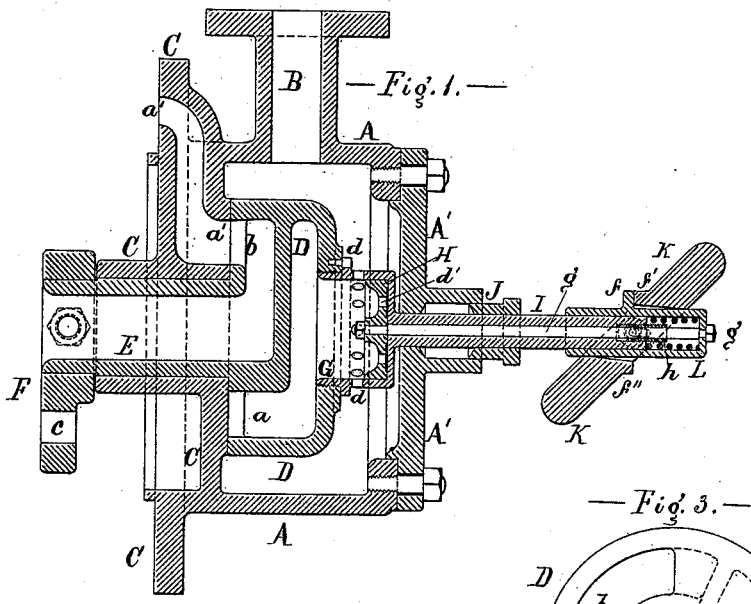
P. BROTHERHOOD.

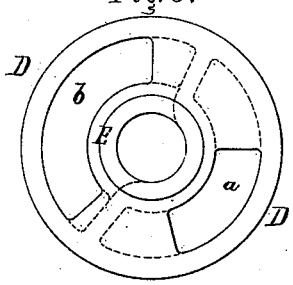
Rotary-Valve for Steam-Engine.

No. 196,189. Patented Oct. 16, 1877.

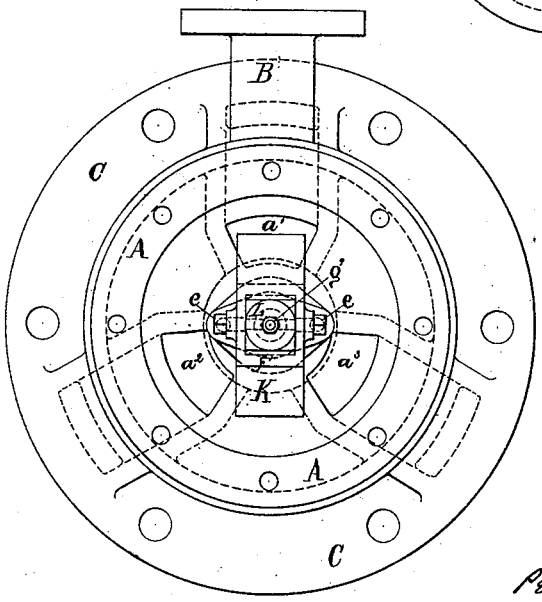
—Fig. 1.—



—Fig. 3.—



—Fig. 2.—



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UNITED STATES PATENT OFFICE.

PETER BROTHERHOOD, OF NOTTING HILL, ENGLAND.

IMPROVEMENT IN ROTARY VALVES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **196,189**, dated October 16, 1877; application filed June 23, 1875; patented in England, June 5, 1873, for fourteen years.

To all whom it may concern:

Be it known that I, PETER BROTHERHOOD, of No. 25 Ladbroke Gardens, Notting Hill, in the county of Middlesex, England, have invented certain new and useful Improvements in Rotary Valves for Steam-Engines, of which improvements the following is a specification, the same being shown in English Patent No. 2,003 of June 5, 1873.

The objects of my invention are, first, to control the revolutions of the engine-shaft by effecting the regulation of the steam as near as possible to the outer end of the cylinder-ports; second, to operate the governor directly by the rotary valve; and, third, to make use of the rotary valve as a part of the regulating apparatus; and to these ends my invention consists in constructing a rotary valve so that the admission of steam may be regulated within the valve itself by a sliding or reciprocating disk or regulator, and also in effecting the regulation of the steam within a rotating valve by a governor driven directly by the valve itself, and acting thereon by means of an endwise-moving rod, as will hereinafter more fully fully be set forth.

My invention further consists in certain novel constructions of parts and combinations of devices, which will hereinafter specifically be designated.

In the accompanying drawings, which make part of this specification, I have shown an exemplification of my improvements as applied to my triple-cylinder engine described in the Letters Patent of the United States issued to me December 23, 1873.

Figure 1 is a section through the axis of the valve, its chest or cover, and the governor. Fig. 2 is a plan of the governor and the valve-chest with the cover of chest and the valve removed to show the ports. Fig. 3 is a plan of the valve, showing its steam and exhaust openings.

A A represent the valve chest or cover, which is provided with a nozzle, B, for the admission of steam. One end of this cover is closed by a cap, A′ A′, bolted to a flange in the cover, and the other end by a head, C C, cast with the cover. In this head are provided steam-passages a^1 a^2 a^3, which at one end open into the interior of the chest, and at the other into the passages leading to the cylinder. An extension of this head forms a flange through which the chest is bolted to the central chamber of my triple-cylinder engine.

