

L. Huntoon.

Compound Steam Engine.

N<sup>o</sup> 51,131.

Patented May 15, 1866.

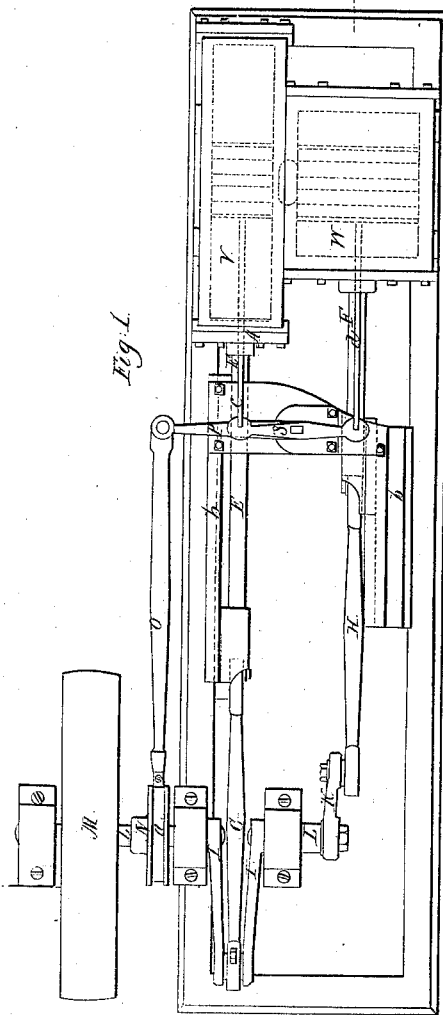


Fig. 1.

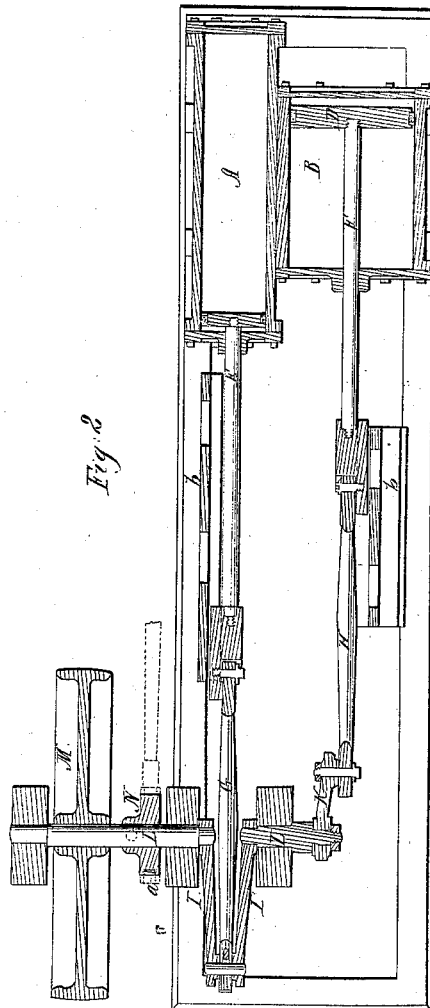


Fig. 2.

Witnesses:

J. P. Riddle Jr.  
L. H. Washburn

Inventor:

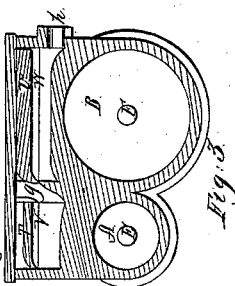
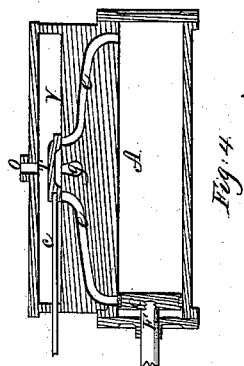
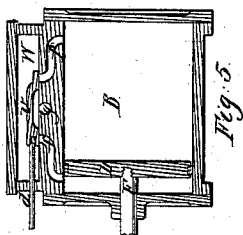
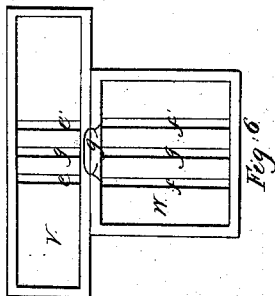
L. Fayette Huntoon  
by his attorney  
R. H. Kelly

L. Huntoon,

Compound Steam Engine.

