

No. 608,421.

Patented Aug. 2, 1898.

T. G. CLAYTON.

STEAM ENGINE.

(Application filed Aug. 24, 1897.)

(No Model.)

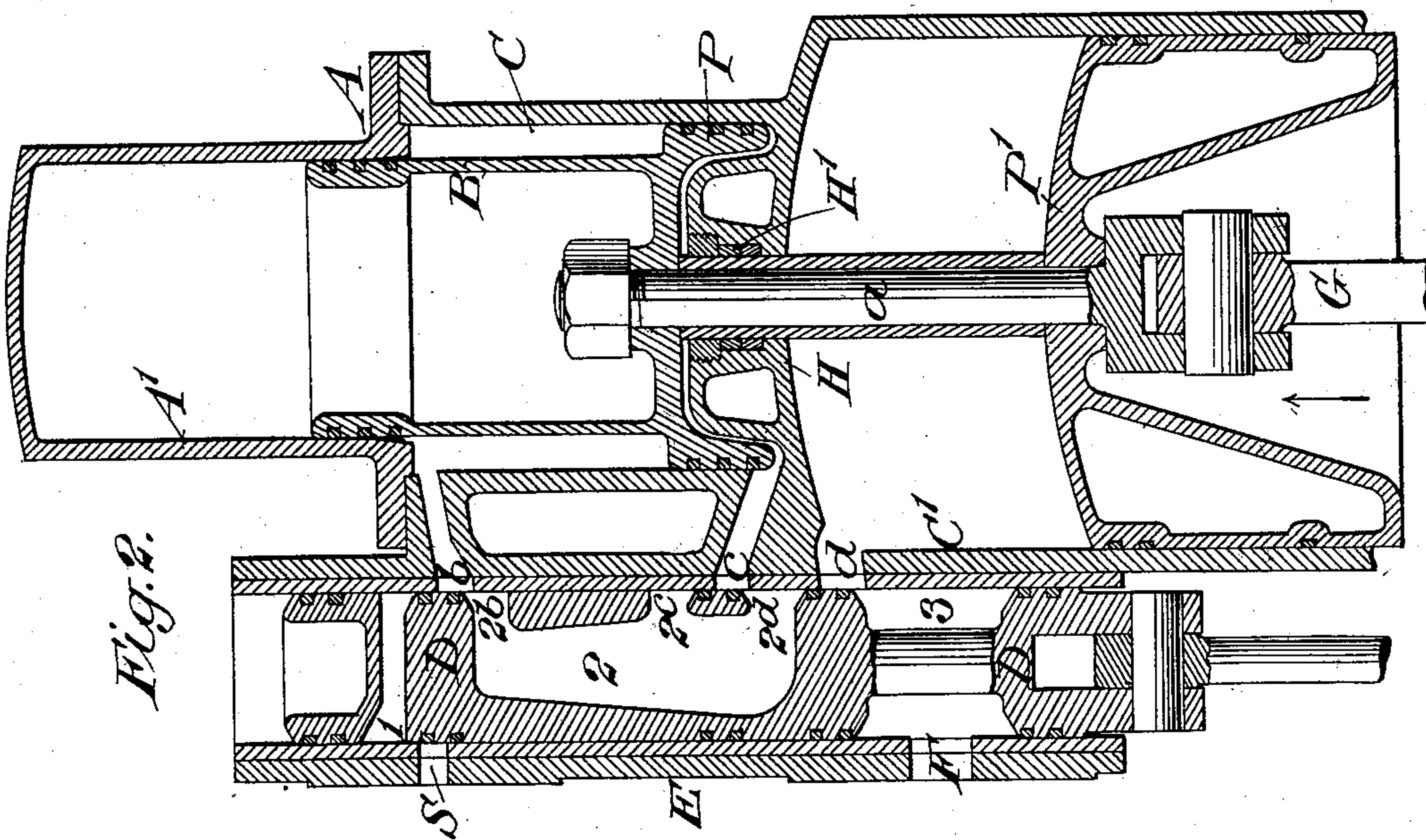


Fig. 2.

