

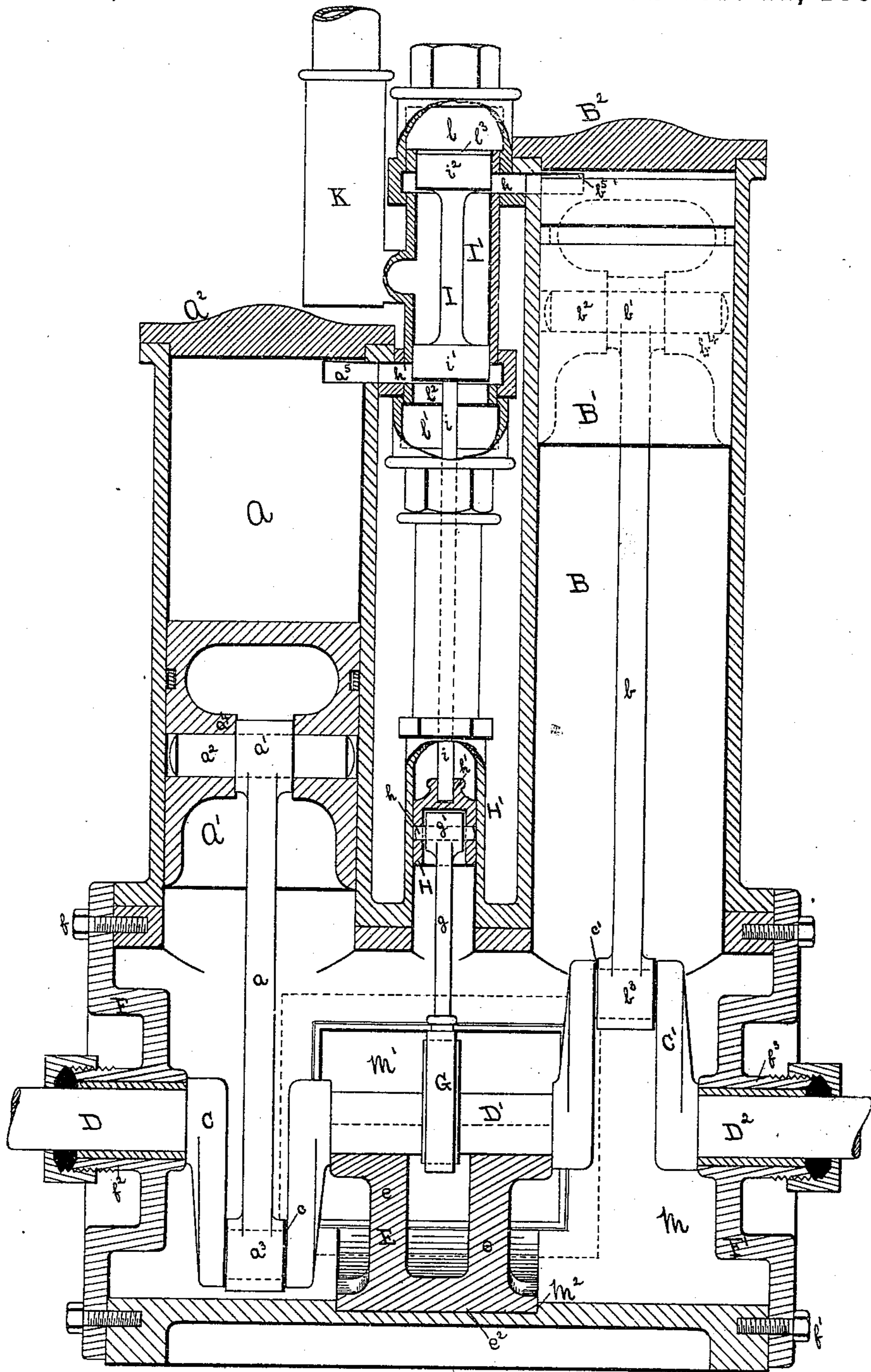
(No Model.)

2 Sheets—Sheet 1.

L. D. COPELAND.  
STEAM ENGINE.

No. 420,930.

Patented Feb. 11, 1890.



WITNESSES

Fig. 1.

