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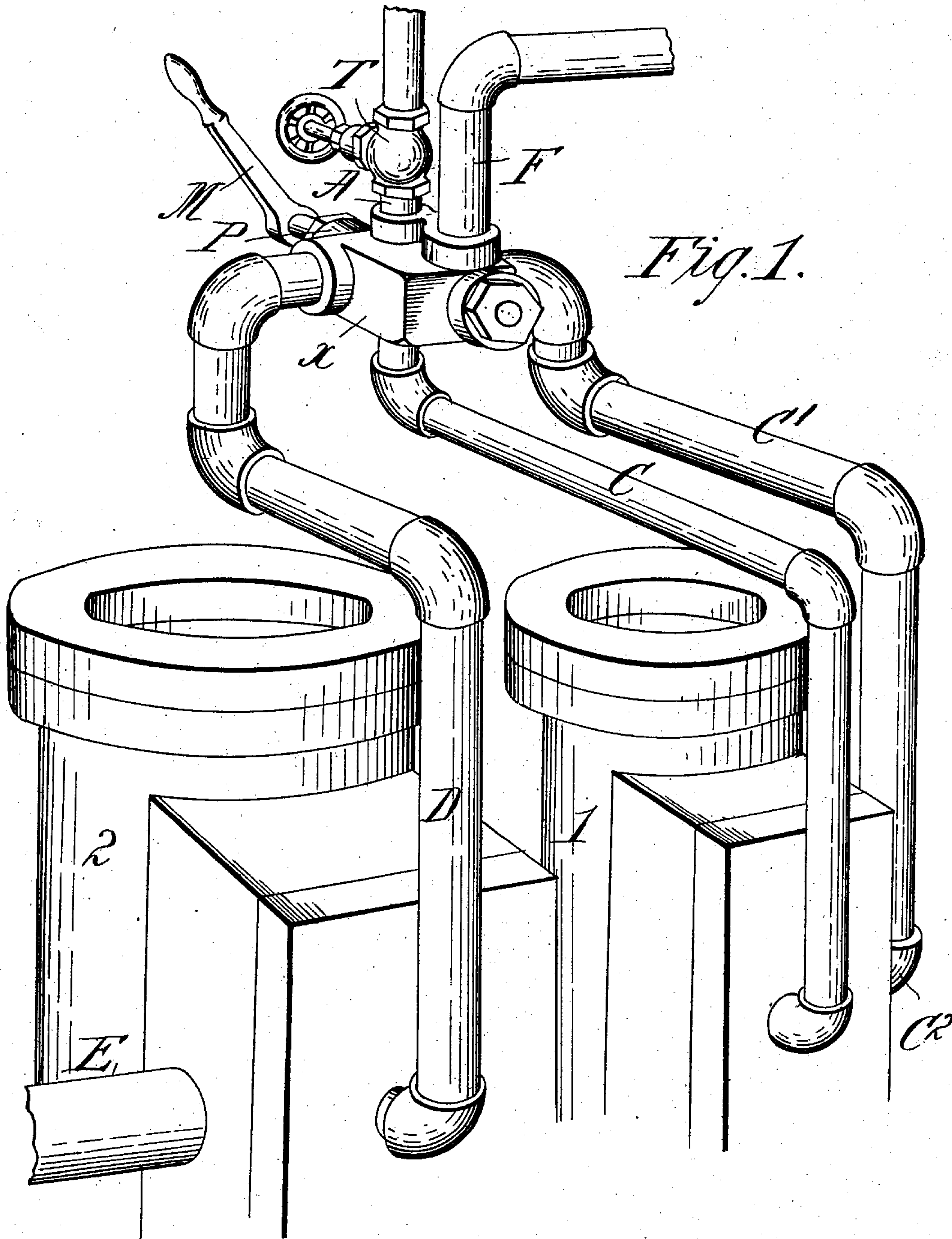
C. E. VAN NORMAN.

STEAM ENGINE.

APPLICATION FILED MAR. 7, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses.

Frank B. Mitchell.

