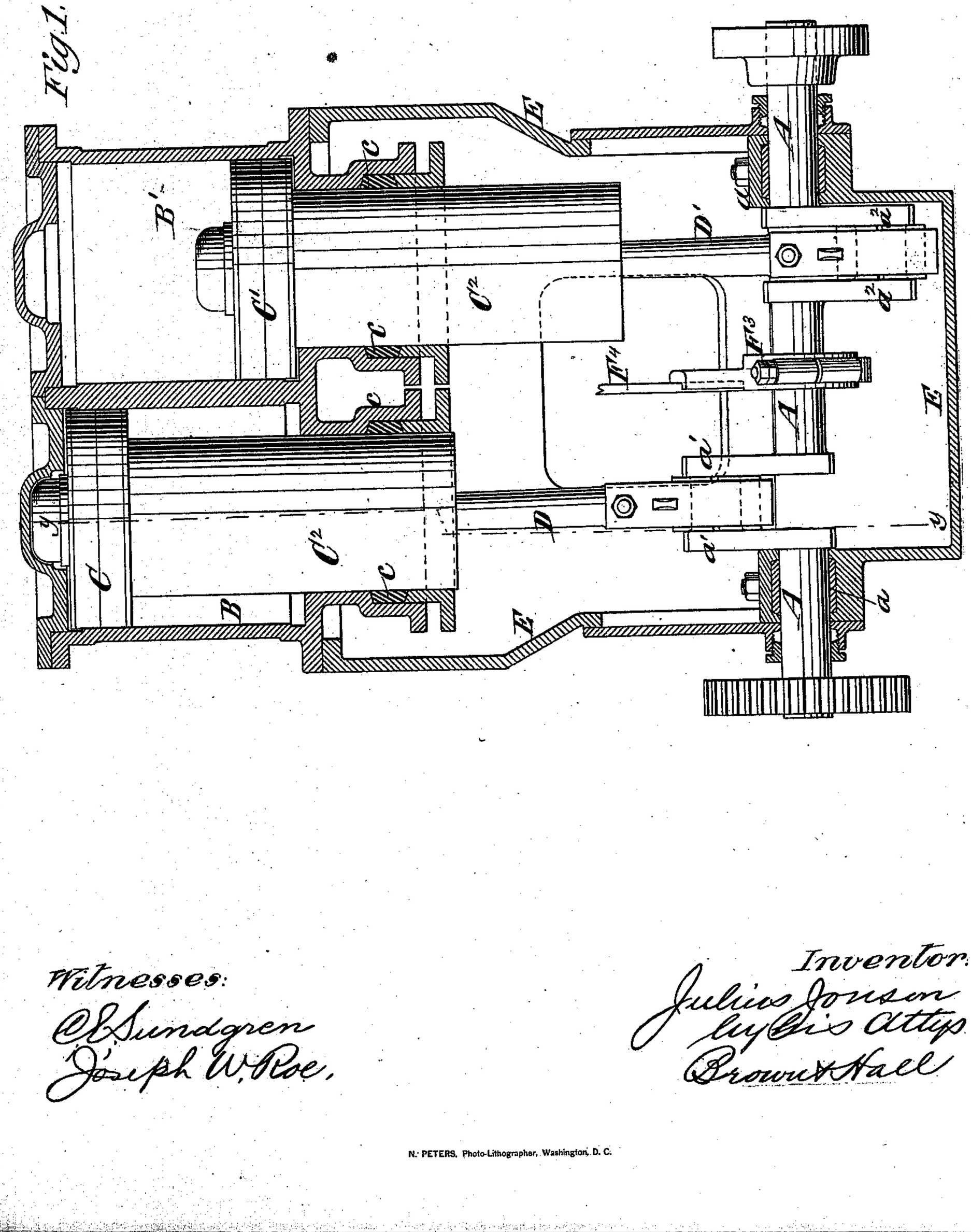
(No Model.) 2 Sheets—Sheet 1.

J. JONSON.

ENGINE.

No. 402,086. Patented Apr. 23, 1889.

Fig. 1.



Witnesses:
C. L. Sundgren
Joseph W. Roe.