INVENTOR

Lucius D. Copeland,

By William S. Powell,

Attorney

*John H. Longstreet,*  
*R. Dale Sparhawk*

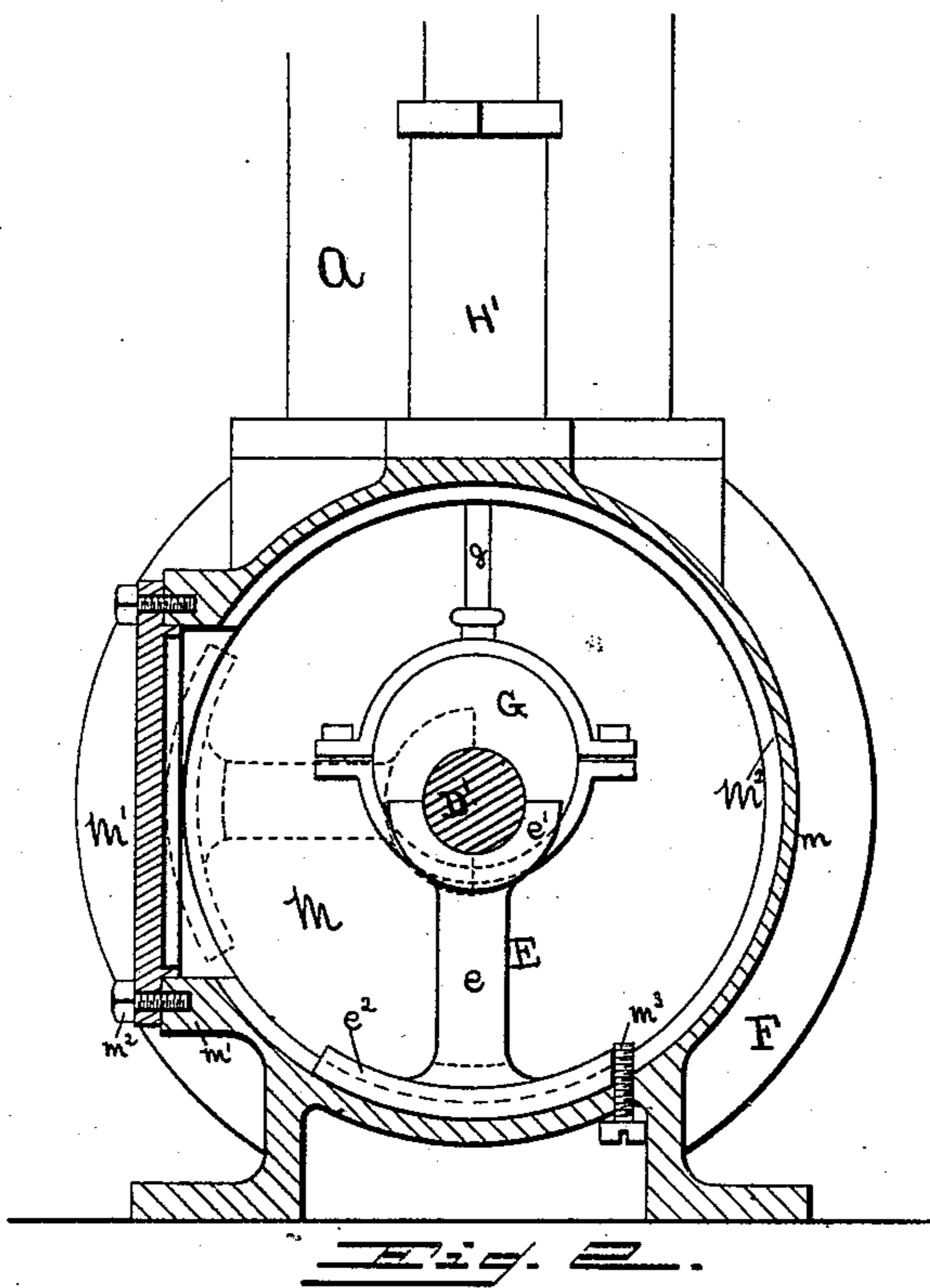
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By William B. Powell,  
Attorney.

# UNITED STATES PATENT OFFICE.

LUCIUS D. COPELAND, OF CAMDEN, NEW JERSEY.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 420,930, dated February 11, 1890.

Application filed March 21, 1889. Serial No. 304,215. (No model.)

*To all whom it may concern:*

Be it known that I, LUCIUS D. COPELAND, a citizen of the United States, residing at Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the invention, reference being had to the accompanying drawings.

My invention has relation to duplex single-acting steam-engines, and has for its object to simplify the construction thereof and effect a saving in the consumption of steam thereby.

