(No Model.) 2 Sheets—Sheet 1.

E. H. JOHNSON.

STEAM ENGINE.

No. 428,106. Patented May 20, 1890.

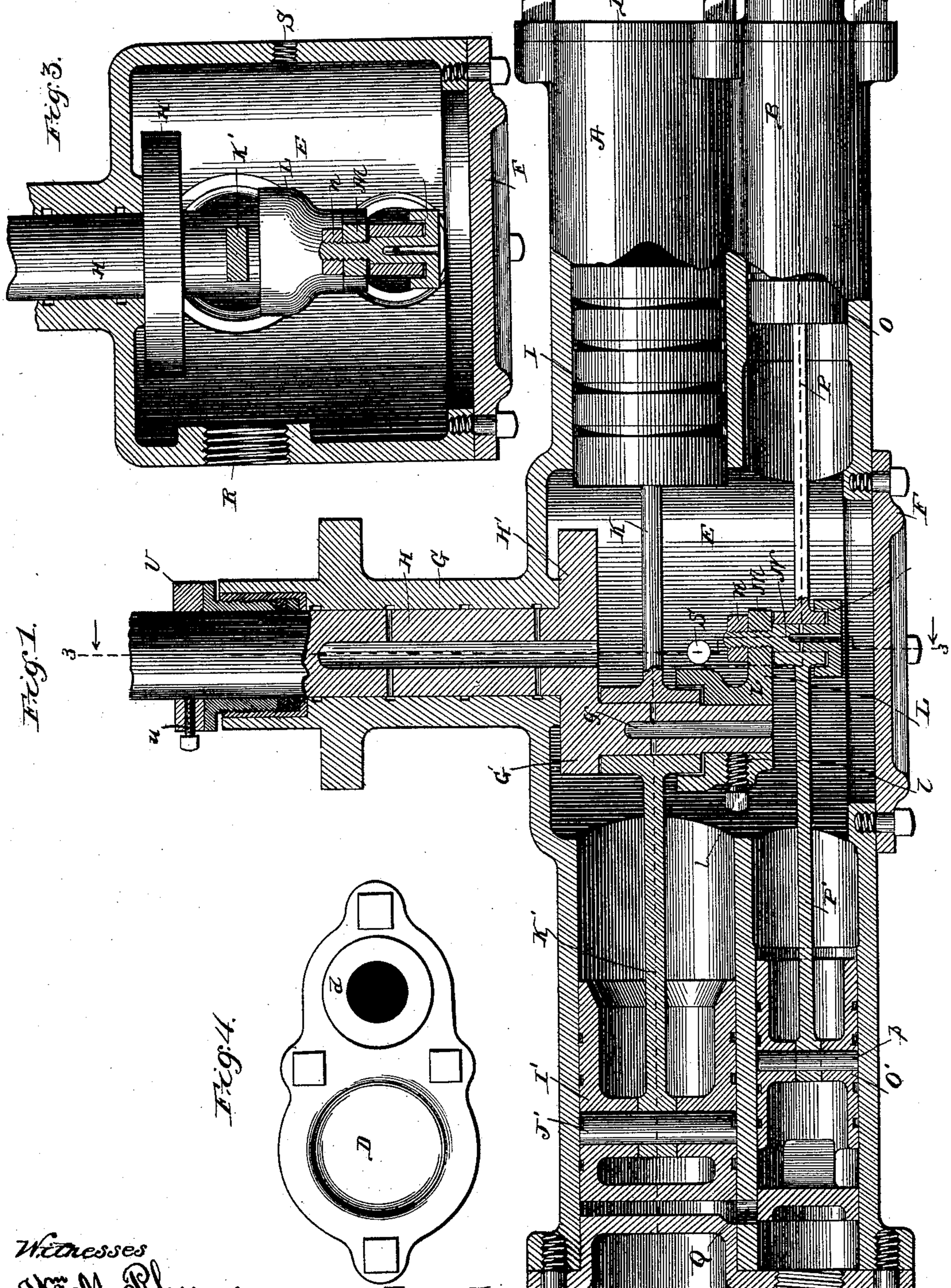

Fig. 3.

Fig. 4.

Witnesses
Wm. M. Rheem.
Jas. R. Underwood.