M. A. Campbell

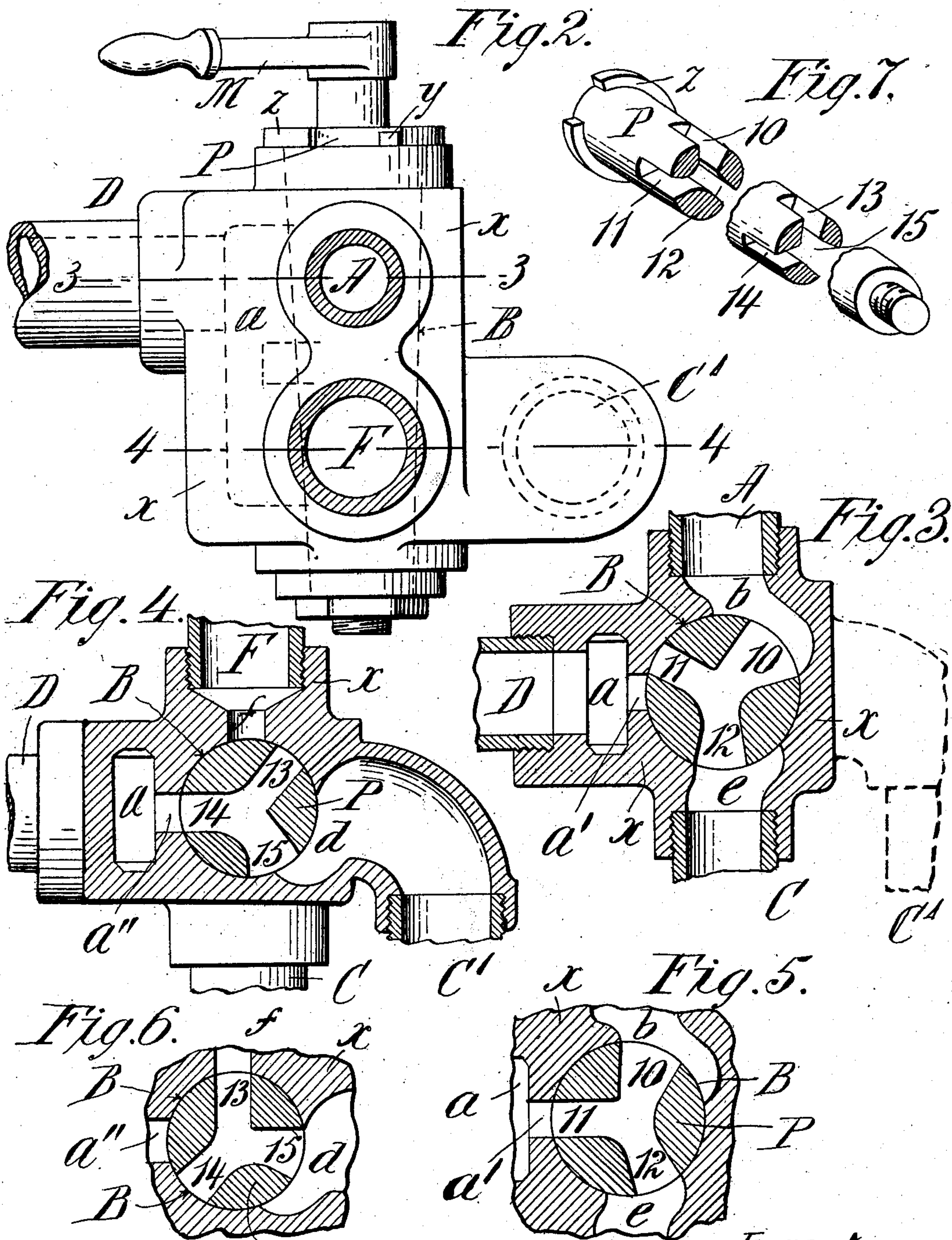
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Frank B. Mitchell
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Inventor:
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UNITED STATES PATENT OFFICE.

