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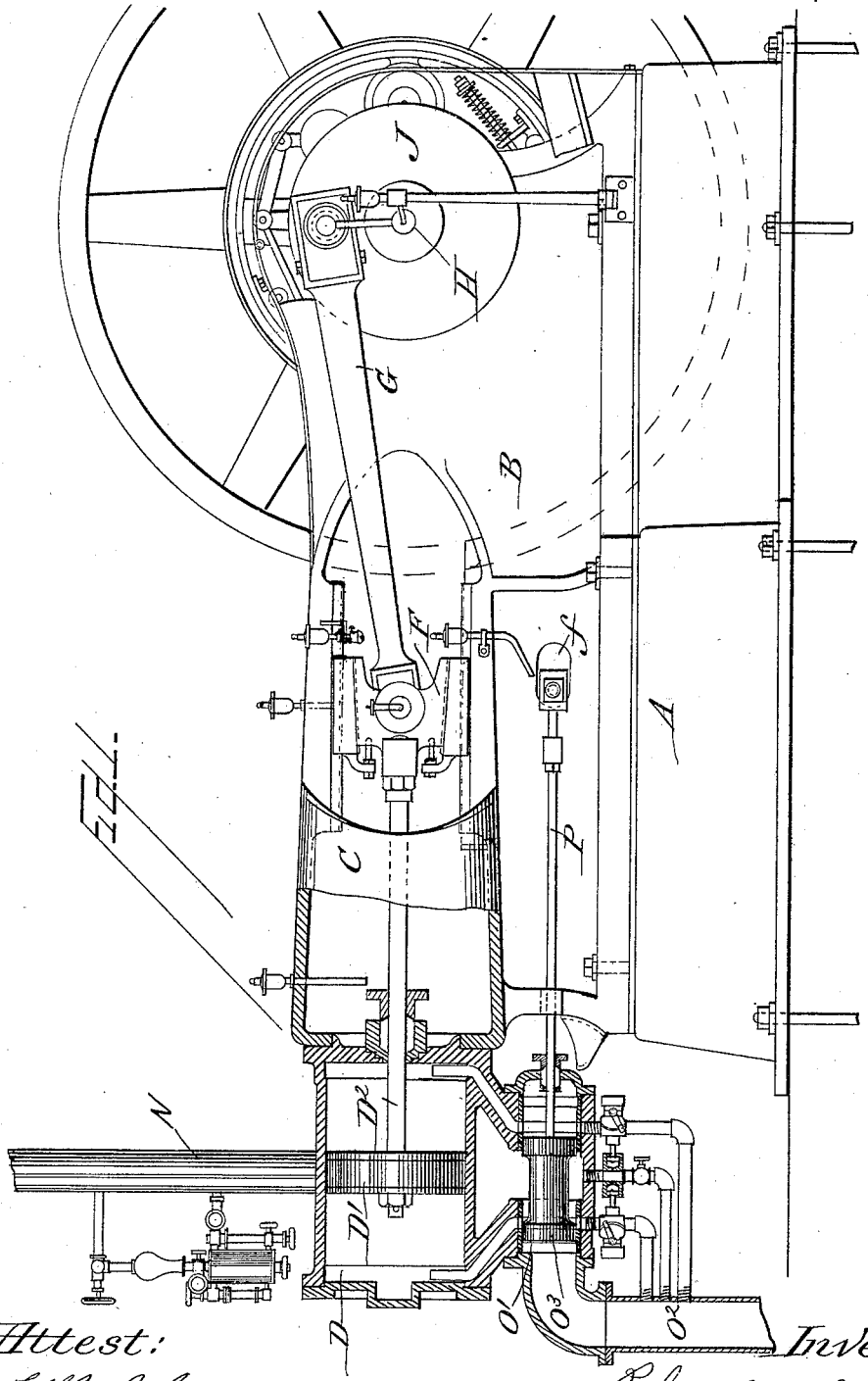
R. M. BECK.

COMPOUND STEAM ENGINE.

No. 422,110. Patented Feb. 25, 1890.



Attest:
F. H. Scholl
Fred E. Tasker.

Inventor
Robert M. Beck.
per John C. Tasker.
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(No Model.) 4 Sheets—Sheet 2.

R. M. BECK.

COMPOUND STEAM ENGINE.

