

(No Model.)

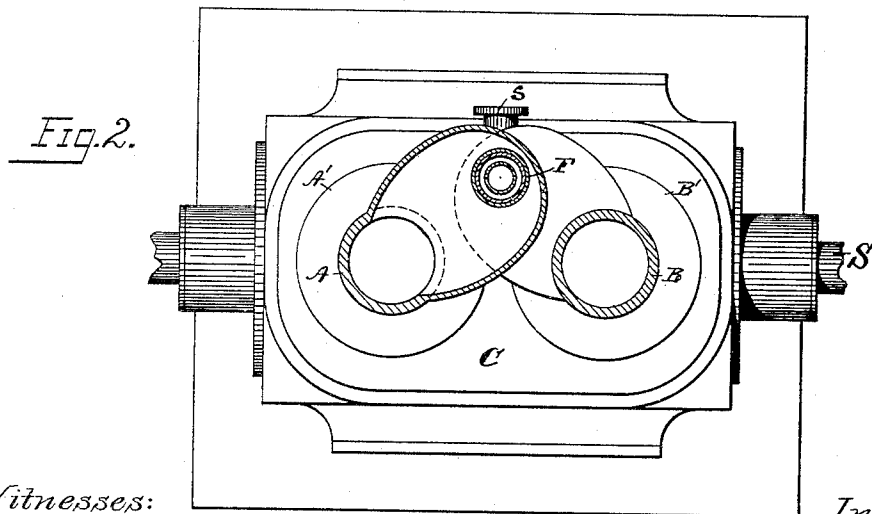
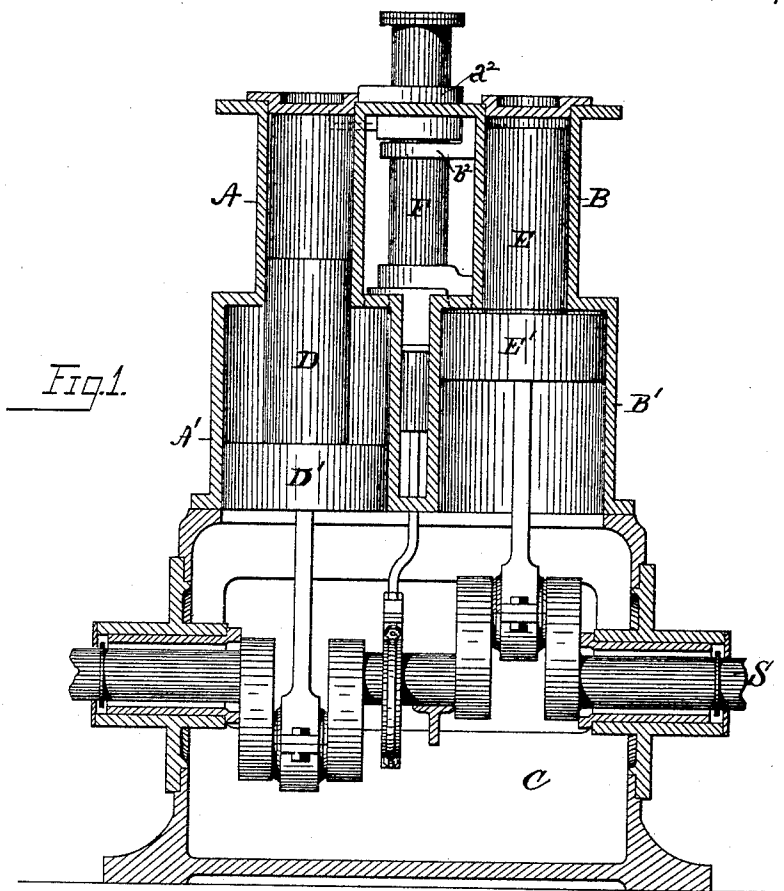
2 Sheets—Sheet 1.

J. C. HOBART.

VALVE FOR COMPOUND STEAM ENGINES.