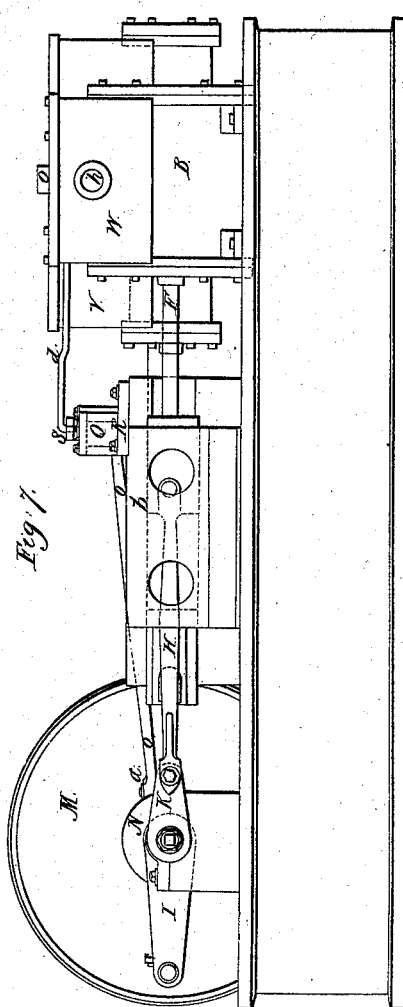
N<sup>o</sup> 54,731.

Patented May 15, 1866.



Witnesses:

Frederick Curtis  
G. H. Washburn



Inventor:

Lafayette Huntoon.  
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R. H. Ledy

# UNITED STATES PATENT OFFICE.

LAFAYETTE HUNTOON, OF MILFORD, MASSACHUSETTS.

## IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. 54,731, dated May 15, 1866.

*To all whom it may concern:*

Be it known that I, LAFAYETTE HUNTOON, of Milford, in the county of Worcester and State of Massachusetts, have invented an Improved Steam-Engine; and I do hereby declare the same to be fully described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a top view of it; Fig. 2, a horizontal section of it, taken through its two cylinders. Fig. 3 is a transverse section of the two cylinders and their valve-chests. Figs. 4 and 5 are vertical sections of the cylinders and their valve-chests. Fig. 6 is a top view of the valve-seats of the two valve-chests. Fig. 7 is a side elevation of the engine.

In this improved engine the steam, after having driven the main or lesser piston, or that of the lesser cylinder, in either direction, will be forced into the expansion or greater cylinder, and there be employed in working its piston, the said steam being used expansively in the larger cylinder.

In the construction of the engine I employ two cylinders having separate pistons, whose rods are connected with separate cranks of the driving-shaft of the engine. One cylinder has a length double that of the other and a diameter of bore equal to one-half of that of the other. Consequently the cubical contents of the chamber of the lesser cylinder, although such cylinder has a length double that of the greater, are equal to but one-half the cubical contents of the larger or shorter cylinder, which I term the "expansion-cylinder," because the steam is used expansively in it.

I am aware that Letters Patent No. 33,181, dated September 3, 1861, were granted to Jacob Bradley for certain improvements on an engine having two cylinders and two pistons, it being supposed that by the construction of such engine the steam employed for propelling the piston of the lesser cylinder could be used to advantage in the larger cylinder. It will be evident, however, from the arrangement of the two cylinders and the fact that the two pistons are fixed to one rod, that the steam introduced into the larger cylinder can in no way operate to move its piston, for the connection of the two pistons—viz., by a single rod—is such that the waste steam, when expanded in the two cylinders, must act with

equal effect in opposite directions, and in such manner against the two pistons as to cause the pressure against one to counterbalance that against the other, and as a consequence produce no movement of either piston. In fact, by the construction of the engine as exhibited in the said patent, the larger cylinder and its piston operate to arrest the power of the smaller cylinder and piston rather than to add to the power of the engine.

With my improved engine the case is very different, for, as the two pistons of it are provided with separate rods connected with separate cranks, one of which is double the length of the other, and as the expansion-cylinder has a capacity double that of the longer or other cylinder, the waste steam from the latter cylinder, in flowing into the larger cylinder, will be expanded and exert a force on the larger piston equal to double that which it will exert on the smaller one. Thus the back-pressure of the steam on the smaller piston will be neutralized by the greater pressure on the larger piston, and the excess of pressure will operate to move the said larger piston in its cylinder. Thus the power of the engine will be increased by the excess of pressure in action to move the larger piston in its cylinder. The steam, after having been let into the main or longer cylinder, is to be cut off and used expansively therein, in order that its power over the waste steam, or that to be driven out of the main cylinder at the starting of the piston in either direction, may be very much greater than that of the said waste steam.