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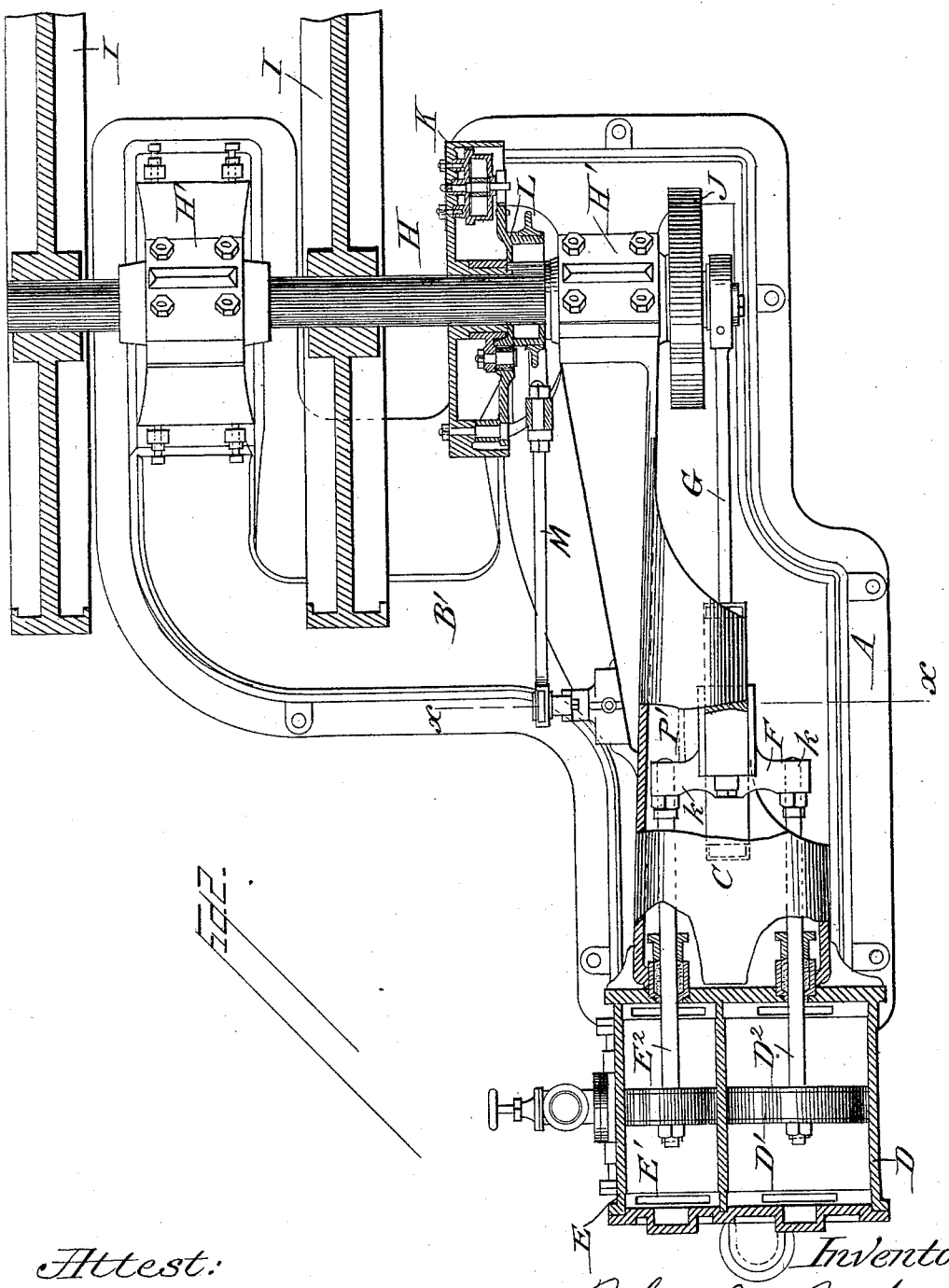

Attest:
F. H. Schott
Rud E. Tasker.

Inventor
Robert M. Beck
by John C. Fasten atty

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R. M. BECK.

COMPOUND STEAM ENGINE.

No. 422,110. Patented Feb. 25, 1890.

Fig. 3.

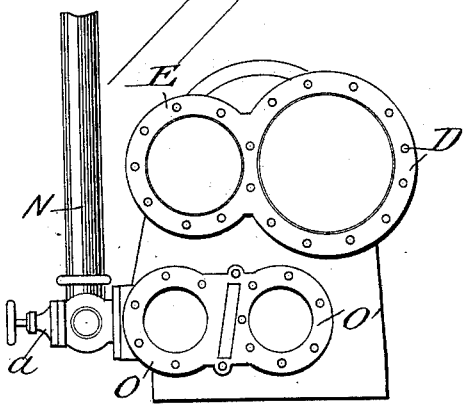


Fig. 4.