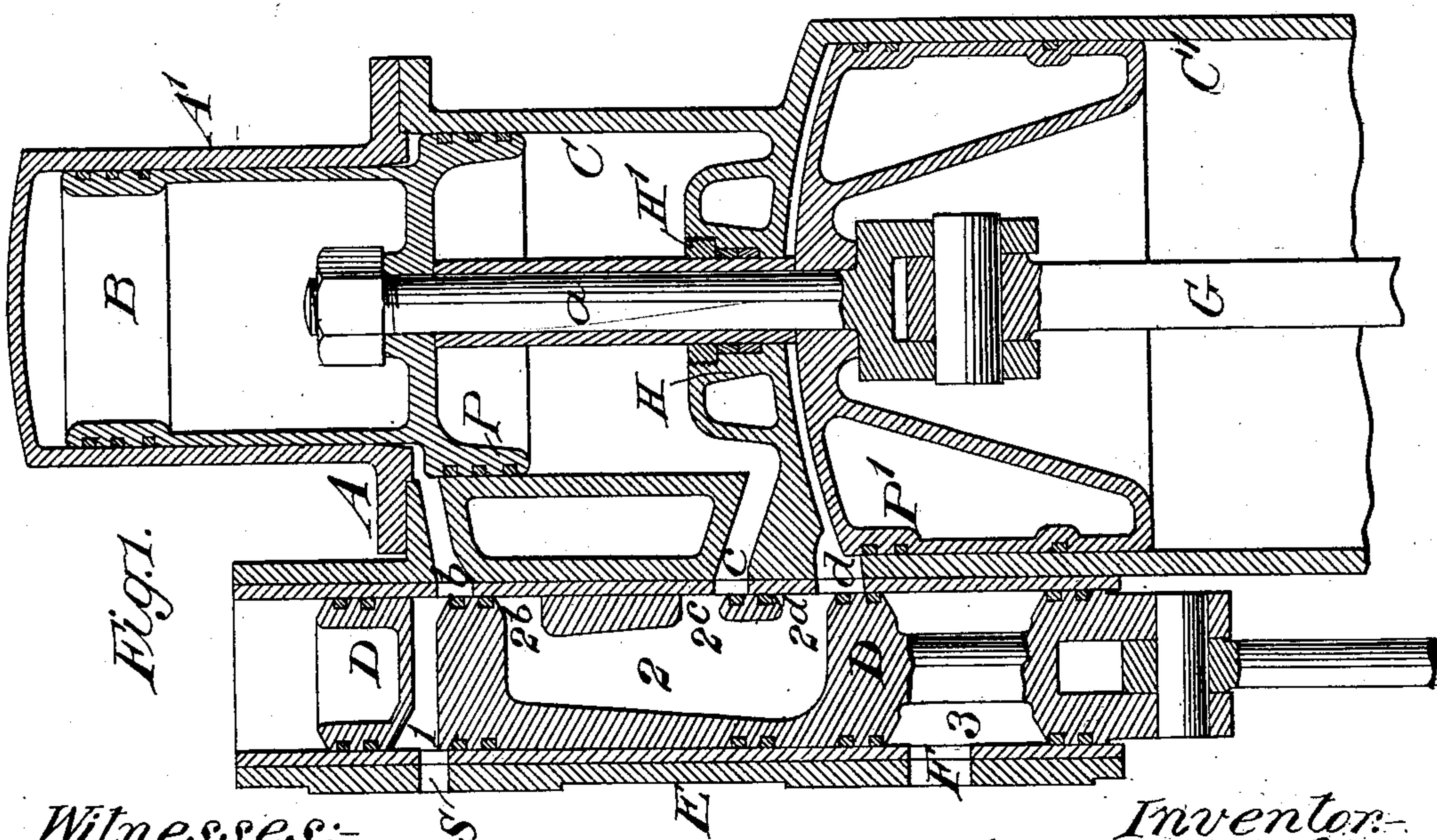


Fig. 1.

Witnesses:
George Barry Jr.
M. C. Fletcher.

Inventor:
Thomas Gething Clayton
by attorneys
Brown & Howard

UNITED STATES PATENT OFFICE.

THOMAS G. CLAYTON, OF NORMANTON, ENGLAND, ASSIGNOR TO JAMES CLAYTON, OF NEW YORK, N. Y.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 608,421, dated August 2, 1898.

Application filed August 24, 1897. Serial No. 649,358. (No model.)

To all whom it may concern:

Be it known that I, THOMAS GETHING CLAYTON, of the Grange, Normanton, in the county of Derby, England, have invented a new and useful Improvement in Triple - Expansion Compound Steam-Engines, of which the following is a specification.

My invention consists in the construction, arrangement, and combinations of steam-cylinders, pistons, and slide-valves, as hereinafter described and claimed, whereby the steam is used three times in succession in two cylinders.

The improvement is illustrated in the accompanying drawings, which are central vertical sectional views of such parts of a triple-expansion compound engine embodying my invention as are necessary to illustrate the improvement, Figure 1 showing the pistons at the upper end of their stroke and Fig. 2 showing them at the lower end thereof.

Similar letters and figures of reference designate corresponding parts in both figures.

