

No. 637,754.

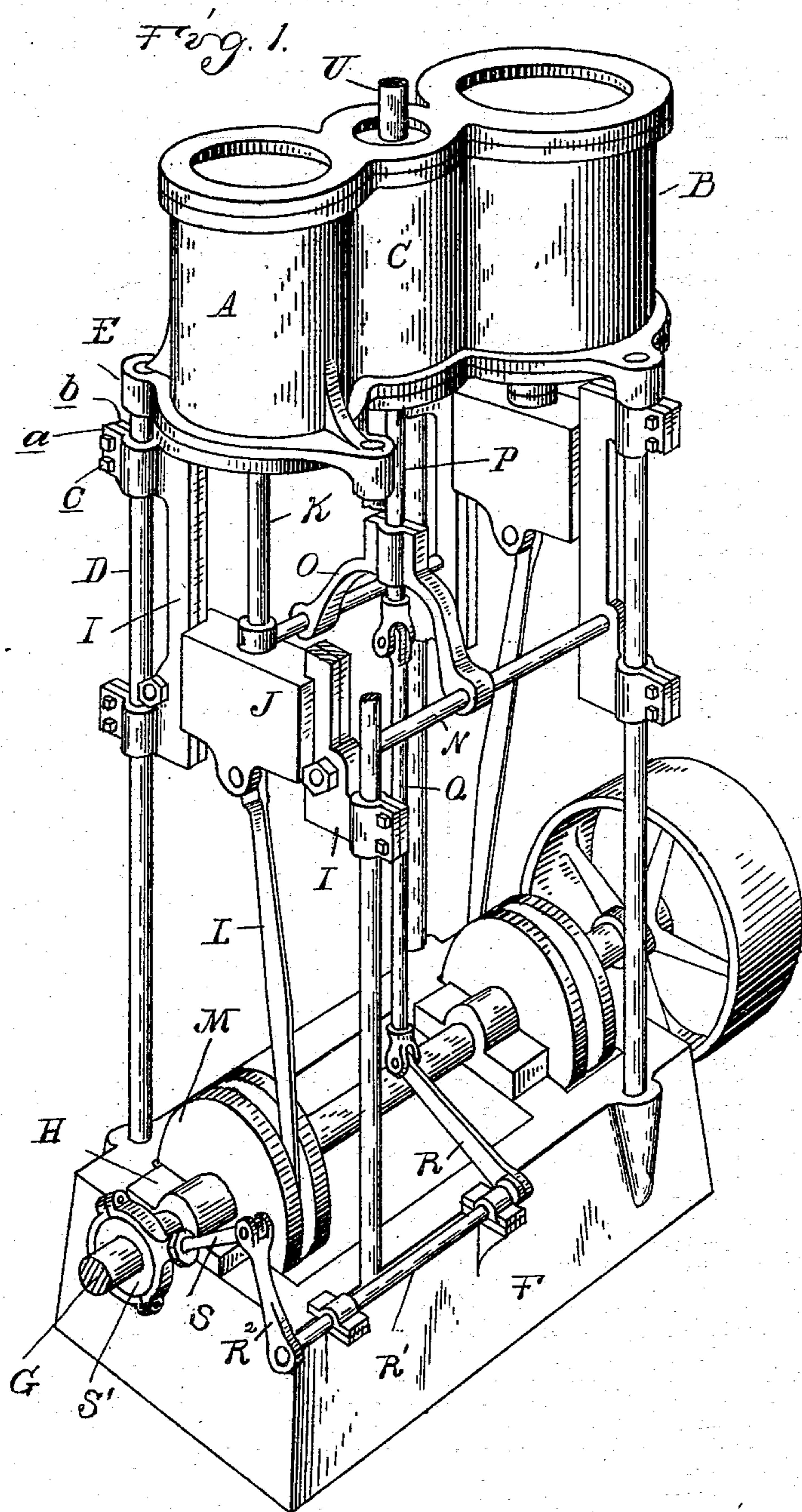
Patented Nov. 21, 1899.