My invention consists in constructing an engine of the above character with two cylinders of different lengths, the pistons of said cylinders both having the same length of stroke and the piston-rods thereof of different lengths, in combination with a slide-valve operated by an eccentric on the main shaft and placed between the cylinders, the ports leading from the valve-chamber to said cylinders being perfectly straight.

My invention further consists in the provision of a support for the main shaft of a steam-engine of novel construction and in the means for placing such support in its proper position, such support consisting of a yoke maintained on a suitable standard, the base of said standard being curved concentrically with the inner diameter of the crank-chamber and sliding from a suitable door therein in a concentric groove until it strikes an abutment or shoulder in the bottom of said chamber, where it is secured by contact with said shoulder, as hereinafter more fully described.

My invention further consists in the peculiar construction and combination of parts, as hereinafter set forth.

Referring to the accompanying drawings, Figure 1 is a vertical longitudinal section of an engine of improved construction, and Fig. 2 a vertical transverse section of the crank-chamber.

A and B represent the shorter and longer cylinders, contained within which and sliding therein are the pistons A' and B', both of which are of the same length and impart motion to the cranks C C' on the sections D D', constituting the main shaft through

connecting-rods *a b*, which are, as shown, of different lengths to correspond with those of the cylinders. These connecting-rods are journaled at their upper ends *a' b'* on pins *a<sup>2</sup> b<sup>2</sup>*, which pins are secured in trunnions *a<sup>4</sup> b<sup>4</sup>*, cast integral with pistons A' B' on the insides thereof, and at their lower ends terminate in heads *a<sup>3</sup> b<sup>3</sup>*, journaled on pins *c c'* in the cranks C C'. Shaft-section D' is journaled in the yoke E, while sections D D<sup>2</sup> are journaled in the caps F F', secured to the crank-chamber by screws *ff'*, and having hollow bosses *f<sup>2</sup> f<sup>3</sup>* at their centers, forming the bearings for said sections. These caps also serve as covers for the openings in the crank-chamber, through which the cranks are inserted or removed.

Yoke E, which is U-shaped in vertical section, is composed of standards *e e*, cast integral with the segmental or curved base or flange *e<sup>2</sup>*, which standards terminate at their upper ends in semicircular enlargements *e'*, with recesses therein in which revolves shaft-section D'. Now, in order that this support may be placed in its proper position, the wall *m* of the crank-chamber M is formed with a rectangular opening M<sup>3</sup> therein, which is closed by a flanged cover M', secured to shoulders *m'* by bolts *m<sup>2</sup>*. Beginning at the lower edge of this opening there is formed in the inner circumference of the crank-chamber a broad concentric groove M<sup>2</sup>, which extends downwardly and around the entire inner circumference of the casing, terminating at the upper side of said opening. The base *e<sup>2</sup>* of standards *e e* is curved concentrically with the groove M<sup>2</sup>, as shown at *e<sup>2</sup>*.

When it is desired to place support E in position, the same is held with its standards *e e* in a horizontal plane. It is then thrust through the opening in the crank-chamber until the enlargements *e'* grasp the shaft-section D', when the bottom of the base *e<sup>2</sup>* will be in line with the bottom of the groove M<sup>2</sup>, just clearing the same. In this position said support is free to be pushed around said shaft-section and in the groove until the edge of base *e<sup>2</sup>* contacts with the threaded bolt *m<sup>3</sup>* in groove M<sup>2</sup>, in which position support E is secured against dislodgment while the shaft is revolving by reason of the direction of revolution being toward the said bolt. The

opening in the crank-chamber also affords means of access to the eccentric G, which is secured to shaft-section D' between the enlargements  $e'$  on the standards  $e$ . This eccentric has the usual rod  $g$ , terminating in the head  $g'$ . This head is journaled on a pin  $h$  in the cross-head H, which cross-head slides in its casing H' when the eccentric G is actuated. The upper end of cross-head H is cast solidly and receives the lower threaded end of the valve-rod  $i$ , as shown at  $h'$ . Rod  $i$  at its upper end is secured to the lower end of the slide-valve I, which slides up and down in the valve-chamber I' in response to the movement of the eccentric and allows the steam from said chamber, which enters through steam-pipe K, to pass through the steam-ports  $k$   $k'$ , and thence to the cylinders A B. Said steam-ports are straight and at right angles with the cylinders and the valve-chamber or steam-chest. Thus the long and tortuous steam-ports most commonly heretofore provided are effectually dispensed with, which require a large amount of steam therein, owing to their great length, before said steam is admitted to the cylinders and allow a great amount of waste steam to remain in said ports after the ingress of steam ceases and exhausting begins.

