

(No Model.)

4 Sheets—Sheet 1.

P. BROTHERHOOD.
MULTIPLE CYLINDER ENGINE.

No. 299,731.

Patented June 3, 1884.

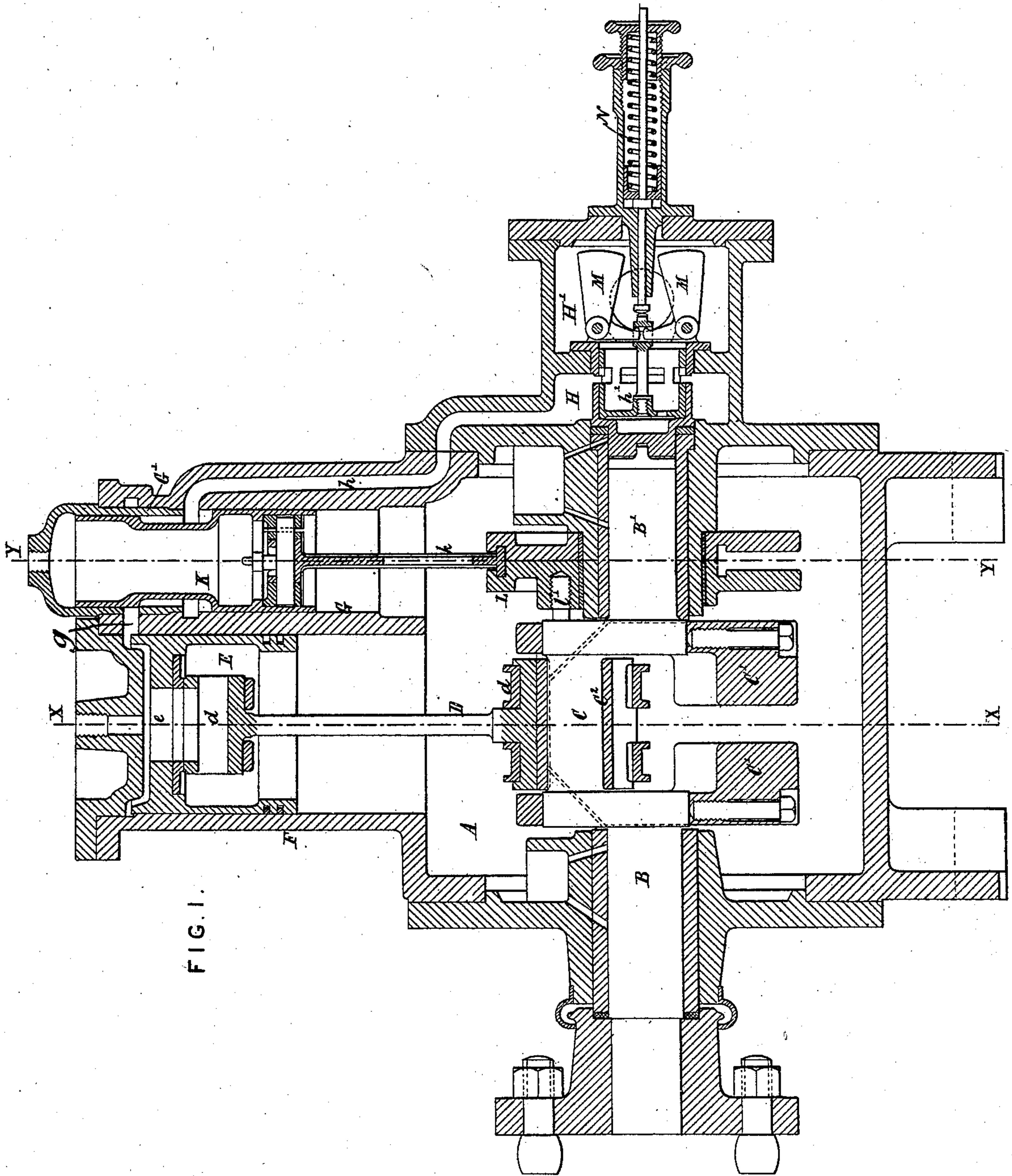


FIG. 1.

Witnesses,

J. A. Rutherford
Robert Everett

Inventor,

Peter Brotherhood.