Inventor:
Julius Jonson
by his Attys
Brown & Hall

(No Model.) 2 Sheets—Sheet 2.

J. JONSON.

ENGINE.

No. 402,086. Patented Apr. 23, 1889.

Fig. 4.

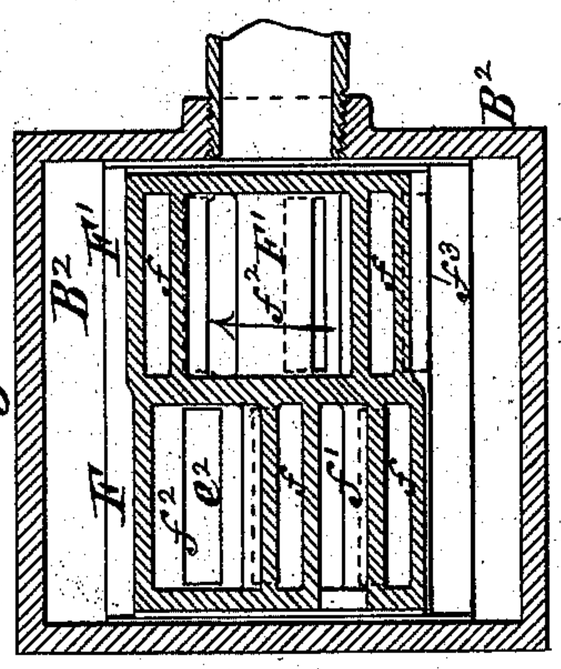


Fig. 5.

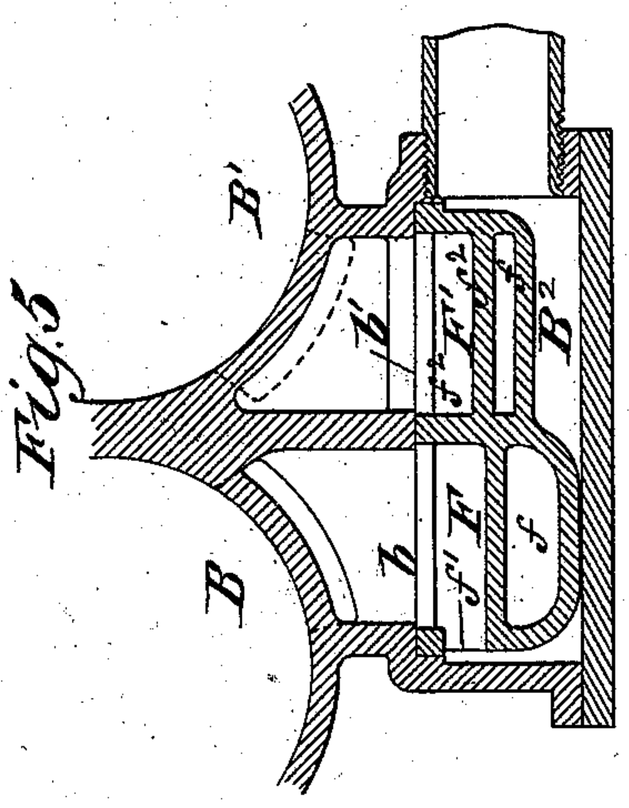


Fig. 2.

