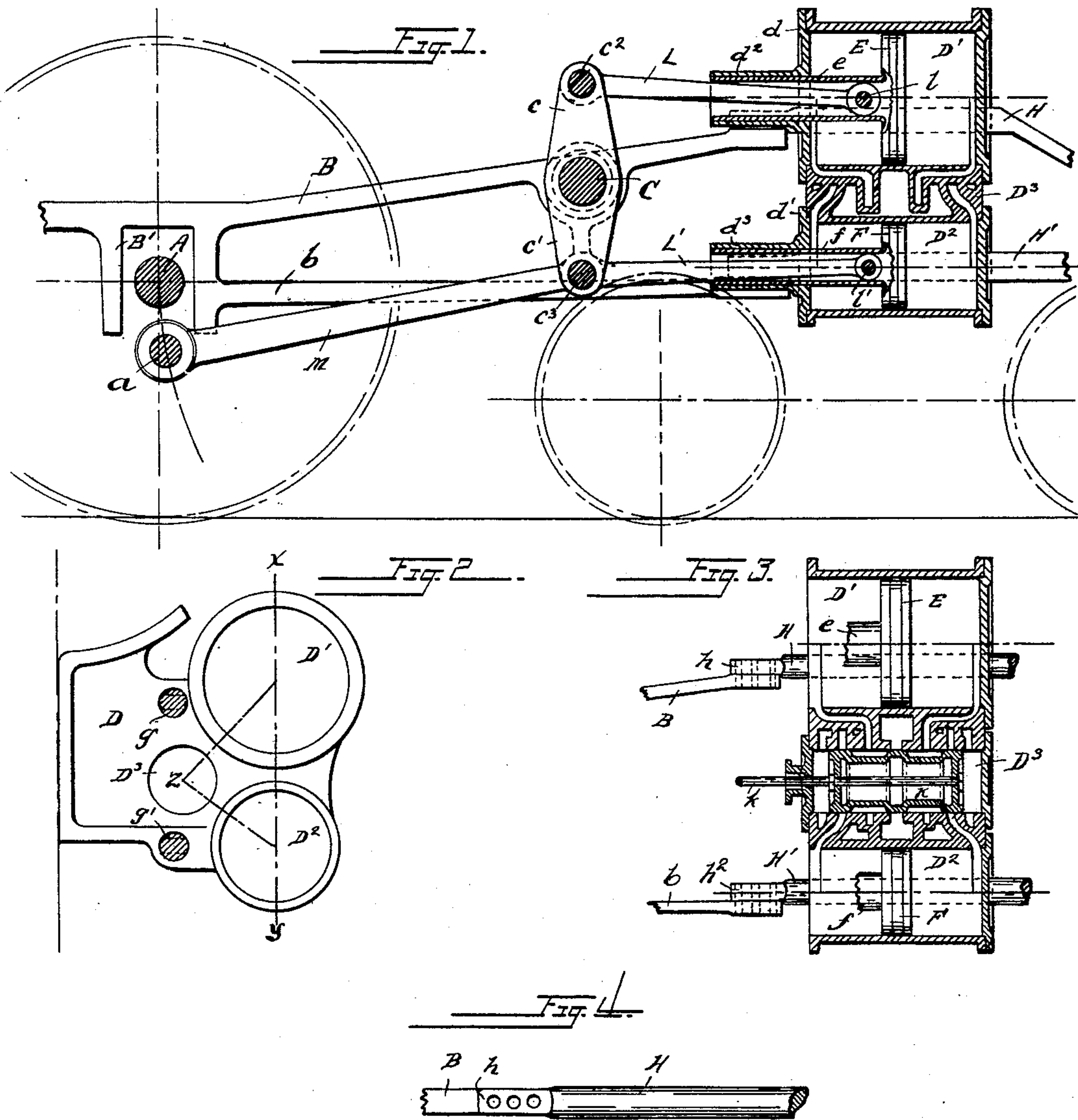


(No Model.)

S. F. PRINCE, Jr.
COMPOUND ENGINE.

No. 480,781.

Patented Aug. 16, 1892.



Witnesses
Edw. Kelly
Calvin J. Bieber

Saml. F. Prince Jr. Inventor
By *his* Attorney *J. H. H. H.*

UNITED STATES PATENT OFFICE.

SAMUEL F. PRINCE, JR., OF READING, PENNSYLVANIA.

COMPOUND ENGINE.

SPECIFICATION forming part of Letters Patent No. 480,781, dated August 16, 1892.

Application filed November 25, 1891. Serial No. 413,075. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL F. PRINCE, Jr., a citizen of the United States, residing at Reading, in the county of Berks, State of Pennsylvania, have invented certain Improvements in Compound Engines, of which the following is a specification.