By James L. Norris.
Attorney

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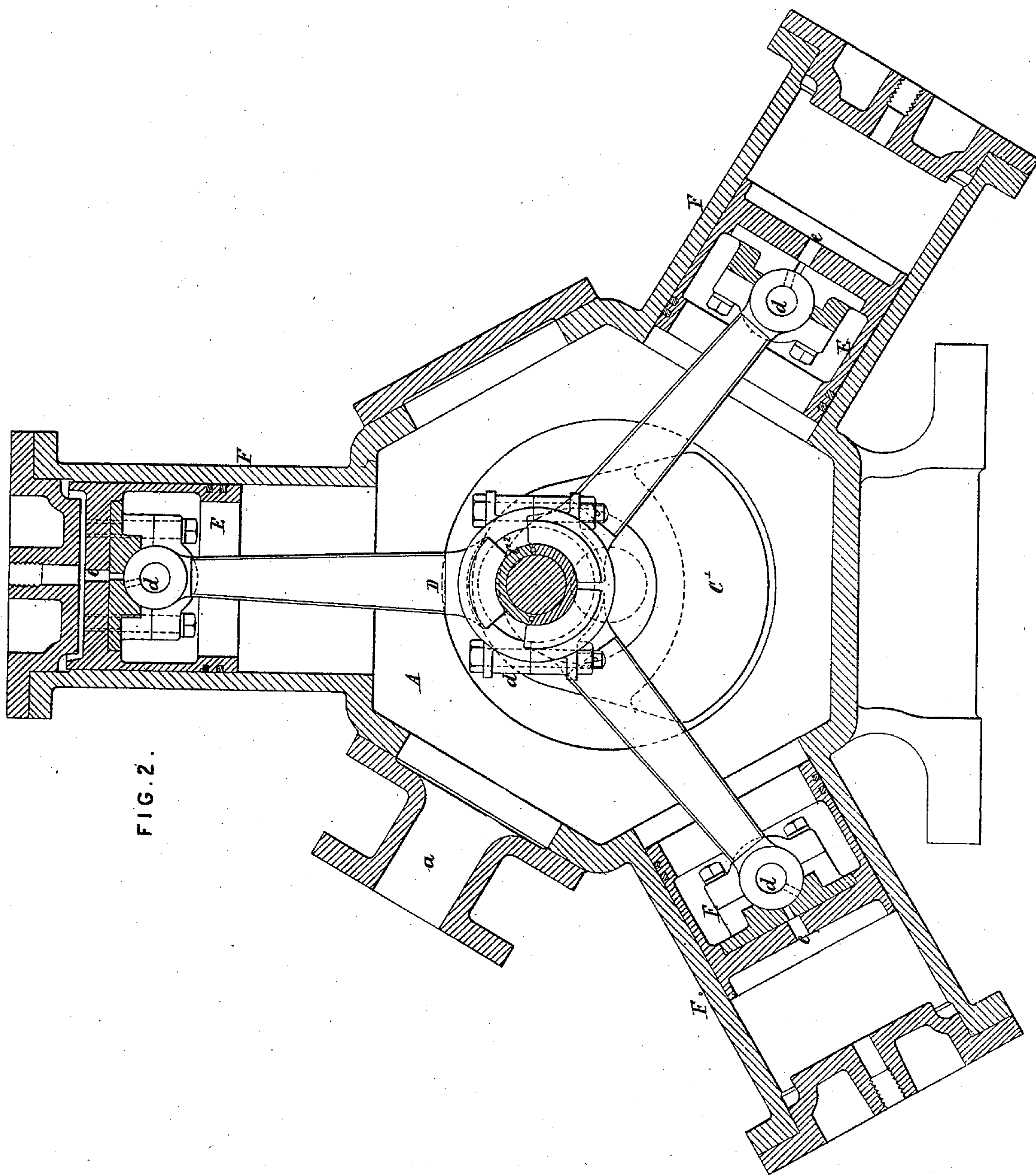


FIG. 2.

Witnesses,
J. A. Rutherford
Robert Everett.

