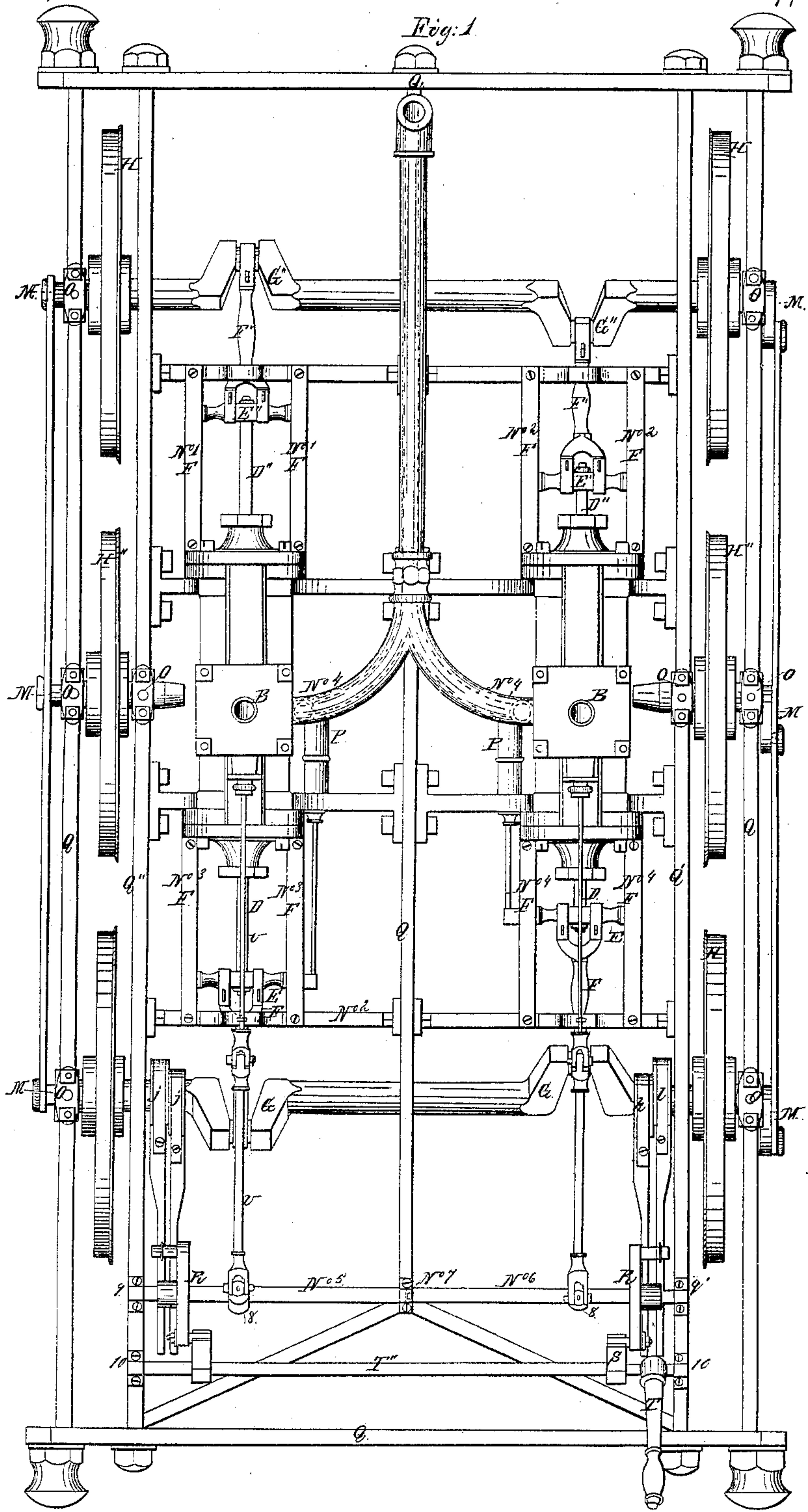


2 Sheets - Sheet 1.

*A. Smethurst,  
Locomotive.*

№ 18,712.