No. 467,933.

Patented Feb. 2, 1892.



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Fig. 3.

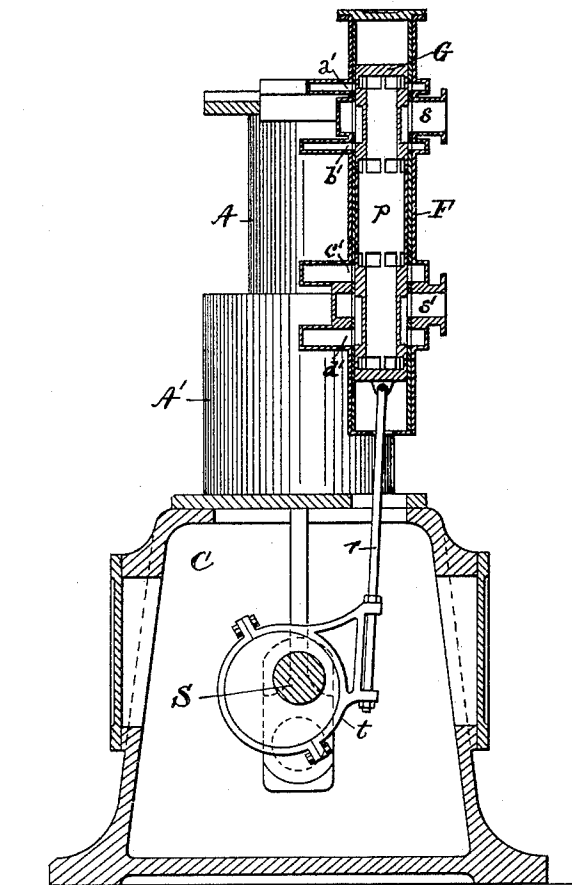
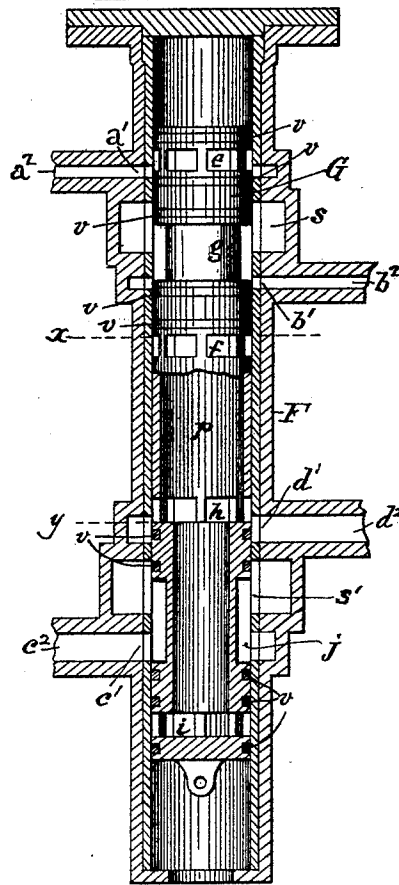


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES C. HOBART, OF CINCINNATI, OHIO, ASSIGNOR TO THE TRIUMPH
COMPOUND ENGINE COMPANY, OF SAME PLACE.

VALVE FOR COMPOUND STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 467,933, dated February 2, 1892.

Application filed August 31, 1891. Serial No. 404,285. (No model.)

To all whom it may concern:

Be it known that I, JAMES C. HOBART, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in Distribution-Valves for Compound Steam-Engines, of which the following is a specification.

My invention relates to compound engines, its object being to produce a simple, economical, and effective distribution-valve and valve-chest for effecting the induction, expansion over, and final exhaust of steam in a direct manner with conservation of heat, and in form to insure by due proportion and relation of parts a proper degree of economical efficiency in the working of the engine.