In the drawings, A and B are the two cylinders, and C and D the pistons thereof, E and F being the piston-rods. Each of the said rods has one of two connecting-rods, G H, jointed to it, such rods being applied to the wrists of two cranks, I K, of a driving-shaft, L. The said shaft L carries a fly-wheel, M, and an eccentric, N, the latter being encompassed by the strap *a* of a connecting-rod, O, which is jointed to an arm, P, that projects from a short upright shaft, Q, having its journals duly supported by a frame, R, erected on the piston head-guides *b b*.

A lever, S, fixed on the upper end of the shaft Q, has two valve-rods, *c d*, jointed to its arms. Such rods extend from two slide-valves T U, which are placed on two separate steam

chest, V W, one of which belongs to the cylinder A and the other to the cylinder B. Steam-passages lead from each valve-chest to the ends of the steam-space of its cylinder, the same being as shown at *e e'* and *f f'* in Figs. 4 and 5.

An eduction-passage, *g'*, leads from one valve-chest into the other, and directly between the two external ports of one and also between the two external ports of the other. Furthermore, another eduction-passage, *h*, leads out of the valve-chest of the expansion-cylinder and from between the two leading ports thereof.

The cylinder A, I usually make of a length equal to twice that of the expansion-cylinder B, and I also construct the said expansion-cylinder with an internal diameter double that of the main cylinder A. The two cranks stand in opposite directions, one, or that for the main cylinder to operate, being double the length of the other.

The valves of the two steam-chests are to be arranged in such manner that when one of the leading ports of one cylinder is uncovered by its valve the opposite leading port of the other cylinder may be uncovered by its valve.

On steam being let into the steam-chest of the main cylinder A through an induction-passage, *o*, leading into the said steam-chest, the piston of the said cylinder will be put in action. The steam which may be expelled from the said cylinder will be received into the valve-chest of the expansion-cylinder, and in consequence of the movements imparted to the valve thereof the steam so received will enter the expansion cylinder, expand therein, operate on its piston, and finally be expelled through the valve-chamber and eduction-passage of the steam-chest of such expansion-cylinder.

The gain by using the steam expansively in the expansion-cylinder will be due to the excess of pressure on its piston over the back-pressure of the expanded steam on the piston of the main cylinder, the said excess of pressure being made to contribute to the power of the engine by operating the piston of the auxiliary cylinder, which being connected with the driving-shaft by the auxiliary or shorter crank, piston-rod, and connecting-rod, will aid in revolving such shaft.

I make no claim to the engine described in the hereinbefore-mentioned patent; nor do I claim the low-pressure expansion-engine of John Ericsson described in the United States Patent No. 6,844, dated November 6, 1849, as such, although using two expansion-cylinders of different capacities and the same length, differs materially from my engine, the expansive force of the steam used in the smaller cylinder of the engine of Ericsson being employed to work the piston of the larger cylinder in one direction, whereas in my construction of an engine (which is a high-pressure one) in which the cylinders are of different lengths and diameters, the waste steam used in the larger cylinder at either stroke of its piston is employed to work the piston of the larger cylinder; nor do I claim the engine as described in the United States Patent No. 11,119, granted June 20, 1854, to Benjamin F. Day, as it differs materially from my engine, though resembling it in some particulars. The two cylinders of the engine of Day are of like capacity and length, and their pistons have the same length of stroke, and their cranks are arranged at right angles with each other; whereas in my improved engine one cylinder is double the length of the other and has a capacity of but half of the capacity of the auxiliary, and the two cranks are of unequal lengths and arranged at one hundred and eighty degrees distant from each other. Besides there are other important differences.

I claim as my invention—

The improved steam-engine constructed substantially in the manner and so as to operate as hereinbefore described—that is to say, as composed of the main and expansion cylinders A B, of different capacities or lengths and diameters, as stated, their separate pistons C D, piston-rods E F, connecting-rods G H, and cranks I K, steam-chests V W, valves T U, and steam-passages and valve operating mechanism, arranged together and applied to a driving-shaft substantially as explained.

LAFAYETTE HUNTOON.

Witnesses:

R. H. EDDY,  
F. P. HALE, Jr.