M. E. DURMAN.  
ENGINE.

(Application filed Dec. 14, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses  
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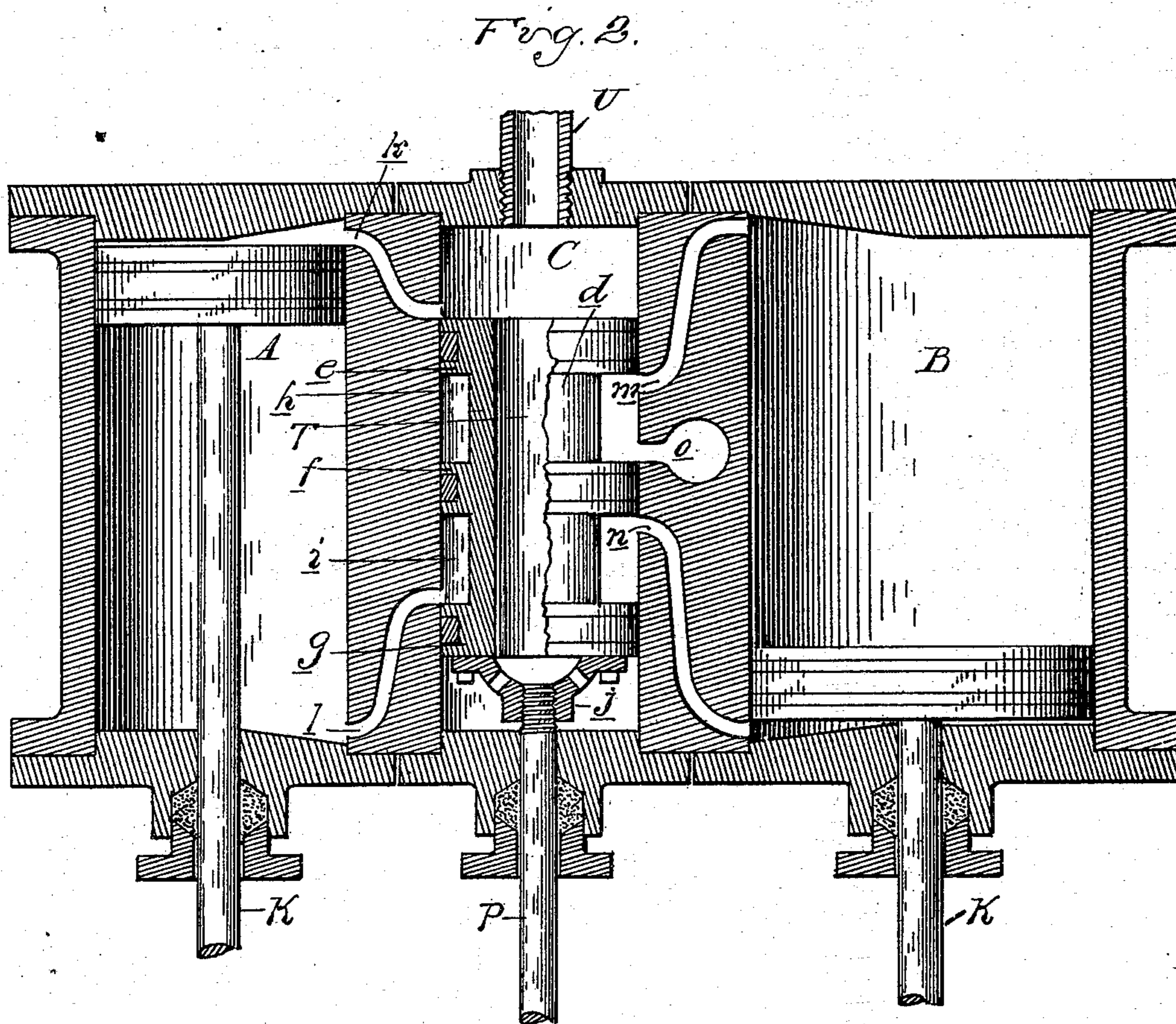
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(No Model.)

**2 Sheets—Sheet 2.**



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# UNITED STATES PATENT OFFICE.

MICHAEL E. DURMAN, OF WOODMERE, MICHIGAN.

## ENGINE.

SPECIFICATION forming part of Letters Patent No. 637,754, dated November 21, 1899.

Application filed December 14, 1898. Serial No. 699,253. (No model.)

*To all whom it may concern:*

Be it known that I, MICHAEL E. DURMAN, a citizen of the United States, residing at Woodmere, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention has reference to engines of the compound type, and relates particularly to an improved valve adapted for use in that class of engines and to a novel construction of the supporting-frame for the cylinders.

One of the objects of my invention is to construct a piston-valve and arrange the same within the casing, or what will be termed hereinafter the "valve-chest," in such a manner that the pressure of the live steam within the chest will be extended upon both ends of the piston and not confined to one only, whereby the piston instead of being retarded by the steam moving in one direction will be evenly balanced.

Another object of my invention is to provide a simple and effective frame to support the engine-cylinders and to construct the frame in such manner that while performing the usual function of a support it will always serve as and constitute the guides for the cylinder cross-heads.

With these objects in view my invention consists in the novel construction of an engine, of a frame for the same, and in the peculiar arrangement and combination of the various parts of the engine and frame, as will be more fully hereinafter shown and described.

In the drawings, Figure 1 is a perspective view of the engine, illustrating the peculiar formation of the frame, the engine-cylinder mounted thereon, and the mechanism for reciprocating the pistons. Fig. 2 is a vertical central section through the cylinders and valve-chest, showing the novel construction of piston and the arrangement of the piston in relation to the cylinders.