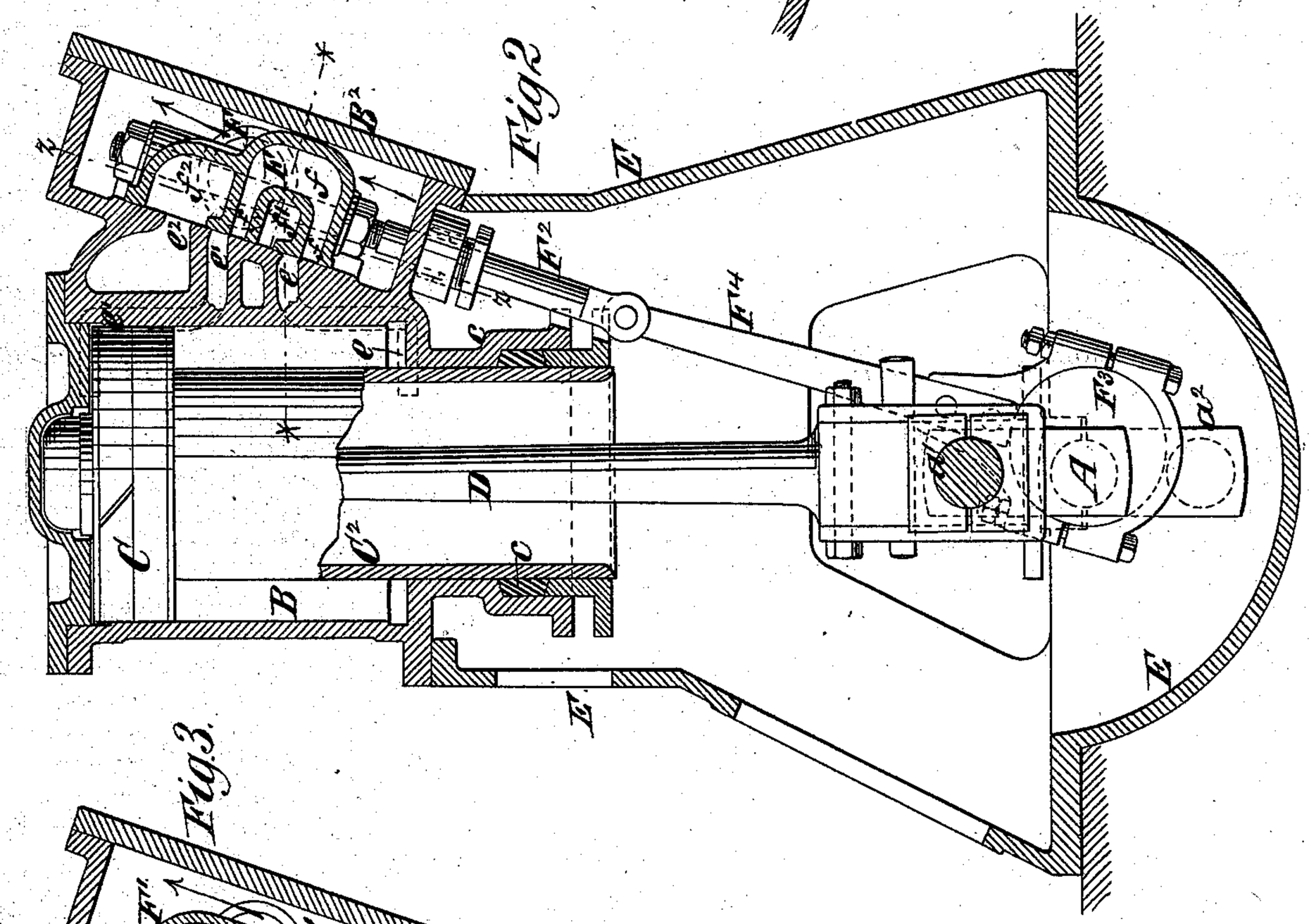
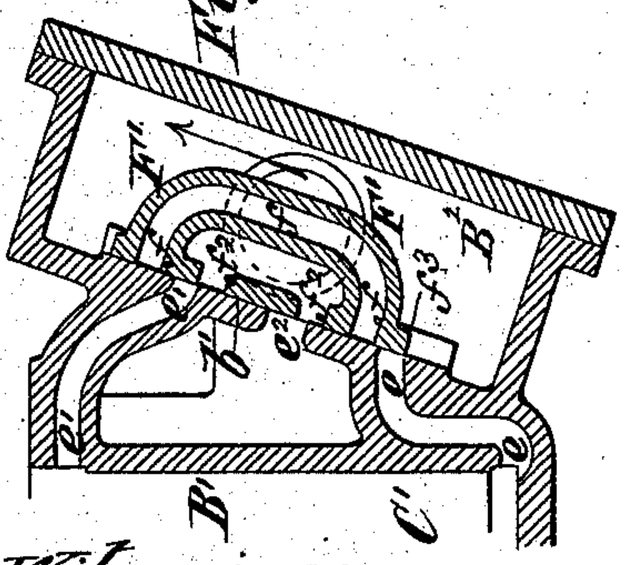


Fig. 3.