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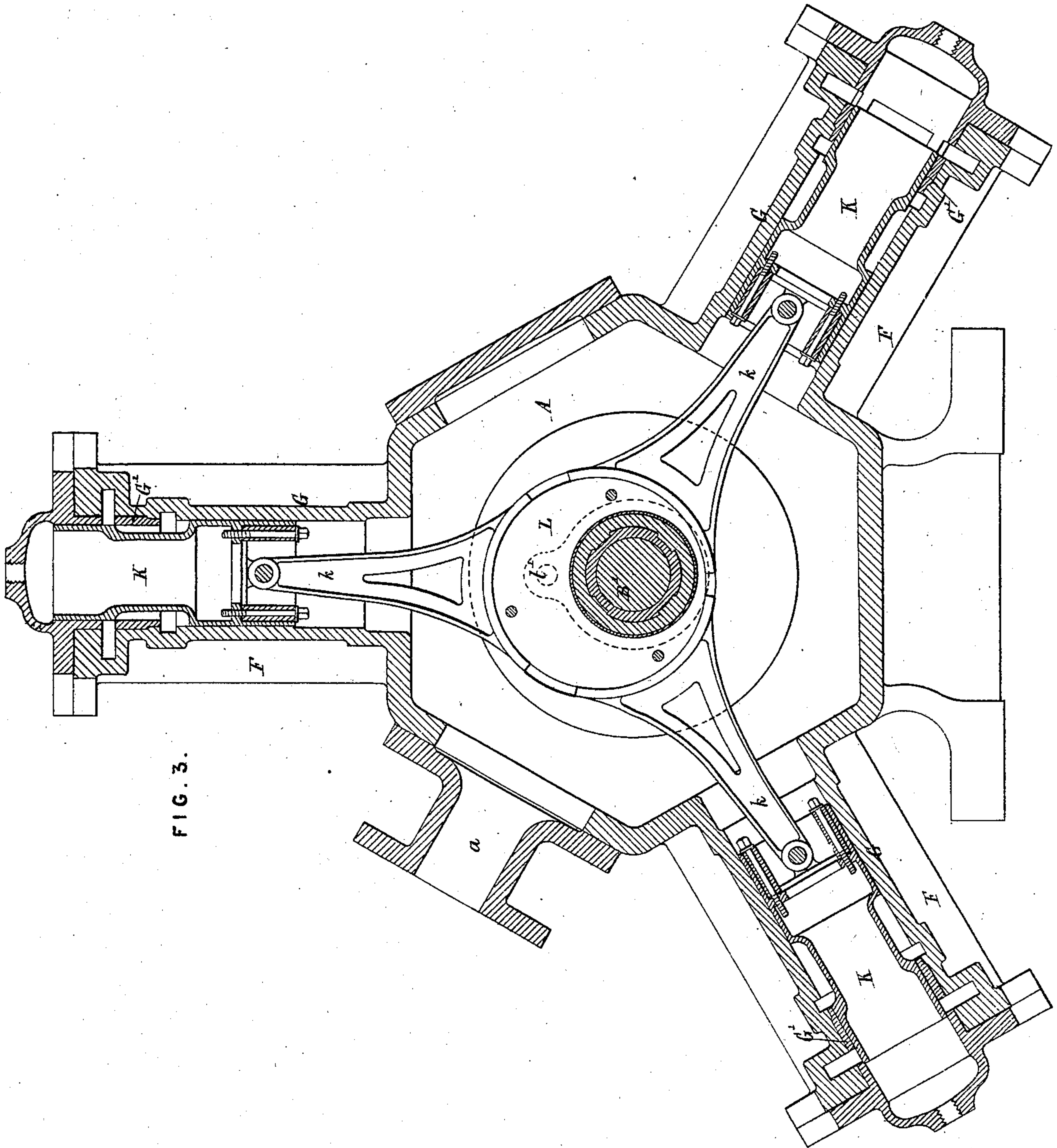


FIG. 3.

Witnesses.

J. A. Rutherford
Robert Everett.

Inventor.

Peter Brotherhood.
By James L. Norris.
Atty.

(No Model.)

