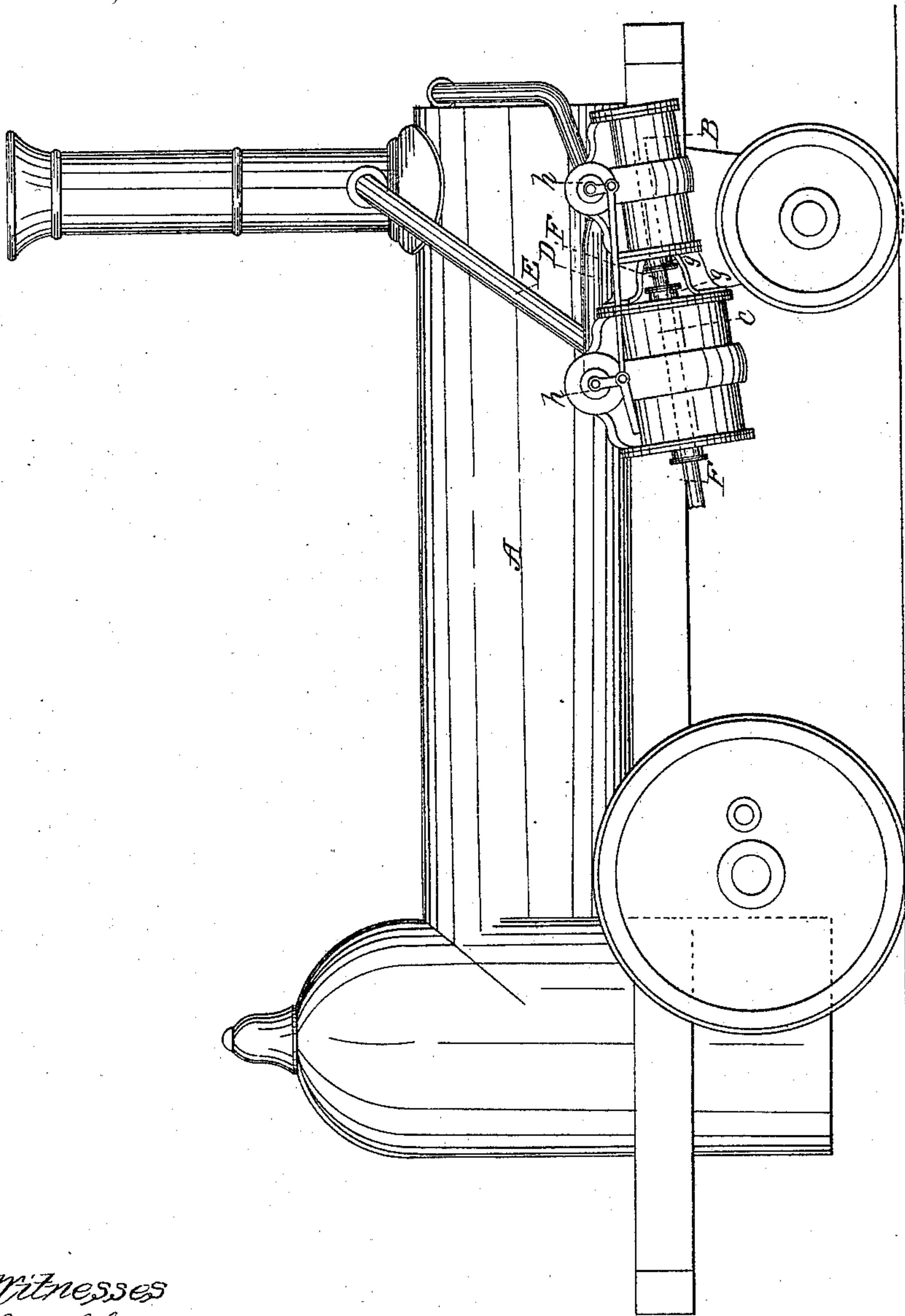


*J. L. Lay,  
Locomotive.*

*N<sup>o</sup> 70,341*

*Patented Oct. 29, 1867.*



*Witnesses  
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# United States Patent Office.