This invention relates more particularly to compound steam-engines; and it consists in certain improvements in construction whereby great simplicity and economy are secured.

Compound engines have been designed in which the high and low pressure pistons operate through the medium of a rocking shaft upon the crank, and numerous forms of trunk-engines, in which the piston-rod is pivoted directly to the piston and oscillates within the hollow trunk projecting therefrom, have also been used.

The main object of my present invention is to provide a compound engine in which these features will be so combined as to produce a very simple and advantageous construction.

A further object is to provide an improved means of firmly securing the cylinder-casting to the engine-frame.

The invention is designed more especially for locomotive-engines, and the drawings, in connection with which the following description is to be read, illustrate its application thereto.

Figure 1 is a side elevation showing the cylinders in section on line $x x$, Fig. 2. Fig. 2 is an end view of the cylinder-casting. Fig. 3 is a sectional view taken on line $x z y$, Fig. 2. Fig. 4 is a separate view of the cylindrical frame-section.

The high-pressure cylinder D^2 and low-pressure cylinder D' are represented as cast in one piece D , in which is also formed an intermediate cylindrical steam-chest D^3 . In this chest is located a valve K , by means of which the steam distribution is effected, so as to cause the pistons to move in opposite directions. This construction corresponds with that described in my patent, No. 463,450, issued November 17, 1891. The rear cylinder-heads d and d' are formed with long stuffing-boxes or guides d^2 and d^3 , within which move the projecting hollow trunks e and f of the pistons E and F for the high and low pressure

cylinders, respectively. Within these hollow trunks at l and l' are pivoted the front ends of piston-rods L and L' , the rear ends of which are connected directly at c^2 and c^3 to the opposite arms c and c' of a rocking arm C , which is journaled in the frame B of the engine. A connecting-rod M , which is represented as pivoted at c^3 to the same pin which connects the piston-rod L' to the rocking arm, is connected to the crank-pin a , through the medium of which the main axle A is rotated. The upper and lower members $B b$ of the frame, which extend forward from the pedestal B' , stop somewhat short of the cylinder-casting D , which is secured thereto by means of separate sections H and H' of the frame, the front ends of which are not shown. These sections are of cylindrical form for a whole or a portion of the part which engages the cylinder-casting and are adapted at the ends h h^2 to be secured to the frame $B b$, either by squaring the ends, as shown, to a cross-section, which is within the cross-section of the cylindrical portion, so that said sections of frame may be entered or withdrawn from cylindrical openings g and g' , formed in the cylinder-casting D , or by a socket or other suitable connection, the cylindrical sections being firmly fitted in the openings g and g' in the cylinder-casting, so as to effectually prevent any movement on the frame-sections other than longitudinally without bolting the casting thereto, such longitudinal movement being prevented by end keys, as usual. By employing this means of attaching the cylinder to the frame I readily and economically secure a perfectly satisfactory construction, such as is ordinarily secured only with much greater trouble and expense, the necessary machine-work being effected with much greater facility and economy as well as perfection than is possible with previous constructions, and at the same time I avoid entirely the use of bolts passing through the cylinder-casting and the wrought iron or steel frame, which bolts are in practice frequently loosened and broken, and form an unsatisfactory means of connection.

By applying the well-known features of the ordinary trunk-engine to a compound engine in the manner described above I provide a very simple and satisfactory form of com-

pound engine, no disadvantage resulting from the inequality of effective area upon opposite sides of the pistons, inasmuch as the steam-pressure is acting both in the forward and
5 back stroke upon the front of one piston and the rear of the other, so that the sum of said pressures is equal in both strokes. Moreover, the use of the rocking arm reduces the oscillation of the piston-rods to a minimum, and
10 thus enables a trunk of comparatively small diameter to be used.

What I claim is—

1. In a steam-engine, the combination, with high and low pressure cylinders and valve
15 mechanism therefor, of oppositely-moving pistons having hollow trunks extended through the cylinder-heads, piston-rods connecting said pistons directly to opposite ends of a rocking arm mounted on the engine-frame,
20 and a connecting-rod between one arm of said

rocking shaft and the crank-pin, all substantially as set forth.

2. A steam-engine having the cylinder-casting thereof fastened to the engine-frame by means of cylindrical frame-sections HH' , passing through and firmly fitted in corresponding cylindrical openings $g g'$ in said casting, the extended ends of said sections being connected with the main portion of the frame, substantially as described, whereby said cylinder is firmly secured to a continuous frame without being bolted thereto, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

SAML. F. PRINCE, JR.

Witnesses:

ADAM B. RIESER,
W. G. STEWART.