Inventor:
Enos H. Johnson
By C. C. Linthicum & Co. Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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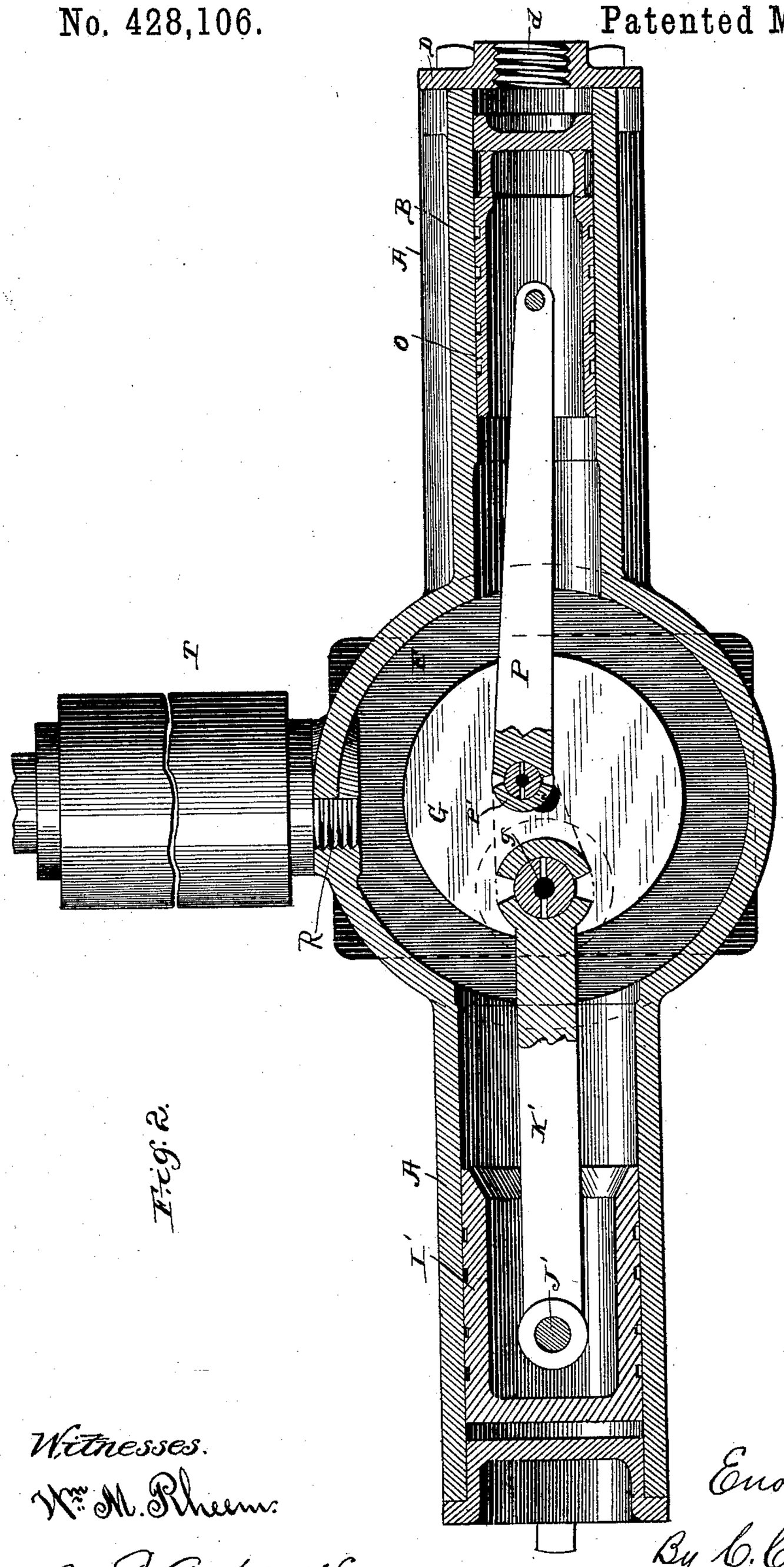

Fig. 2.

Witnesses.
Wm. M. Rheem.
Jas. R. Andrews

Inventor:
Enos H. Johnson
By C. C. Linthicum
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ENOS H. JOHNSON, OF CHICAGO, ILLINOIS.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 428,106, dated May 20, 1890.

Application filed October 12, 1889. Serial No. 326,876. (No model.)

To all whom it may concern:

Be it known that I, ENOS H. JOHNSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

My invention relates to certain improvements in steam-engines whereby simplicity of construction and efficiency of operation are attained; and my invention relates more particularly to certain improvements in steam-engines in which two cylinders are arranged in the same plane, the pistons being hollow and the piston-rods being connected to the crank-pin of a common driving-shaft, each cylinder having its steam-port controlled by a slide-valve, the valve-rods being connected to the crank-pin. The valves are hollow, so that the exhaust-steam passes into the exhaust-chamber between the valves.

Other features of my invention relate to the particular construction of parts and to means whereby the lubrication of the bearings, pistons, and valves is thoroughly effected.

In the accompanying drawings, Figure 1 is a sectional plan view through the center of one cylinder, valve-chamber, and exhaust-chamber, and through the piston, piston-rod, valve, valve-rod, and their connections, the parts at the opposite end showing entire. Fig. 2 is a central vertical section taken on the line 2 2 of Fig. 1. Fig. 3 is a section on the line 3 3 of Fig. 1, looking in the direction indicated by the arrow, and Fig. 4 is an end elevation of the cylinder and valve-head.

In constructing the engine I prefer to form the cylinder, valve-chamber, and exhaust-chamber walls, and the bearing for the end of the shaft, integrally, and this may be conveniently done by casting said parts all in one piece, providing, however, an opening opposite the shaft-bearing to which is fitted a removable cap or cover.