To this end it consists in a cylindrical valve-casing having a single inlet-port with a single distribution-port for each high-pressure cylinder symmetrically disposed at opposite sides thereof (longitudinally) and a single exhaust-port with a single distribution-port for each low-pressure cylinder symmetrically disposed at opposite sides thereof, (longitudinally,) and, further, in a hollow piston-valve constructed in detail as hereinafter set forth, wherein the tubular interior of the valve is wholly employed as a passage for the expansion over of the steam, the admission being controlled by a peripheral groove surrounding the valve near one end and the exhaust by a similar groove at the other end. The valve is especially adapted to the use of two-cylinder engines, whether single or double acting, or to any engines wherein the initial steam is expanded upon the return stroke of the high-pressure pistons against low-pressure pistons coupled to an oppositely-set crank. It is particularly adapted to the type of such engines having one or more differential cylinders with corresponding pistons used, respectively, with high and low pressure steam.

Mechanism embodying my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a general side or front elevation of a vertical two-cylinder engine of the

differential-cylinder type to which my invention is applied; Fig. 2, a horizontal section through the upper receiving-port and valve-chest; Fig. 3, a vertical cross-section of the engine, taken through the axial plane of the valve and valve-chest; and Fig. 4, an enlarged vertical section of the valve and chest, taken in an axial plane parallel with the common axial plane of the working cylinders.

Referring now to the drawings, A A' and B B' designate the cylinders, respectively, of a vertical two-cylinder engine, and C the crank-case constituting a support for the same. The cylinders open into the crank-case and are fitted in their lower and larger ends A' B' with pistons D' E' of the bucket-plunger type extended by cylindrical plungers D E, respectively, into the smaller ends A B of the cylinders, the initial steam being introduced in each smaller cylinder against the end of the plunger-piston extension as a high-pressure piston, and thence expanded over to the opposite larger cylinder against the annular upper surface of the bucket-plunger piston therein. There are thus constituted, in effect, four cylinders, two high-pressure and two low-pressure, having their pistons operated in the same direction but at opposite times by connection with oppositely-set cranks upon the crank-shaft S. These and other constructive details being common in this class of engines I need not describe further.

The valve-chest is a third cylinder F, which, for constructive reasons, I prefer to place parallel to and between the working cylinders and a little rearward of their common axial plane. Also, for constructive reasons, I have shown it herein of full length to secure symmetrical and equal distribution ports and passages to all the cylinders, but the valve may be made shorter and the cylinder-passages lengthened accordingly.

Into the valve-casing near the top enter two induction-ports a' b', symmetrically disposed at opposite sides, respectively, of a live-steam receiving-port s. The ports a' b' connect, respectively, by passages a² b² with the upper ends of the smaller working cylinders A B and serve for the admission of live steam to

the working cylinders and also for its subsequent expansion over through the valve, as will be explained later.

Near the bottom of the valve-casing are two ports $c' d'$, symmetrically disposed at opposite sides, respectively, of an exhaust-port x and connecting to the upper ends of the larger cylinders $A' B'$ by passages $c^2 d^2$, these serving for the admission of the expansion-steam from and through the valve into the larger cylinders and its final exhaust therefrom around the valve, as will be explained later. The passages connecting the several distribution-ports to the respective cylinders are thus provided of equal length so as to obtain equal clearance in the successive distributions to the cylinders.

