood that the valve is only momentarily opened and that such opening is arranged to take place only upon the piston reaching the end of its outward movement. The valve-plug G is during the movement of the piston backward and forward caused to register with the ports *g* periodically, as hereinbefore explained, during but a short portion of the movement of the piston and is held closed by the roller of the connecting-rod operating against the notch *h* in the disk H, so as to throw the solid portion of the plug-valve opposite the openings f^2.

It will be seen that the valve such as I describe between the high-pressure end of the piston and the low-pressure end is a perfectly-balanced valve, and therefore there is but a minimum amount of wear on the same.

It will also be seen by my construction of piston that I entirely dispense with the piston-rod and that there is no danger of any rattle in the engine. As there are no high and low pressure cylinders, and consequently no connecting passage-ways, it will be understood that no condensation of steam can take place, as the cylinder is always kept at a temperature which will not permit of condensation.

What I claim as my invention is—

1. In a compound engine, the combination with the cylinder and extension thereof and the inlet and exhaust ports, of a hollow piston having openings extending through the same, a rotary valve in such piston provided with openings designed to be brought to register with the openings in the piston, to open communication through the piston to the opposite end of the cylinder when the piston has reached the limit of its high-pressure stroke as and for the purpose specified.

2. In a compound engine, the combination with the cylinder and extension thereof of less diameter than the cylinder and the inlet and exhaust ports, of a hollow piston provided with a reduced portion fitting into the extension and having openings in proximity to the piston-head, and an intermediate cross-wall, of a valve-plug provided with openings designed to register with the openings in the piston and having a recessed end extending through the outer end of the piston and a stem extending through the wall and means for turning such stem when the piston has reached the limit of its high-pressure stroke as and for the purpose specified.

3. In a compound engine, the combination with the cylinder and extension thereof of less diameter than the cylinder and the inlet and exhaust ports, of a hollow piston provided with a reduced portion fitting into the extension and having openings in proximity to the piston-head, and an intermediate cross-wall, of a valve-plug provided with openings designed to register with the openings in the piston and having a recessed end extending through the outer end of the piston and a stem extending through the wall, a disk secured on the end of the stem provided with a notch and means from the main shaft for operating against such notch to slightly oscillate the disk when the piston has reached the limit of its high-pressure stroke as and for the purpose specified.

4. In a compound engine, the combination with the cylinder and extension thereof of less diameter than the cylinder and the inlet and exhaust ports, of a hollow piston provided with a reduced portion fitting into the extension and having openings in proximity to the piston-head, and an intermediate cross-wall, of a valve-plug provided with openings designed to register with the openings in the piston and having a recessed end extending through the outer end of the piston and a stem extending through the wall, a disk secured on the end of the stem provided with a notch, a crank-shaft, the connecting-rod connected at one end of the same and a pin extending through the piston at the opposite end to which said rod is connected, an extension on the connecting-rod, a roller on said extension designed to engage and coact with the notch, to oscillate the disk and the valve connected thereto when the piston has reached the limit of its high-pressure stroke as and for the purpose specified.

WM. THOMAS BENNETT.

Witnesses:
B. BOYD,
G. S. BATE.