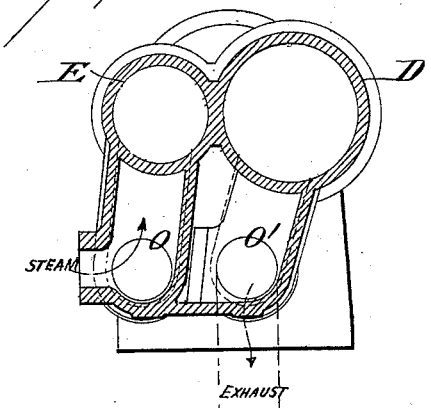
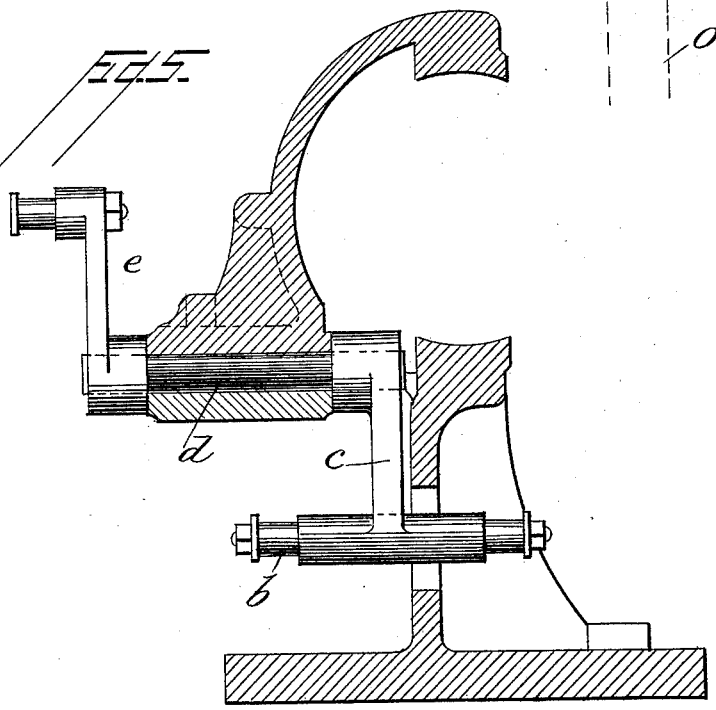


Fig. 5.



Attest.

F. H. Schott

Fred E. Paskew.

Inventor:

Robert M. Beck,

by John C. Paskewalty

(No Model.)

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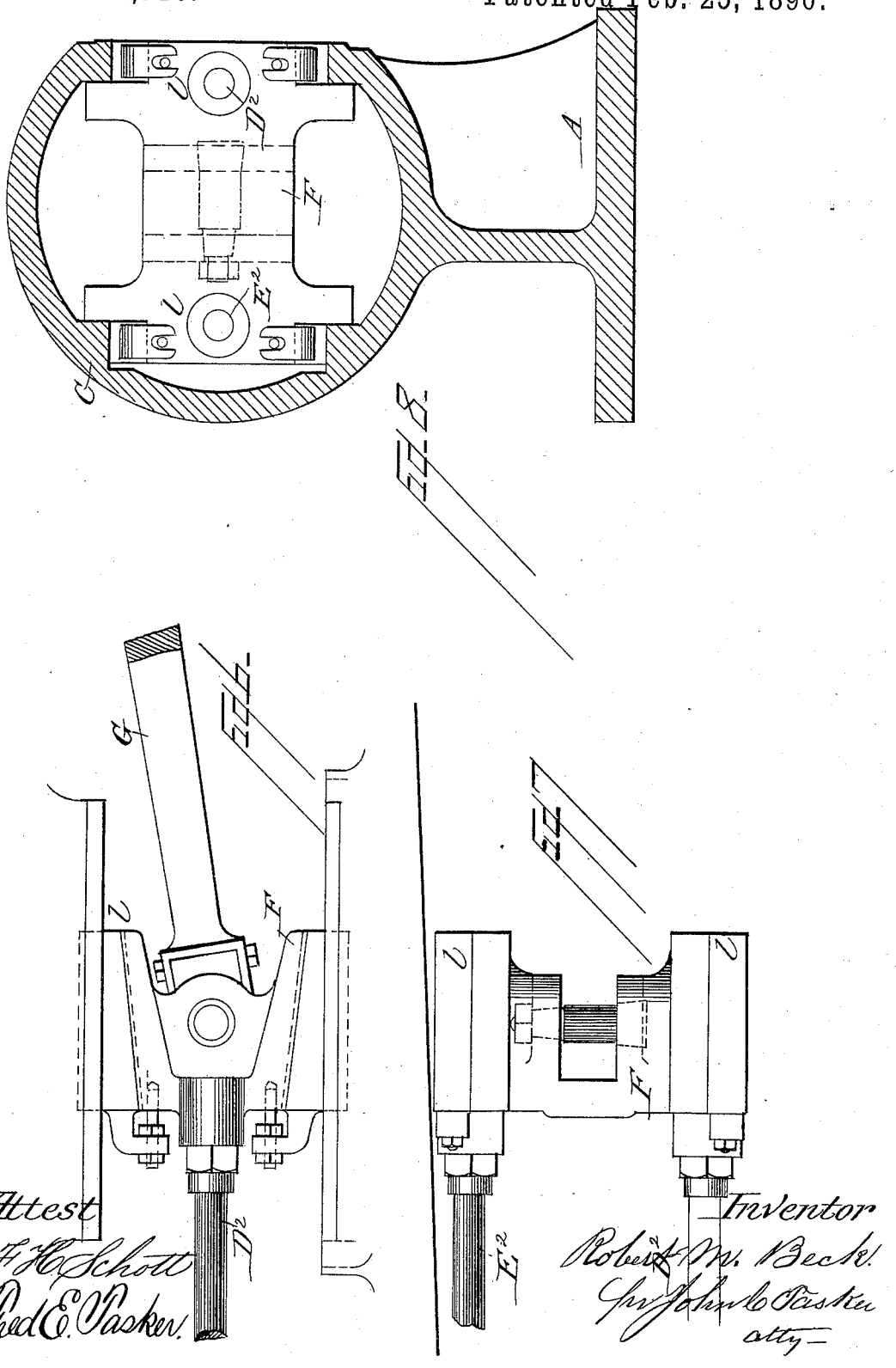
R. M. BECK.