A indicates the cylinders, and B the valve-chambers, the heads of both being formed by a single cap D, said cap being provided at the ends of the valve-chambers with steam-openings *d*.

E is an exhaust-chamber, one of the walls of which is formed by the removable cap F.

G represents an extension of the exhaust-chamber wall, which forms a bearing for the shaft H, said shaft terminating in a disk H′ inside the exhaust-chamber, and at G′ is the crank-pin, which may be formed integral with the disk H′; and *g* is an aperture therein for the passage of a lubricant to channels which conduct the lubricant to the exterior of the pin.

I I′ are the pistons, which are hollow, and J J′ are pins secured within the hollow of the pistons, to which pins the rods K K′ are connected. The opposite ends of the rods K K′ have a parti-circular bearing upon the crank-pin G′ and are held thereto by a flanged sleeve L, secured by set-screws *l*. Formed integral with this sleeve is a crank-arm M, to which is secured a flanged crank-pin N, preferably by means of the jam-nut *n*. This pin also has a longitudinal aperture and lubricant-channels, whereby a lubricant is supplied to its exterior.

O O′ are the valves, which are also hollow, and P P′ are their respective rods, which have parti-circular bearings at one end upon the crank-pin N, the flange of which embraces the edges of the bearings, and at the other end the rods P P′ are connected to pins *p* secured with the valves. Suitable ports for the admission of steam from the valve-chambers to the back of the pistons are provided, one of said ports showing at Q, Fig. 1.

R is an exhaust-opening, and S a drip. A lubricant will be supplied with the steam, and to the exhaust-opening R, I apply a condenser T, which will effect the condensation of the exhaust steam and return the water of condensation and oil to the exhaust-chamber E, in which the water and oil will accumulate, so that the pistons, valves, and all the bearings will be constantly and thoroughly lubricated.

In setting up the engine, the caps D and F being removed, the shaft will be shoved through the opening until the disk H′ rests against the bearings at the side of the exhaust-chamber, and the shaft will then be secured in position by the collar U, having the set-screw *u*. The pistons and valves connected to their respective rods will then be put in place, and the bearings of the former will be placed on the crank-pin G′ and secured by the flanges of sleeve L. The bearings of the

valve-rods will then be placed in position and the crank-pin N passed between them, its flanges embracing their edges and the jam-nut *n* turned on, holding it in position. The caps being then secured in place, the engine is ready for the steam-connections.

Live steam will be conducted to the openings *d* by suitable pipes, and in operation the steam will be admitted to the cylinders through the ports Q alternately by the action of the valves. Starting with the parts in the position shown in Fig. 1, the steam will enter the port Q, driving the piston I′ forward and turning the shaft. Before the piston has reached the limit of its travel the valve will have returned and closed the port, thus cutting off the steam, the piston completing its stroke by reason of the expansion of the steam. At the limit of the stroke of the piston I′ the valve will have passed by, so as to permit the steam to exhaust through the port Q into the hollow of the valve and thence escape to the exhaust-chamber. Simultaneously with the commencement of the exhaust of the steam from the front of the cylinder of the piston I′ steam will be admitted through the port to the opposite cylinder, which will perform the same movements as just described. The steam will be supplied to the openings *d* from a common supply-pipe, and therefore the steam-pressure on the valve will be at all times equal and the latter will therefore be perfectly balanced.

I claim—

1. A steam-engine having a pair of working-cylinders whose piston-rods are connected to a common shaft within a central exhaust-chamber and having its cylinder, valve, and exhaust-chamber walls cast integrally, the valves being hollow to permit the exhaust-steam to enter the common exhaust-chamber, an exhaust-port in the top wall of said chamber, and a condenser applied to said port, whereby to return the water of condensation and lubricant held in suspension therein to the chamber.

2. A steam-engine having in combination a pair of working-cylinders whose piston-rods are provided at their ends with particular bearings adapted to the crank-pin of the shaft, and a flanged sleeve adapted to be secured to the end of the pin, and whose flanges embrace the edges of the rod-bearings, substantially as described.

3. In a steam-engine having a pair of working-cylinders whose piston-rods are connected to the crank-pin of a common shaft, a flanged sleeve securing the rod-bearings on the pin and having a crank-arm thereon and a flanged crank-pin adapted to be secured to said arm, whereby to secure the ends of the valve-rods on said pin, substantially as described.

ENOS H. JOHNSON.

Witnesses:
FREDERICK C. GOODWIN,
N. M. BOND.

Correction in Letters Patent No. 428,106.

It is hereby certified that in Letters Patent No. 428,106, granted May 20, 1890, upon the application of Enos H. Johnson, of Chicago, Illinois, for an improvement in "Steam Engines," an error appears in the printed specification requiring correction, as follows: In line 50, page 2, the word "particular" should read *parti-circular*; and that the Letters Patent should be read with this correction therein to make it conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 3d day of June, A. D. 1890.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

C. E. MITCHELL,
Commissioner of Patents.