The rotary valve D is cylindrical in form, and its interior is divided into two parts or passages, *a* for steam, *b* for exhaust, and openings through the face of the valve to these passages serve to place them alternately in communication with the cylinder-passages described in my before-mentioned former patent.

Perpendicular to the face of the valve, and cast with it, a cylindrical hub, E, projects through the head C C, which it fits accurately. The hole through the hub communicates with the exhaust-passage *b*, and must be of sufficient size to transmit the exhaust freely from the valve into the central chamber before mentioned.

Upon the end of the hub E, I secure a crank, F, having a hole, *c*, which fits loosely over a projection from the crank-pin, by means of which motion is communicated to the valve.

The steam-passage *a* at its outer end is closed by a cylindrical brass cover, G, forming an extension of the valve, through which steam is admitted from the chest A A by a series of holes, *d d d*, in the same plane. The interior of the cover G is provided with a disk, H, which slides freely within it, so as to cover partially or entirely the holes *d d d*, and regulate the quantity of steam which can pass through the valve. One or more holes, *d′*, are bored through this disk parallel to its axis, to prevent the pressure of steam from operating upon it in this direction.

Upon the exterior of the cylindrical extension or cover G, and in line with the axis of the valve D, I provide a hollow shaft, I, which passes through the stuffing-box J in the valve-chest cap A′ A′, and upon its outer extremity the vibrating bar K is suspended by screws *e e*, which pass through the sides of the bar and take into holes provided for that purpose in the shaft I. Upon the outer end of the shaft I, I provide a cylindrical slide, L, closed at one end and fitted to slide freely upon the shaft. Upon one side it has a projection, *f*, to receive a corresponding projection, *f′*, upon the vi-

brating bar K, and to balance this weight a corresponding projection, *f''*, is made upon the opposite side of the bar.

To the closed end of the slide L, I attach the disk H, by means of the rod *g g*, which passes through and fits easily in the hollow shaft I, and to prevent the escape of steam around this rod the stuffing-box *h h* in the outer end of the shaft I is provided.

Between the closed end of the slide L and the outer end of the shaft I a spiral spring is inserted, which is compressed as the slide is pushed onto the shaft, and, by its action through the projections *f* and *f'*, tends to maintain the bar K in the position shown by the drawing.

The revolution of the shaft I and bar K will create a tendency in the bar to assume a position more nearly at right angles to the shaft, which tendency will be resisted by the spring and the pressure of the steam against the inner end of the rod *g g*; but when the revolutions have become sufficiently rapid to overcome this resistance the rod will be moved, carrying with it the disk H, partially covering the holes *d d d*, and reducing the flow of steam into the valve, thereby reducing the pressure and checking a further increase of speed, while a diminution of speed will, through the operation of the forces and means described, increase the opening for the admission of steam into the valve, and prevent a further reduction, thus controlling the revolutions of the engine-shaft within limits proportioned to the degree of motion required by the disk to admit the largest or smallest quantity of steam demanded by the engine to perform the work.

It will be evident to any skilled mechanic that, if the rod *g g* were connected to one end of a lever suitably supported from the valve-chest cap A' A', and the other end of the lever should be connected to an ordinary throttle-valve placed in the nozzle B, the regulation would be effected by diminishing and increasing the pressure of steam in the valve-chest, as is now commonly done, and in like manner it is evident that, if the governor were located in any convenient position to be driven from the engine, and a lever-connection was made from the slide L on the governor so located to the rod *g g*, as described herein, the regulation would be effected within the rotary valve, as hereinbefore described; so that I do not restrict my claim to the relative position and arrangements of parts, as described.

I do not in this application claim the improvements in the governor mechanism illustrated in my drawings, as I have made the same the subject of Letters Patent No. 185,891, granted to me January 2, 1877; but

What I do claim, and desire to secure by Letters Patent, is—

1. The combination of the rotary valve having a perforated extension and the sliding disk within said extension, substantially as hereinbefore set forth, to regulate the admission of steam to the valve.

2. The combination, substantially as hereinbefore set forth, of a rotary valve, a sliding disk therein, a rotating governor, and a rod connecting the governor with the disk, whereby, as the speed of rotation of the governor increases, the rod moves endwise, carrying with it the disk, and decreases the area of the steam-inlets to the valve, as set forth.

3. The combination of the valve-chest, the rotary valve, the hollow shaft projecting therefrom through the valve-chest cap, the vibrating bar suspended upon the hollow shaft, the sliding disk and its rod, these members being constructed and operating substantially as hereinbefore set forth.

4. The rotary valve constructed with a hollow cylindrical hub projecting through the valve-chest head, which communicates with the exhaust-passage in the valve, and provided with a crank, substantially as hereinbefore set forth.

5. The combination, substantially as hereinbefore set forth, of the valve-chest, the rotary valve, its cylindrical hub projecting through the valve-chest head, and the hollow shaft passing through the valve-chest cap.

In testimony whereof I have hereunto subscribed my name.

PETER BROTHERHOOD.

In presence of—

GEORGE MESSENGER,
GEORGE H. FERRY.