CHARLES E. VAN NORMAN, OF SPRINGFIELD, MASSACHUSETTS.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 741,743, dated October 20, 1903.

Application filed March 7, 1902. Serial No. 97,182. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. VAN NORMAN, a citizen of the United States of America, and a resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Steam-Engines, of which the following is a full, clear, and exact description.

The device constituting the subject-matter of this application may be termed a "converter-valve," that is used in conjunction with a fluid-pressure engine having two cylinders arranged to be operated normally as a compound engine—that is, using the fluid at its initial pressure in one cylinder and then conveying the exhaust into the other cylinder for its secondary use expansively.

The object of the invention is to provide in such a device a form of valved appliance located between the throttle and the steam-inlet of the cylinders that in one adjustment will cause the steam to take its usual course into the high-pressure cylinder and then from the exhaust of the latter to be led into the other cylinder, while in another adjustment of the valve in said appliance the steam will be conveyed direct to the inlet-ports of both cylinders, so that it may act with its initial pressure simultaneously in both, and at the same time the steam from the exhaust of the high-pressure cylinder is conveyed into an exhaust-pipe instead of into the inlet-port of the low-pressure cylinder.

The invention consists, in a steam-engine, in the combination, with a high-pressure cylinder having steam inlet and exhaust ports and a secondary cylinder having a steam-inlet port, of a valved appliance having connected therewith a steam-supply pipe and pipes connecting it with the inlet and exhaust ports of the high-pressure cylinder and a pipe connecting it with the inlet-port of the secondary cylinder, said appliance comprising a plurally-ported valve and ports or passages in the inclosing casing therefor coöperating with the ports in the valve, so that under one position of the valve the steam will pass to the high-pressure cylinders, exhausting therefrom through the valved appliance, and be thereby directed for the secondary action of the next cylinder and whereby on a changed position of the valve the steam

will simultaneously pass at high pressure to the inlets of both cylinders.

The invention comprises a valve-casing in which rotates a plug-valve containing two three-way ports, the valve-casing having the steam-inlet port connected with the boiler and also ports connecting, respectively, with the high and low pressure cylinders, all arranged to be controlled by one of the said three-way ports of the plug, the valve-casing having an exhaust-port from the high-pressure cylinder, a port leading to the steam-inlet of the low-pressure cylinder, and an exhaust-port, all three controlled by the second three-way port of the plug-valve; and my invention comprises such further details of construction and arrangement as will be described hereinafter with reference to the accompanying drawings and then particularly pointed out in the claim.

In the accompanying drawings, in which the characters of reference indicate corresponding parts in the several views, Figure 1 is a perspective view of my converter-valve shown applied to an engine of two cylinders. Fig. 2 represents a plan view of the valve. Fig. 3 is a section on the line 3 3 of Fig. 2. Fig. 4 is a section on the line 4 4 of Fig. 2. Figs. 5 and 6 are similar to Figs. 4 and 5, respectively, with the valve in another position. Fig. 7 is a view of the plug-valve removed from the valve-casing, with portions broken away to show the arrangements of its ports.

In the accompanying drawings, 1 represents the high-pressure cylinder, and 2 the low-pressure cylinder, of a compound engine.

The valve-casing *a* is connected with the supply of steam or other fluid pressure by the pipe *A*, which may be controlled by a throttle-valve *T*. The valve-casing has a bore *B*, in which is fitted a double three-way valve-plug *P*, that may be operated by a handle *M* through a distance limited by a stop-pin *y*, engaging the ends of a partial ring *z*, secured to the plug. The plug *P* has near its larger end the three-way port comprising the radial ports 10, 11, and 12, each connecting with the others, as best shown in Fig. 7. The plug also has the three-way port composed of the radial ports 13, 14, and 15 near its other extremity or at another portion in its length that are arranged as shown in this figure.