Witnesses:
C. L. Sundgren.
Joseph W. Roe.

Inventor:
Julius Jonson
by his attys
Brown & Hall

UNITED STATES PATENT OFFICE.

JULIUS JONSON, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO JULIUS ELSON, OF SAME PLACE.

ENGINE.

SPECIFICATION forming part of Letters Patent No. 402,086, dated April 23, 1889.

Application filed February 24, 1888. Serial No. 265,149. (No model.)

To all whom it may concern:

Be it known that I, JULIUS JONSON, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Compound Engines, of which the following is a specification.

This invention relates to those compound engines in which are employed trunk-pistons and which receive live steam upon the trunk sides of the pistons, the said steam being afterward exhausted on the opposite sides of the pistons, so as to apply its pressure to the larger area upon the latter side.

The invention will be hereinafter fully described with reference to the drawings, and its novelty will be pointed out in a claim.

In the accompanying drawings, Figure 1 is a section of a double compound engine embodying my invention, taken in a plane parallel with the crank-shaft. Fig. 2 is a sectional elevation upon about the plane indicated by the dotted line *y y*, Fig. 1, which is transverse to the crank-shaft, and through one of the two cylinders and pistons. Fig. 3 is a sectional elevation of a portion of the other cylinder and piston, including, also, the valve pertaining to such other cylinder. Fig. 4 is a section of the two valves and the valve-chest upon about the plane indicated by the dotted line *z z*, Fig. 3, in a plane parallel with the valve-seats; and Fig. 5 is a transverse section of a portion of the cylinders, together with the two valves and valve-chest upon about the plane indicated by the dotted line * *, Fig. 3.

Similar letters of reference designate corresponding parts in all the figures.

A designates the crank-shaft, which is mounted to rotate in bearings *a*, and which is provided with two auger-handle cranks, a' a^2, which are set at points substantially opposite each other.

B B′ designate the two cylinders, and C C′ the two pistons which operate therein, and each of which is constructed with a trunk, C^2, working through a stuffing-box, *c*, in the lower end of its cylinder. These trunk-pistons are connected directly by rods D D′ with the two cranks a' a^2, and owing to the cranks being at opposite points in the circle the pistons C C′ move simultaneously in opposite directions, one piston being at the upper end of the stroke when the other piston is at the lower end of its stroke.

As here represented, the working parts of the engine are inclosed in a casing, E, upon which the cylinders B B′ are supported, and which includes the bearings *a* for the crank-shaft. The two trunk-pistons C C′ are of equal size and weight, and consequently the weight of these pistons is balanced upon the crank-shaft, and, if desired, the trunks C^2 of the pistons may be so proportioned that the pressure of steam upon the trunk side of each piston, plus the force of the vacuum acting upon the other side, if the engine be condensing, will equal the pressure of that same steam when it is transferred to the opposite side of the piston and acts upon the full area thereof. Therefore both the moving parts and the pressures upon the two engines may be balanced and the pressure upon the crank-shaft bearings will also be balanced, and consequently the engine may be run at a high speed.

b b′ designate the two valve-seats, which are formed within the valve-chest B^2, and upon the seats *b b′* work the two valves F F′. These two valves F F′ are moved simultaneously in the same direction by a single system of mechanism including but a single valve-rod, F^2. As here represented, this single system of mechanism comprises one eccentric, F^3, and a single eccentric-rod, F^4, connected to the valve-rod, and, as here shown, the two valves F F′ are formed in a single valve structure or casting, as best shown in Figs. 4 and 5, and extreme simplicity in a double engine is thus secured. Inasmuch as the two pistons C C′ move simultaneously in reverse directions, the two systems of ports for the two cylinders and the construction of the two valves must be entirely different from each other.