C C' designate the two cylinders, and P P' the pistons working therein, the said cylinders being in line with each other and separated by a cylinder-head H, in which there is a stuffing-box H', and the two pistons being connected by a piston-rod *a*, passing through said stuffing-box. The larger cylinder, which is represented as the lower one, is open at the bottom to the atmosphere, and the upper cylinder is closed at the top by a head A, the central portion of which projects upward in cylindrical form and bored to form a casing and guide for a trunk B, which projects upward from the upper piston P and which is furnished with packing-rings to make it work steam-tight within the said trunk. The said trunk diminishes the effective area of the upper surface of the piston P, and the cylindrical projection A' of the cylinder-head A serves as a guide to the trunk, and consequently to the piston P.

D is the valve common to the two cylinders C C'. This valve is represented of piston form and packed to work steam-tight in a cylindrical valve-casing E, in which are ports *b* and *c*, communicating, respectively, with the upper and lower parts of the cylinder C, and a third port *d*, communicating with the up-

per part of the cylinder C'. The valve has a passage 1 directly through it for forming communication from the steam-supply opening S in the casing E to the upper port *b* of the cylinder C, and it has a passage 2 formed within it with three ports 2^b 2^c 2^d for communicating between the ports *b c d*, as will be presently described. The said valve also has a third passage 3 formed around it for making communication between the port *d* of the cylinder C' and the opening F in the valve-chest for the final exhaust.

The piston-rod is intended to be connected in any suitable manner, as by the ordinary connecting-rod G, with the crank-shaft and the valve to be operated in any suitable manner, as by the usual eccentric on the crank-shaft.

The operation of the engine is as follows: Referring first to Fig. 1, the high-pressure steam, passing from the supply-opening S through the passage 1 in the valve, enters through the port *b* into the upper part of the first or smaller cylinder, wherein its pressure operates upon the smaller area of the piston P to force the said piston downward, while at the same time steam with which the said cylinder had been previously filled below the said piston is exhausting from the said cylinder through the ports *c* and 2^c and entering the lower cylinder by the ports 2^d and *d* and acting to force down the piston P', the high and the low pressure steam thus acting on the two pistons, respectively, in the same direction at the same time. Just before the pistons complete their downward stroke the valve arrives at a position to close the port *b* at the upper end of the cylinder C to the steam-supply port S and open communication between the upper and lower ends of the said cylinder through the ports *b*, 2^b, 2^d, and *c*, and also open communication through the passage 3 in the valve from the cylinder C' to the exhaust-port F. The steam which has done its work on the smaller area of the piston P then passes to the larger area thereof and acts to force it upward, while the steam which has done its work on the lower piston P' exhausts from the lower cylinder. This is the condition shown in Fig. 2; but before the piston completes this upward or return stroke the

valve has moved so far back as to bring its ports 2^c and 2^d , respectively, opposite the ports c and d and its passage 1 between the ports S and b , and the high-pressure steam is again admitted to the upper end of the cylinder C to act on the smaller area of the piston P , while the steam which had done its work on the lower and larger area of the said piston passes to the larger cylinder to act upon the piston P' . It will thus be seen that the steam has a triple action—viz., first on the smaller area of the piston P , then on the larger area of the same piston, and, finally, on the larger piston.

15 What I claim as my invention is—

1. In a compound engine, the combination of two cylinders of different area arranged in line with each other the smaller one having ports at each end and the larger one a port at the end adjacent to the smaller one, two connected pistons working in said cylinders respectively the smaller of said pistons having its faces of unequal area, and a valve for controlling the said ports for the passage of steam first to that end of the smaller cylinder toward which the smaller area of its piston is presented thence to the opposite end of said cylinder thence to the larger cylinder and for the exhaust of the steam from the latter cylinder, whereby there is a double action in the smaller cylinder and a single action in the larger one, substantially as herein described.

2. In a compound engine, the combination with two cylinders of different area arranged

in line with each other the smaller one having ports at each end and the larger one a port near the adjacent end of the smaller one and two connected pistons working in said cylinders respectively the smaller one having its faces of unequal area, of a valve having in it three passages, viz., one for the admission of steam to one end of the smaller cylinder, another for the exhaust from the larger cylinder and an intermediate three-ported passage for controlling the passage of the steam from one to the other end of the smaller cylinder and from the smaller cylinder to the larger one, substantially as herein described.

3. In a compound engine, the combination of two cylinders of different area arranged in line with each other the outer head of the smaller one having a projecting casing, two connected pistons working in said cylinders respectively and the smaller one having a trunk of smaller diameter than itself working in and guided by said casing, ports at opposite ends of the smaller cylinder and a port at the adjacent end of the larger one, and a valve for the control of the passage of steam to the outer end of the smaller cylinder thence to the end thereof next the larger cylinder thence to the larger cylinder and thence to an exhaust-outlet, substantially as herein described.

THOS. G. CLAYTON.

Witnesses:

THOS. HEATH,

H. G. NIGHTINGALE.