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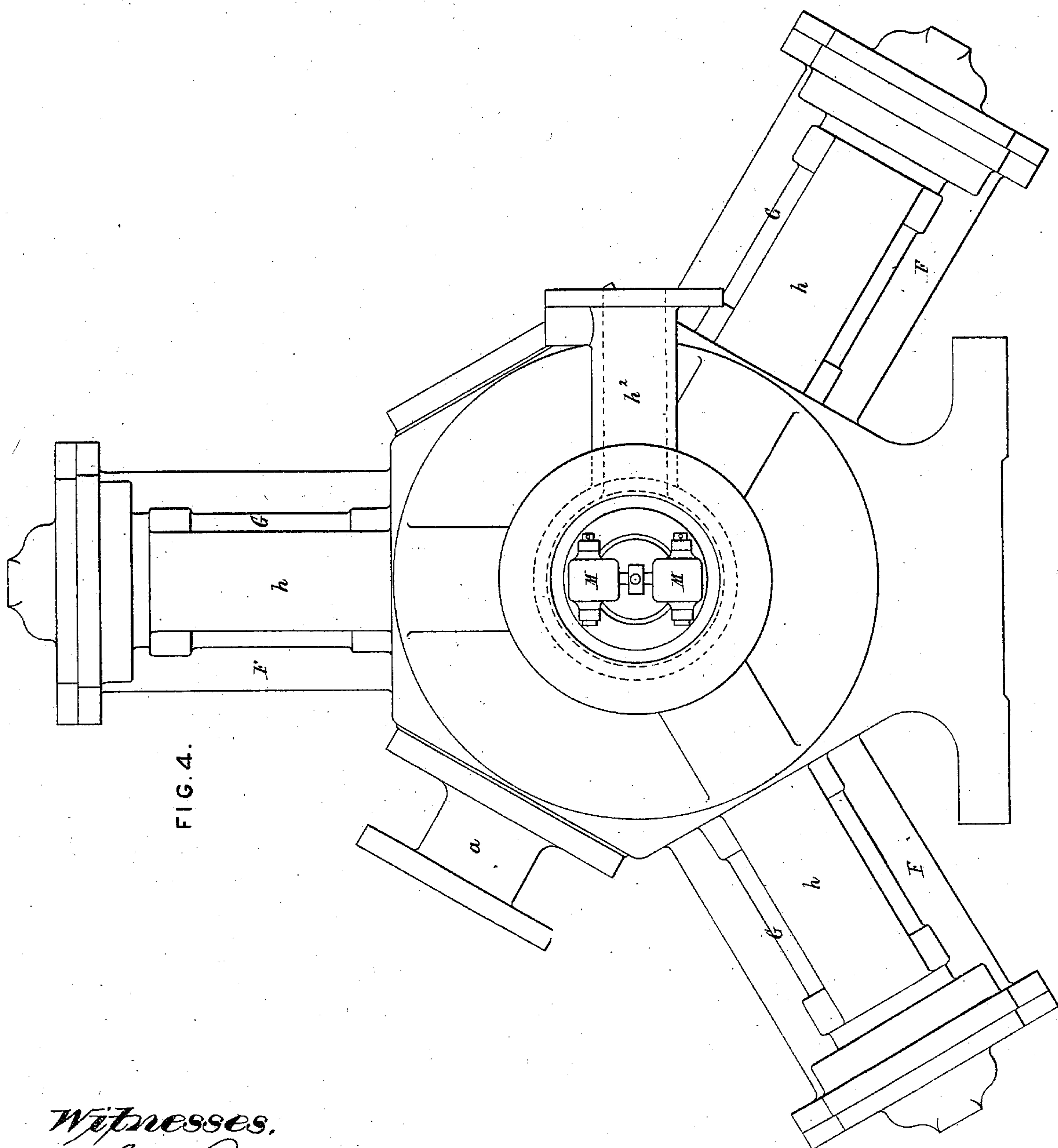


FIG. 4.

Witnesses.

J. A. Rutherford

Robert Emmett.

Inventor.

Peter Brotherhood,

By James L. Norris, *Att'y.*

UNITED STATES PATENT OFFICE.

PETER BROTHERHOOD, OF LAMBETH, COUNTY OF SURREY, ENGLAND.

MULTIPLE-CYLINDER ENGINE.

SPECIFICATION forming part of Letters Patent No. 299,731, dated June 3, 1884.

Application filed November 24, 1883. (No model.) Patented in England May 18, 1883, No. 2,494.

To all whom it may concern:

Be it known that I, PETER BROTHERHOOD, a citizen of England, residing at Lambeth, in the county of Surrey, England, have invented an Improvement in Multiple-Cylinder Engines, (for which I have obtained a patent in Great Britain, No. 2,494, dated May 18, 1883,) of which the following is a specification.

In the specification to Letters Patent No. 284,372, dated September 4, 1883, I described an improvement in multiple-cylinder engines, referring to drawings annexed to the said specification, showing a three-cylinder engine embodying my improvement.