In Fig. 2 I have shown an arrangement of ports and a construction of valve suitable for the valve F and cylinder B, and in Fig. 3 I have shown an arrangement of ports and a construction of valve suitable for the cylinder B′ and valve F′. The ports which are in the valve-seat *b* for the cylinder B are as follows: *e e′* are the two supply-ports and passages which lead to opposite ends of the cylinder

B, and these ports *e e'* are adjacent to each other, and beyond said ports is the exhaust-port e^2. In the valve F is formed a passage, *f*, and within the passage *f*, or in the space inclosed by it and between its ends, is a supply-cove, *f'*, which is open at the side of the valve to receive the steam, as shown clearly in Figs. 4 and 5. Beyond the passage *f* and the supply-cove *f'* is the exhaust-cove f^2. In this example of the invention the valve structure is moving in the direction indicated by the arrows in Figs, 2, 3, and 4, and the piston C is at the upper end of its stroke, while the piston C' is at the lower end of its stroke. As the valve F moves upward, the ends of its passage *f* come into coincidence with the two supply-ports *e e'*, and consequently the steam which is below the piston C is exhausted through the port *e*, through the passage *f*, and through the port *e'* into the cylinder B on the opposite side of the piston and forces said piston downward. After the piston C has completed its downward stroke, and during the time that it is making its upward stroke, the port *e* is in communication with the supply-cove *f'* of the valve F and the ports *e' e²* are in communication through the exhaust-cove f^2 of the valve, and at this time steam is admitted from the valve-chest through the supply-cove *f'* and port *e* under the trunk side of the piston, and simultaneously the steam above or on the opposite side of the piston is exhausted through the port *e'*, the exhaust-cove f^2 of the valve, and the exhaust-port e^2.

The seat *b'* and the cylinder B', to which it pertains, have the supply-ports *e e'* leading to opposite ends of the cylinder B', and the exhaust-port e^2, intermediate between said ports *e e'*.

The valve F' is a double **D**-valve, or, in other words, has a passage, *f*, for steam, and an exhaust-cove, f^2, whereby the port *e'* may be placed in communication with the exhaust-port e^2. The piston C' is at the bottom of its cylinder, and the valve F' is moving upward at the same time that the cylinder commences its movement upward.

In the position of parts shown in Fig. 3 the receiving-edge f^3 of the valve is just about to uncover the supply-port *e* to the steam in the valve-chest B^2, and at the same time the exhaust-cove f^2 is just about to place the port *e'* and the exhaust-port e^2 in communication. By such office of the valve live steam is received to the cylinder B' below the piston C' and the steam above the piston is exhausted through the port *e'*, said cove f^2, and exhaust-port e^2. After the piston C' has reached the upper end of its stroke the valve F' will move downward to place the ports *e e'* in communication through the passage *f*, and the steam from below or on the trunk side of the piston will be transferred through the port *e*, passage *f*, and port *e'* to the upper side of said piston C', and will produce the downward stroke of the piston.

It will be understood that in speaking of a single system of mechanism, including a single valve-rod for operating the valve structure F F', I desire to include either a single eccentric and eccentric-rod, as here shown, or the well-known reversing-gear consisting of a link and two eccentrics and eccentric-rods. In either case there will be but a single valve-rod for operating the two valves, and either arrangement of eccentrics may be considered as a single system of mechanism for operating the valve-rods. Therefore by my invention I produce a double engine in which the weight of the pistons is balanced upon the crank-shaft, and in the case of a double compound condensing-engine the pressure of steam upon the lower or trunk side of each piston, plus the force exerted by the vacuum on the other side of that piston, may be balanced by the downward pressure upon the opposite side of the other piston. So, also, in a compound non-condensing engine the trunks may be so proportioned that the pressure of steam on the trunk side of each piston will balance the pressure on the opposite side of the other piston.

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

The combination, with the cylinder and trunk-piston of a compound engine, the cylinder having a valve-seat in which are the supply-ports *e e'*, adjacent to each other, and the exhaust-port e^2 beyond said supply-ports, of a valve having the passage *f*, whereby the two supply-ports may be placed in communication, and having between the ends of said passage a supply-cove, *f'*, opening at the side of the valve, and also having beyond said passage the separate exhaust-cove f^2, substantially as herein described.

JULIUS JONSON.

Witnesses:
C. HALL,
FREDK. HAYNES.