*Patented Nov. 24, 1857.*



2 Sheets-Sheet 2.

A. Smethurst,  
Locomotive.

N<sup>o</sup> 18,712.

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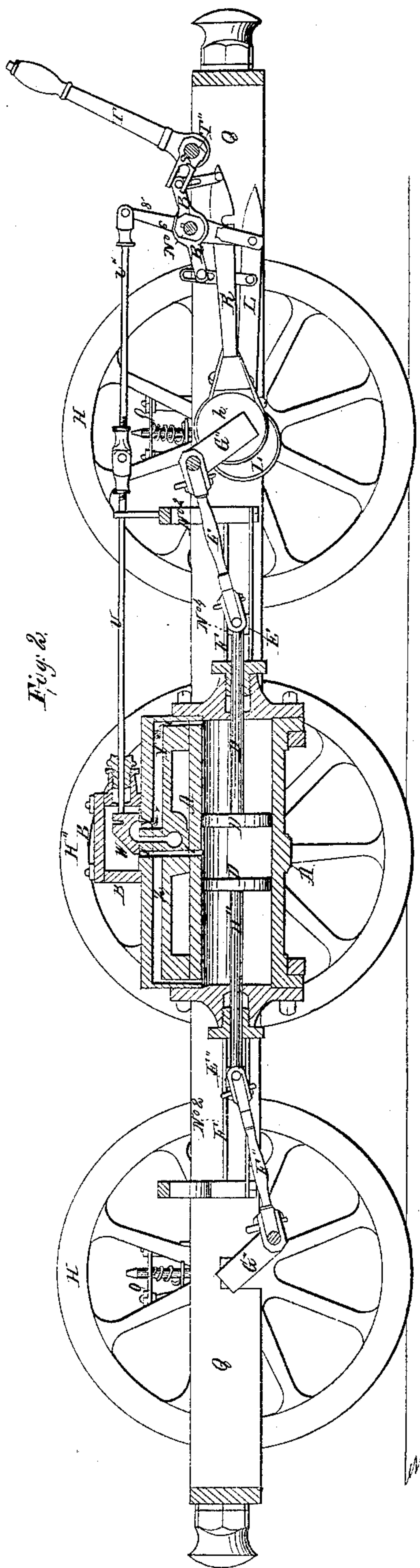


Fig. 3.





# UNITED STATES PATENT OFFICE.

AARON SMETHURST, OF PHILADELPHIA, PENNSYLVANIA.

## ARRANGEMENT OF CYLINDERS AND THEIR CONNECTIONS FOR LOCOMOTIVE-ENGINES.

Specification forming part of Letters Patent No. 18,712, dated November 24, 1857.

*To all whom it may concern:*

Be it known that I, AARON SMETHURST, of the city of Philadelphia, in the State of Pennsylvania and the United States of America, have invented a new Arrangement of Cylinders and their Connections for Locomotive-Engines, of which the following is a specification.

The nature of my invention consists in the arrangement of two cylinders on two cross-section braces in the center of the frame-work commonly used for the working of steam-engines, so as to drive two pistons in each cylinder connected by main rods to two crank-axes, one ahead and the other aft the engine, thereby avoiding the lateral motion so destructive to steam-engines and their running-gear and saving the valves at the same time from the injurious effects so commonly caused from the expansion and contraction of the boiler. In this arrangement the valve-openings have two end openings in the steam-chest and a center opening, by which means I am able to operate two pistons in one cylinder and give direct power to two sets of drivers at the same time ahead and aft the engine, thereby acquiring increased power and saving friction by avoiding an extra steam-chest and valve-gearing.

To enable others to construct and put into operation my said invention, I will proceed to give a full and exact description of the same, reference being had to the accompanying drawings, and letters of reference marked thereon.