A is the high-pressure cylinder, B the low-pressure cylinder, and C the valve-chest, which are preferably integrally formed in one casting. These cylinders are supported on a frame comprising four upright standards D,

which are secured to lugs or projections E on the cylinder-casting. The standards D are secured at their lower ends in a suitable base or bed-plate F, on which the main engine-shaft G is journaled in suitable pillow-blocks H. Upon the standards D are adjustably secured the yoke-shaped slides I for the cross-heads J. These slides are formed of two parts *a b*, clamped together around the standards D by the bolts *c*. The cross-heads J are secured, respectively, to the piston-rods K of the high and low pressure pistons. They are also connected by the connecting-rods L to the disk cranks M of the engine-shaft.

N are cross bars or rods secured at their opposite ends to the slides I.

O is a cross-bar secured to the rods N and forming a bearing for the valve-rod P. This rod is connected by the connecting-rod Q with the rock-arm R on the rock-shaft R', journaled on the base F. R<sup>2</sup> is another rock-arm on the shaft R', connected by the rod S to the eccentric S' on the engine-shaft G.

The pistons in the cylinders A and B may be of ordinary construction, and the piston-rods pass out through suitable stuffing-boxes in the lower heads of the cylinders.

The valve T is of the type commonly known as "piston-valves," and comprises a body portion *d*, having three heads or rings *e*, *f*, and *g* formed therein respectively at the two ends and in the center of the body and leaving between them the annular spaces or channels *h* and *i*. The body portion of the valve is hollow and is connected by suitable coupling *j* with the valve-rod, this coupling being provided with a series or plurality of perforations or apertures, permitting of free communication between the hollow body and the valve-chest below the valve. This valve controls the ports of both the high and low pressure cylinders, said ports being arranged as follows: *k* is a port leading from the upper end of a high-pressure cylinder to the valve-chest and opening therein at a point a short distance below the upper end of the valve-chest. *l* is a port similarly connecting the lower end of the high-pressure cylinder with the valve-chest. *m* and *n* are ports respectively connecting the upper and lower ends of the low-pressure cylinder with the valve-chest and opening

thereinto at points between the openings of the ports *k* and *l* and upon opposite sides of the exhaust-port *o*.

The parts being constructed and arranged  
5 as above described, the operation is as follows: Live steam is admitted into the valve-chest through a suitable conduit-pipe *U*, preferably connected to the upper end of the chest. Supposing the parts to be in the position shown in Fig. 2 of the drawings, the steam  
10 in the chest *C* will be free to pass through the port *k* into the upper end of the high-pressure cylinder, and will thus cause the downward movement of the piston in said cylinder. At  
15 the same time the steam which has been previously admitted in the lower end of the cylinder is free to pass through the port *l* into the annular channel *i* between the heads *f* and *g*. As this channel is also connected  
20 with the port *n*, leading to the lower end of the low-pressure cylinder, the steam from the lower end of the high-pressure cylinder will thus pass freely into the lower end of the low-pressure cylinder and act to raise the piston therein. Finally, in the position of parts  
25 shown in Fig. 2 the port *m* offers a free passage for the steam previously admitted in the upper end of the low-pressure cylinder to the channel *h* between the heads *e* and *f* of the valve and from said channel into the exhaust-passage *o*, connected therewith. After  
30 the piston in the high-pressure cylinder has been driven down to the lower end of said cylinder and the piston in the low-pressure cylinder correspondingly raised to the upper end the position of the valve will be reversed, this being accomplished by means of the eccentric *S'*, rod *S*, rock-arm *R*<sup>2</sup>, rock-shaft *R'*, rock-arm *R*, connecting-rod *Q*, and valve-rod  
35 *P*. These parts together will operate to raise the valve into a position where the port *l* is in free communication with the live steam in the valve-chest. The ports *k* and *m* are con-

nected with the annular channel *h*, and the port *n* is connected with the channel *i*, which  
45 is also connected with the exhaust. Thus it will be understood that with a single valve I am enabled to control all of the ports of both the high and low pressure cylinders. It will  
50 likewise be observed that as the steam passes entirely through the body of the piston or valve a pressure of steam will be constantly upon both ends of said valve, which permits the latter to be more readily reciprocated than  
55 if resistance were formed to said valve by the steam. Moreover, the construction of the valve, which permits the result above referred to to be obtained, is exceedingly simple, whereby the liability of the disarrangement and  
60 breakage of parts is reduced to a minimum, and the valve can be readily manufactured at a small cost.

What I claim as my invention is—

In a compound engine, the combination with a base, a pair of vertically-arranged guide-  
65 rods fixedly secured at each end of the base, a high-pressure cylinder mounted upon and connecting one pair of rods, a low-pressure cylinder arranged upon and connecting the opposite pair of rods, a valve-chest intermediate  
70 the cylinders and connecting the same, a yoke-shaped slide adjustably secured to each guide-rod, each slide being formed in two parts, clamped to each other and to the rods and arranged in pairs, as shown, a vertically-recip-  
75 rocating cross-head engaging each pair of guides, a main drive-shaft mounted upon the base, disk cranks upon said shaft and a connecting-rod between each crank and its respective cross-head.  
80

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

MICHAEL E. DURMAN.

Witnesses:

M. B. O'DOHERTY,  
H. C. SMITH.