COMPOUND STEAM ENGINE.

No. 422,110. Patented Feb. 25, 1890.



UNITED STATES PATENT OFFICE.

ROBERT M. BECK, OF CHAMBERSBURG, PENNSYLVANIA.

COMPOUND STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 422,110, dated January 25, 1890.

Application filed May 22, 1889. Serial No. 311,700. (No model.)

To all whom it may concern:

Be it known that I, ROBERT M. BECK, a citizen of the United States, residing at Chambersburg, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Compound Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention has reference to an improvement in compound steam-engines. Its object is to simplify and perfect the construction of engines of this class.

It consists, essentially, of two cylinders—a high-pressure and a low-pressure—placed side by side, their piston-rods being attached to one cross-head, and their valves operated by one governor and through one rocker-arm arrangement.

The invention further comprises the construction, arrangement, and combination of parts substantially as will be hereinafter described and claimed.

In the annexed drawings, illustrating my invention, Figure 1 is a sectional side elevation of my improved compound steam-engine. Fig. 2 is a sectional plan view of the same. Fig. 3 is an end view of the two cylinders and their valve-chambers. Fig. 4 is a transverse section of the same. Fig. 5 is an enlarged transverse section on the line x x of Fig. 2. Figs. 6, 7, and 8 represent details of a modified construction of the cross-head.

Similar letters of reference designate corresponding parts throughout all the different figures of the drawings.

The frame of my improved engine is constructed after any desirable pattern, to permit the convenient arrangement therewith of the mechanical parts.

In the drawings, A denotes the base of this frame; B, the upright longitudinal portion; B′, the rear part connected to base A; and C, the curved and partially cylindrical portion, within which the cross-head slides. These parts are given by way of example only and may be modified and changed as desired.

Adjacent to the left end of the cylindrical guide-frame C are the two horizontal steam-cylinders, D denoting the larger or low-pressure cylinder, and E the smaller or high-pressure. The low-pressure cylinder contains a piston D′, having a piston-rod D^2. The high-pressure cylinder contains a piston E′, having a piston-rod E^2. The ends of the piston-rods D^2 and E^2 are connected to the single cross-head F, which slides between suitable guides in the curved part C of the frame. The connecting-rod G connects the cross-head F with the crank-disk J on the engine-shaft H, which is journaled or supported in suitable bearings H′ H′ in the main frame. The engine-shaft H carries the drive-pulleys I I, to which belts are applied for the transmission of power. On the shaft H is also the engine-governor, preferably of the kind shown in my previous patent, No. 359,006, of March 8, 1887, consisting of a governor-wheel K, keyed to the shaft and carrying weighted levers pivoted within the wheel-rim, said levers being connected by links to the arms of a vibratory sleeve mounted on the hub of the governor-wheel and connected with a shifting eccentric L, having an arm pivoted to said wheel, to which eccentric is fastened a connecting-rod M, whereby the valve or valves of the cylinders are automatically actuated through certain connections to be hereinafter explained. It is needless to further explain here the detailed construction of the governor. Moreover, it will be understood that I am not confined to the special form of governor herein mentioned, but may use other forms if I wish.