JOHN L. LAY, OF BUFFALO, NEW YORK.

Letters Patent No. 70,341, dated October 29, 1867.

## IMPROVEMENT IN LOCOMOTIVES.

The Schedule referred to in these Letters Patent and making part of the same.

### TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOHN L. LAY, of Buffalo, in the county of Erie, and State of New York, have invented a new and useful Improvement in Locomotive Engines; and I do hereby declare that the following is a full and exact description thereof.

My invention consists in the employment on locomotive engines of compound cylinders in place of the present high-pressure cylinders, viz, of a small cylinder, working steam at high pressure, and exhausting it into a large cylinder where it acts expansively, the cylinders being arranged in line, so that both cylinders simultaneously work pistons arranged on one rod.

As locomotive engines are non-condensing, and required to work steam at a high pressure, varying from ninety to one hundred and thirty pounds per square inch, much of the effective power is lost, as the steam is frequently exhausted from the cylinder under a considerable pressure, and this, acting as back pressure on the piston, reduces by so much the available driving force. This exhaust is necessarily through the smoke-stack, in order to produce sufficient increase of combustion in the furnace to generate the enormous amount of steam required by this wasteful process. And it is the object of my invention to economize by the use of a smaller quantity of steam at high pressure in the first cylinder, and adding its expansive power in the second to the work performed in the first, exhaust it at a pressure ordinarily but little above that of the atmosphere, thereby utilizing more of the power, and by obviating the necessity of such intense heat in the furnace, and maintaining by the low pressure exhaust a steady and uniform combustion, effecting a great saving in fuel.

The drawing represents a locomotive engine of my improved construction in side elevation, A being the boiler, B the first or high-pressure cylinder, taking steam direct from the boiler, C the secondary cylinder, into which the steam is led from B by the exhaust pipe D, and after being worked again, is finally exhausted into the smoke-stack through the pipe E. The steam in both cylinders acts on pistons connected with a continuous rod, F, extending through both heads of cylinder C and the proximate head of B. A chamber is preferably arranged between the two cylinders, to afford convenience of access to the stuffing-boxes *g g* in their heads. Any style of valves may be used upon these cylinders, but I prefer to employ oscillating valves, as shown at *h h*, which may be connected together to open and close the ports of both engines simultaneously. The combination of double cylinders is of course duplicated on the opposite side of the boiler. The first cylinder B is much reduced from the size ordinarily employed, and I prefer to make it of a size that will contain only about half the usual quantity of steam, and the second cylinder C of about four times the capacity of the first, by which the amount of steam used is reduced by about one-half, and the aggregate working power obtained from the area of the two pistons when worked in this manner is equal or nearly so, to results obtained by the single cylinder engines in common use. This saving in the amount of steam obviates the necessity of frequent stoppages for fuel and water, enabling double the distance to be accomplished with the same supply.

The combustion of the fuel is more perfect, steady, and complete under the low pressure of the exhaust, which may be made through large openings of the pipes instead of the contracted nozzles, rendering the draught more steady and uniform, and the consumption of fuel more economical, and carrying fewer sparks off through the smoke-stack.

Other arrangements of the high and low-pressure cylinders may be employed, as, for instance, placing the smaller concentrically within the greater, and accomplish as good, or nearly as good a result. But changes in the relative position of the parts, while they may produce more advantages of construction, do not vary from the principle of my improvement, which consists essentially in the employment on locomotive engines of two cylinders, so connected that one receives its steam directly from the boiler, the other takes it as it exhausts from the first, utilizing still further its expansive force, the power thus obtained from both cylinders being united in its application.

Locomotive engines constructed on this principle are simple and compact, and those of the present mode may be easily altered to this style by the removal of the cylinders and the substitution of the compound ones therefor.

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

A locomotive engine, constructed with high and low-pressure cylinders, the pistons of the high-pressure cylinders being upon the same rod with those of the low-pressure, and the axis of each in line with the other, substantially as and for the purposes set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOHN L. LAY.

Witnesses:

JAY HYATT,

ALBERT HAIGHT.