I construct my engine by introducing into an ordinary cylinder, as marked A A in Figure 2, longitudinal section, two pistons D' D' instead of one, so that each piston will drive an axle in the ordinary manner, as shown in the figure G' G'. The steam-chest B B B is placed on the cylinder A A, so as to bring the center opening 1 1, which separates the pistons D' D' exactly over the center of the cylinder A A. The two end openings Y and Z, which drive the pistons D' D' toward the center of the cylinder A A, as seen in Figs. 2 and 3, are located a little toward one end of the cylinder A A, so that the valve W in its travel over the valve-seat V covers and uncovers the end openings Y and Z in the same manner as the

valve covers and uncovers the end openings in the ordinary cylinder with a single piston. The loose tumbler R R is made by boring a straight lever in the center and fitting it to the rock-shaft No. 6, so that one end of it is moved by the fork S of the reverse-lever T, which throws the eccentric-rod K out of gear, while the other end plays in the link of the eccentric-rod L and throws it into gear.

I will now proceed to give a description of the drawings hereto annexed, Figs. 1, 2, and 3, which represent a locomotive-engine combining my improvements, to which I give the name of "The Union Steam-Engine."

In the drawings, Fig. 1 represents a top view of the Union steam-engine without the boiler. A A are the cylinders; B B, the steam-chests, with sectional view of steam-pipes; C C C, exhaust-pipes connecting with the smoke-stack; D D and D' D', piston-rods; E E and E' E', cross-heads; F F and F' F', main rods; G G and G' G', cranks and bearings; F No. 1, F No. 2, F No. 3, and F No. 4, vertical guides; H H, main driving-wheels; H' H', independent driving-wheels; i j k l, eccentrics and rods; M M M M M M, outside cranks and pins connected by rods N N; O O O O O, springs and caps resting on driving-brasses; P P, water-rams for supplying the boiler; Q Q, outside frame-work; Q' Q', inside frame-work; R R, loose tumbler fitted to the rock-shafts Nos. 5 and 6; S S, reverse-forks keyed on the reverse-shaft T' at such points as to operate on the loose tumblers R R, simultaneously throwing the eccentric-rods i j k l in and out of gear; T, reverse-lever; T', reverse-shaft; U U, valve-rod and connection with rock-arms 8 8'; Nos. 2' and 2'', cross-section braces for vertical guides; Nos. 4 4, upper and lower chambers of the pumps for supplying the boiler with water, as seen under the exhaust-pipes C C; Nos. 5 and 6, rock-shafts; No. 7, center bearings of rock-shafts; 8 8', rock-arms; 9 9, outside bearings of rock-shafts; 10 10, bearings for reverse shafts.

Fig. 2 represents a longitudinal section of the Union steam-engine. A A, cylinder; B B, steam-chest; D D', piston-rods; D' D', pistons on the outward stroke; E E', cross-heads; F No. 2 and F No. 4, vertical guides; G' G', cranks; H H, main driving-wheels;

H'', independent driving-wheel; K K, forward eccentric and eccentric-rod; L L, back eccentric and eccentric-rod; O O, springs and studs; Q Q, inside of frame; R R, loose tumbler fitted to rock-shaft No. 6; S, reverse-fork; T, reverse-lever; T'', reverse-shaft; U, valve-rod; U'', rod connecting valve-rod with rock-arm 8; V, valve-seat; W, slide-valve; X, exhaust-opening; Y Y Z Z, end openings and steam-passages; 11, center opening communicating steam to the center of the cylinder.

Fig. 3 represents the valve-seat and steam-passages from steam-chest to cylinder; B B, steam-chest; V V, valve-seat; X, exhaust-

opening; Y Y Z Z, end openings and steam-passages; 1, center opening.

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

The arrangement of the two double-piston cylinders herein described with their connecting means in relation to the frame of the engine, as herein set forth.

AARON SMETHURST.

Witnesses:

H. R. WARRINEO,  
WILLIAMS OGLE,  
HENRY T. GROUT.