Below each cylinder is the valve and valve-chamber belonging thereto.

In Fig. 3 the two cylinders, and also the two valve-boxes, are seen in end view, and also the steam-supply pipe N, with the valve a, is clearly represented.

In Fig. 4 we have a cross-sectional view of the cylinders and valve-chambers. O denotes the valve-chamber belonging to cylinder E, and O′ that belonging to cylinder D. The steam enters the high-pressure cylinder E from supply-pipe N through valve-chamber O, and after acting on the piston in said cylinder it is exhausted into the low-pressure cylinder D, wherein it acts on the piston there, and then it finds an outlet through the valve-chamber O′ into the exhaust-pipe O^2. It is unnecessary to enumerate and describe

the several ports and passages by which the steam finds its way through the cylinders, chambers, &c.

The valve O^3 (see Fig. 1) within valve-chamber O′ is attached to a valve-rod P, the other end of which is loosely connected to the end of the horizontal spindle *b*, carried by the rocker-arm *c*, that swings on its journal *d*, which has a bearing in the frame and carries at one end the crank *e*, to which is pivotally connected the eccentric-rod M, above mentioned and described. (See Fig. 5.) The rocker-arm spindle *b* operates within a slot *f* in the part B of the main frame. It has just been stated that valve-rod P is pivotally connected to one end of the spindle *b*. To the other end thereof the valve-rod P′ is connected, which rod is attached to the valve within the valve-chamber O. In this way it will be observed that the valves of both the cylinders are operated by one governor and through one rocker-arm connection with the valve-rods. This reduces the mechanism for accomplishing the intended results to the simplest form without any loss of advantage. Not only is the mechanism simplified, but excellence in operation and accuracy of movement are achieved.

In Figs. 6, 7, and 8 is shown a modification in the construction and arrangement of the cross-head. Reference to Figs. 1 and 2 will show the cross-head F, which has an upper and lower slide, whereby it is enabled to reciprocate in suitable guides in the curved frame C, and said cross-head F is provided with opposite horizontally-projecting lugs *k k*, to which the two piston-rods are respectively connected.

In the modification of Figs. 6, 7, and 8, however, the cross-head is widened to provide slides on each side at *l l*, in lieu of the center slide. This enables the piston-rods of the two cylinders to be connected to the cross-head near the center line of each slide. Observe in Fig. 7 the two piston-rods D^2 and E^2, and in Fig. 8 we see how they are connected to the center lines of the slide.

I reserve the liberty of varying from the precise construction and arrangement herein described without departing from the principles of the invention.

My improved compound engine thus explained will be found to possess numerous advantages over those in common use by reason of its simplicity, cheapness, durability, and ease and accuracy of movement.

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

1. In a compound steam-engine, a high-pressure and a low-pressure cylinder, the valves for said cylinders, the governor on the engine-shaft, and the intermediate connections between the governor and valves, whereby they are jointly operated, substantially as described.

2. In a compound steam-engine, the combination of a high-pressure cylinder, a low-pressure cylinder, the valves for said cylinders, the governor on the engine-shaft, and the valve-rods for said valves, the rocker-arm to which they are connected, and the eccentric-rod connecting the governor and rocker-arm, substantially as described.

3. In a compound engine, the combination of a high-pressure cylinder, a low-pressure cylinder, their pistons and piston-rods, the cross-head to which the latter are connected, the valves for the cylinders, and the governor for jointly operating said valves, substantially as described.

4. The combination of a high-pressure cylinder E, a low-pressure cylinder D, the cross-head F, to which the piston-rods of said cylinders are connected, the engine-shaft H, crank-disk J thereon, and connecting-rod G, together with the valve-chambers, valves, and valve-rods, all substantially as described.

5. The combination of the high and low pressure cylinders, the valve therefor, the engine-shaft, the wheel-governor on said shaft having eccentric L, the valve-rods P and P′, connected to the valves of the cylinders, the rocker-arm journaled in the main frame and having said valve-rods connected thereto, and the eccentric-rod connected to said eccentric and to the rocker-arm, all substantially as described.

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

ROBERT M. BECK.

Witnesses:
JOHN T. CORCORAN,
D. K. WUNDERLICH.