The portion of the valve-casing that coöperates with the ports 10, 11, and 12, as shown in Fig. 3, has a port *b*, that communicates with the steam-inlet A. It has also a port *e*,
 5 that communicates with the pipe C, the latter leading to the admission-valve of the high-pressure cylinder 1. This portion of the valve-casing also has a port *a'*, connecting with a chamber *a* in the casing, which extends along
 10 parallel with the valve-plug, and this latter chamber communicates by pipe D with the admission-valve of the low-pressure cylinder 2. The portion of the valve-casing that coöperates with the ports 13, 14, and 15 has a
 15 port *f*, that serves as an outlet for the steam into the atmosphere or condenser through pipe F. The valve-casing also has the port *d*, that communicates by pipe C' with the exhaust-port C² of the high-pressure cylinder
 20 1. A port *a*² connects the bore of the casing at this portion with the chamber *a*.

E represents the exhaust-pipe from the low-pressure cylinder 2, which, if desired, may be carried around to and connected with the
 25 exhaust-pipe F.

The operation of the converter appliance is as follows: When it is desired to operate the engine as a compound engine—for instance, if used on a motor-vehicle that is running under conditions when only moderate
 30 power is required—the lever M is turned to bring the plug P with its ports in the positions in which they are shown in Figs. 3 and 4. By inspection of these figures it will be
 35 seen that the steam from the pipe A will pass through the port B into the port 10 of the plug and thence through port 12 of the plug and out of the casing through port *e* into the pipe C, that will conduct it to the high-pressure
 40 cylinder. It will be noticed that in this position the port 11 of the plug is closed by the wall of the bore in the casing and that the steam can only pass as just described. The exhaust-steam from the high-pressure cylinder
 45 will be led by the pipe C' to the port *d* in the valve-casing, which, it will be seen in Fig. 4, communicates with the port 15 of the plug. Thence the steam passes through port 14 of the plug and port *a*² of the casing into
 50 the chamber *a'* of the casing. From this chamber the steam-exhaust from the high-pressure cylinder will pass by pipe D to the low-pressure cylinder to be used expansively, as is usual in compound engines; but when
 55 the vehicle requires a greater amount of power for ascending hills or other reasons the han-

dle M is turned to move the plug so that the several ports are in the positions indicated by Figs. 5 and 6.

From Fig. 5 it will be seen that the steam 60 from the inlet A still passes through the ports *b*, 10, 12, and *e* to the pipe C and thence to the high-pressure cylinder; but it will be also noticed that the port 11 in the plug now exposes the port *a'* for the steam to pass 65 through ports 10, 11, and *a'*. Hence the steam will also pass directly from the pipe A into the pipe D and thence for high pressure in the secondary cylinder 2; and from Fig. 6 it will be apparent that the exhaust from the high- 70 pressure cylinder through pipe C' and port *d* will no longer pass into the chamber *a*, but will be carried through the ports 13 and 15 in the plug-valve to the port *f* and exhaust-outlet pipe F. The port 14 will now be closed 75 by the wall of the bore, and the port *a*² will be closed by the solid portion of the plug, thus preventing any escape of the live steam in the chamber *a*.

Having thus described my invention, what 80 I claim, and desire to secure by Letters Patent, is—

The combination of a valve-casing; a plug-valve mounted in the casing and having a pair of three-way radial ports therein; the 85 casing having ports *f*, *d*, and *a*², that are arranged to be controlled by the plug-valve at one of its three-way-port portions; the casing also having the ports *b*, *e*, and *a*², that are controlled by the other three-way-port portion 90 of the plug; the casing also having a chamber communicating with the ports *a'*, and *a*²; said ports being so arranged that at one position of the plug the port *b* is in communication with the port *e* by one said three-way- 95 port portion and the port *d* is in communication with the port *a*² by the other said three-way-port portion; while the ports *f* and *a'*, in the casing are covered by the plug; and when the plug is in another position the ports *b*, *e*, 100 and *a'* are all put in communication by one said three-way-port portion and the port *f* is put in communication with the port *d*, by the other said three-way-port portion while the port *a*², is covered by the plug. 105

Signed by me at Springfield, Massachusetts, in the presence of two subscribing witnesses.

CHARLES E. VAN NORMAN.

Witnesses:

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 M. A. CAMPBELL.