By making the cylinder A shorter than cylinder B the port  $a^5$  of said cylinder is brought directly opposite the port  $k'$  of the valve, which is also the case with port  $b^5$  of cylinder B and the valve-port  $k$ . This construction affords steam-ports of the shortest possible extent, as the valve-casing and cylinder are close together, and the amount of waste steam in said ports is reduced to a minimum. Besides, the trouble of casting ports of irregular form is entirely obviated and the expense of constructing engines of this class is very greatly reduced, as is also the expense of running the same.

The above construction entirely dispenses with the bell-cranks, rock-valves, &c., incidental to engines as sometimes constructed, and does not require the nicety of adjustment of such engines.

The exhaust-pipe is not illustrated in the drawings; but the outlets to said pipe are shown at each end of valve-chamber I and are lettered  $l$   $l'$ .

The heads of cylinders A and B are designated in the drawings by letters A<sup>2</sup> B<sup>2</sup>. The lower ends of these cylinders open directly into the crank-chamber M, as shown in the drawings.

The cylinder-casings may be joined to the crank-chamber casing by bolts or any other convenient means.

With the parts in their respective positions shown in the drawings, as will be clearly understood, the entrance  $l^2$  to exhaust  $l'$  is just opening on account of piston A' being about to make its return-stroke, the head  $i'$  of valve I having closed the passage for steam from said valve to cylinder A, while entrance

$l^3$  to exhaust-outlet  $l$  is entirely closed by the head  $i^2$ , and the steam from the valve has entrance to cylinder B, and piston B' is about to make its downward stroke.

I am aware that steam-engines with cylinders of different lengths, with their pistons of the same length of stroke and the piston-rods of different lengths, have heretofore been employed; therefore I do not wish to be understood as claiming such a construction, broadly.

What I claim as my invention is as follows:

1. The combination, with the main shaft of a steam-engine, of a standard or support for said shaft provided with a curved base-plate adapted to slide into a vertical position in a correspondingly-curved crank-chamber and suitably secured therein in such position, as and for the purpose set forth.

2. In a steam-engine, the combination, with the main shaft thereof, of a standard or support for said shaft provided with a curved base-plate adapted to slide into a vertical position in a correspondingly-curved crank-chamber in a concentric groove therein and maintained in such position by contact with a shoulder or other stop in said groove and the friction of the main shaft, as and for the purpose set forth.

3. In a steam-engine, the combination, with the shaft-section D thereof, of the U-shaped support E for said shaft, having the standards  $e$ , provided with the enlargements  $e'$  and mounted on the curved base-plate  $e^2$ , adapted to slide in the concentric groove M<sup>2</sup> in a correspondingly-curved crank-chamber M and into contact with the shoulder  $m^3$  at the end of said groove, said chamber also having the rectangular opening M<sup>3</sup> in its wall  $m$ , provided with the flanged cover M', as and for the purpose set forth.

4. In a steam-engine, the combination, with the cylinders A B, the pistons A' B', the piston-rods  $a$   $b$ , the cranks C C', and the main shaft, of the valve I, the ports  $k$   $k'$ , the cylinder-ports  $a^5$   $b^5$  in the same horizontal planes with the ports  $k$   $k'$ , the valve-slide I', the slide-heads  $i'$   $i^2$ , the eccentric-rod  $g$ , the eccentric G, the cross-head H, and the valve-rod  $i$ , as and for the purpose described.

5. In a steam-engine, the combination, with the cylinders A B, the pistons A' B', the piston-rods  $a$   $b$ , the cranks C C', the slide I', the valve I, the eccentric G, the eccentric-rod  $g$ , the cross-head H, and the valve-rod  $i$ , of the support E for the main shaft having the standards  $e$ , the enlargements  $e'$ , the base-plate  $e^2$ , the groove M<sup>2</sup>, the chamber M, the shoulder  $m^3$  in the groove, the opening M<sup>3</sup>, and the cover M', as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand this 2d day of February, A. D. 1889.

LUCIUS D. COPELAND.

Witnesses:

WM. H. POWELL,  
F. C. WARNER.