The valve G is a tubular piston closed at both ends, hollow interiorly, and provided with openings or ports, as follows: Near the top are ports $e f$, communicating with the interior passage p , extending the entire length of the valve between its end-closing heads. The ports $e f$ are at opposite sides of a peripheral groove g , which is constantly in communication with the live-steam receiving-ports of the casing and distributes the live steam alternately at opposite reciprocations of the valve to the cylinder ports and passages $a' a^2 b' b^2$. The ports $e f$ alternately register with the same ports $a' b'$ oppositely with the steam-groove s , and permit the expansion-steam to pass into the interior passage p of the valve. Near the bottom of the valve are two farther ports $h i$, opening to the interior passage p at opposite sides of an annular groove j . The ports $h i$ register alternately with the ports and passages $c' c^2 d' d^2$ and permit the expansion-steam to flow through and from the interior passage p of the valve into the larger cylinders $A' B'$. The groove j also registers with the ports $c' c^2$ in opposite alternations with the valve-ports $h i$, thus permitting the final exhaust to pass outward. The lower end of the valve-casing being open, a connecting-rod r , pivoted to the lower end of the valve G , connects it through said opening and a similar one in the crank-case to the eccentric-yoke t , as indicated in Figs. 1 and 3. The ports, both of the valve-chest and the valve, are preferably extended entirely around the same and are bridged across parallel with the valve-axis by suitable bridges, as shown. Packing-rings v are provided upon the valve in suitable grooves at each side of each port, except between the two central expansion-ports $f h$, where they are not needed.

The operation of the valve has been to a great extent indicated in the foregoing description, but may be summarized as follows: The valve being at its highest position, steam is delivered to working cylinder A , moving its pistons down. At the same time the live steam, which has just completed its work in working cylinder B , now expands over through

passages and ports $b^2 b'$ through the interior valve-passage p and ports and passages $c' c^2$ to working cylinder B' . So in a similar manner the induction, expansion, and exhaust takes place between the cylinders in opposite sequence in accordance with the reversed movement of the parts. The valve, it will be observed, is balanced in respect to steam pressure and exhaust, and the expansion-passage is practically neutral in respect to gain or loss of heat from high-pressure or exhaust steam and is devoted exclusively to the expansion-steam. The area of said expansion-passage may of course be reduced as much as desired. The valve is preferably made in one piece, as shown. It may, however, be made in two pieces—the shell from the dotted line x , Fig. 4, upward, including the end piston, in one piece, and similarly from the dotted line y downward in another—connected by a central rod secured in the end pistons.

I claim as my invention and desire to secure by Letters Patent of the United States—

1. In a compound engine of two low-pressure and two high-pressure cylinders operating oppositely-set cranks, a cylindrical valve-casing having a single steam-inlet port and symmetrically disposed in relation thereto and at opposite sides thereof longitudinally a single distribution-port for each high-pressure cylinder, a single exhaust-port, and symmetrically disposed in relation thereto and at opposite sides thereof longitudinally a single distribution-port for each low-pressure cylinder, in combination with a reciprocating-piston valve governing the steam-distribution through said ports, substantially as set forth.

2. In a compound engine of the character described, in combination with a cylindrical valve-casing having single inlet and outlet ports and single distribution-ports for the high and low pressure cylinders arranged symmetrically at opposite sides longitudinally of the inlet and outlet ports, respectively, a reciprocating-piston valve having two peripheral grooves, one near each end, respectively, constituting cavities exclusively for the delivery of steam to the high-pressure cylinders and the final exhaust of steam from the low-pressure cylinders, an internal passage exclusively for the expansive distribution in common of steam between each high and its proper low pressure cylinder, and ports opening from said internal passage through the shell of the valve beyond and between said peripheral grooves, substantially as set forth.

3. In a compound steam-engine, in combination with two or more independent single-acting working cylinders for high and low pressure steam, a single cylindrical valve-chest common to all the cylinders having single independent ports and passages symmetrically arranged connecting the casing with the cylinders, respectively, and a single reciprocating distribution-valve having a tubular

body, a pair of end pistons, ports between
said pistons communicating with and con-
nected by a passage within the valve, and
two annular grooves or ports in the shell of
5 the valve, one governing the entire distribu-
tion of live steam to the high-pressure cylin-
ders and balancing the valve, the other the
final exhaust of steam from the low-pressure
cylinders, and the interior passage of the
10 valve and its communicating ports governing

the expansion over of steam from the high to
the low pressure pistons in common, substan-
tially as set forth.

In testimony whereof I have hereunto set
my hand in the presence of two subscribing 15
witnesses.

JAMES C. HOBART.

Witnesses:

R. M. HOSEA,

E. HOSEA.