My present invention consists in certain modifications in such engines, whereby I am enabled to simplify their construction and obtain more ready access to some of their working parts, as I will explain, referring to the accompanying drawings, in which I have marked the parts corresponding with those in the specification, No. 284,372 with similar letters.

Figure 1 is a central vertical longitudinal section. Figs. 2 and 3 are vertical transverse sections, respectively, on the lines X X and Y Y of Fig. 1; and Fig. 4 is a side elevation.

A is the central cavity, into which the cylinders successively discharge their exhaust, which passes away by the exhaust-pipe *a*.

B B' is the engine-shaft, with crank C, balanced by eccentric weights C' C', secured in position by setting screws on the cheeks of the cranks, which are turned circular for their reception. On a bush, C², fitted on the crank C, bear the segmental ends of the three connecting-rods D, which are held to it by rings *d*, divided in halves bolted together. At the side of each of the cylinders F is the cylindrical slide-case G, communicating with the cylinder by a short port, *g*, and opening at its inner end into the central cavity, A. The middle part of the slide-case receives supply of the steam or other working fluid by a passage, *h*, from an annular cavity, H, to which the working fluid is admitted through a regulating-valve, *h'*, worked by the governor, as will presently be described. The cylindrical tubular slide-valve K has its inner part larger

than its outer part, so that there is always an excess of pressure on the slide inward. As this form of slide, if the case were bored to fit it, could only be removed from its case by drawing it inward, which would involve great trouble and inconvenience, I bore the outer ends of the slide-cases G larger than their inner ends, and fit them with linings G', which are lips projecting from the covers, and thus, by removing a cover with the lining G' belonging to it, I can withdraw the slide K outward. Each of the slides K is worked by a connecting-rod, *k*, which has a T-shaped segmental end, with the flanges of the T engaged in grooves in two eccentric sheaves, L, which are bolted together face to face, and fitted on a trunnion formed on the exterior of the bearings for the shaft B'. A pin, *l'*, entering a slotted hole in the crank of the main shaft, is a driver for the eccentrics. As the slides K are always pressed toward the eccentric, their rods *k* are always under thrust-strain, and therefore there is no noise or shock, such as would result at quick speed if the strain were alternately tensive and compressive. The regulating-valve *h'* is fitted to slide within a casing, which is caused to revolve with the shaft B' by a coupling giving a little freedom of end motion. To this rotating casing are hinged the two governor-weights M M, which are formed as bell-crank levers, their arms engaged in a slot in the stem of the valve *h'*, which stem is pressed inward by a rod subject to the strain of an adjustable spring, N. When the centrifugal force of the weights M is sufficient to overcome the pressure of the spring N, the valve *h'* is moved toward the right, closing more or less the passage to the space H from the cavity H', which is supplied with the working fluid by the lateral pipe *h*².

The eye *d*, by which each connecting-rod D is jointed to the piston E, is made tubular, with a slot through it, which, at a certain part of the stroke, is made to coincide with a slot, *e*, through the piston, for the purpose of permitting escape of exhaust, and so relieving back-pressure on the piston, as explained in my patent Specification No. 284,372.

As the engine which I have herein described

corresponds in its general features and also in some of its details with that described in the previous specification No. 284,372, it is to be understood that I make no claim in respect of those features or details; but

I claim only as my present invention—

1. The combination of the double sheaves L, having a T-shaped eccentric groove for the end of the valve-rod k, with a trunnion cast on one of the casing-heads, forming also an end bearing for the end B' of the crank-shaft, all arranged substantially as described.

2. The combination of the double sheaves L, having T-shaped eccentric groove for the end of the valve-rod k, with a trunnion cast on one of the casing-heads, forming an end bearing for the end B' of the crank-shaft, and said sheaves operated by a pin, l', secured to the crank, substantially as described.

3. The combination of the crank-shaft of the engine, having an end bearing for the part

B' of said shaft, and forming a trunnion with the double sheaves L, provided with a T-shaped eccentric groove, and operated by a pin, l', secured in the crank, as specified.

4. In combination with an engine having radiating cylinders, a bearing on one of the casing-heads for the end B' of the crank-shaft, serving, with its outer surface, as a trunnion, upon which the eccentrics or sheaves for operating the valves are mounted, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 1st day of November, A. D. 1883.

PETER BROTHERHOOD.

Witnesses:

JOHN DEAN,

J. WATT,

Both of 17 Gracechurch Street, London.